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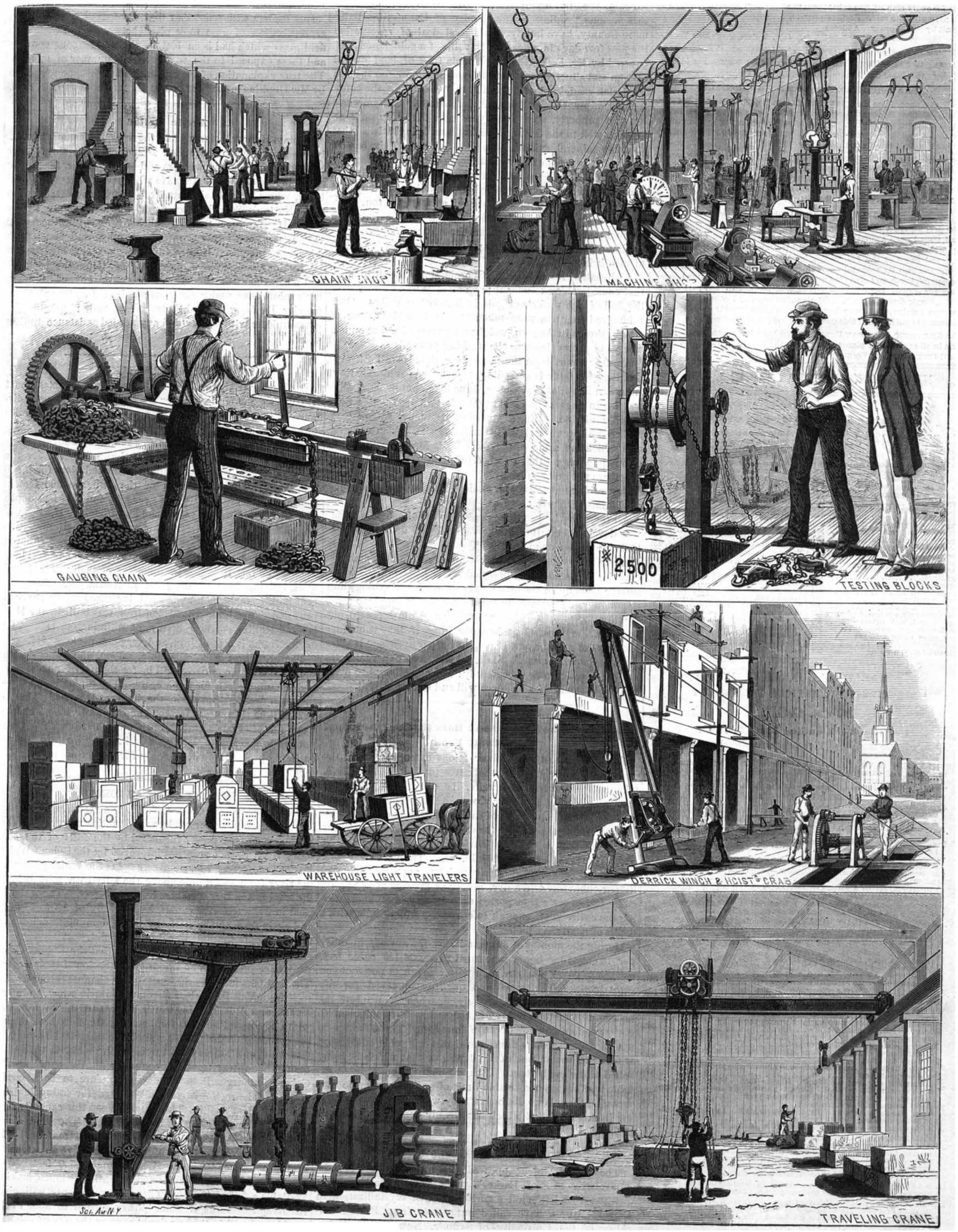

MANUFACTURE OF THE WESTON DIFFERENTIAL PULLEY BLOCK, YALE LOCK MANUFACTURING CO.—[See page 357.]

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Contents.

(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 281,
For the Week ending June 5, 1880.

Price 10 cents. For sale by all newsdealers.

AN EPIDEMIC OF GOLD DISCOVERY.

Reports of gold discoveries in Maine or beyond the Rocky Mountains are matters of everyday occurrence and surprise no one There seems to have been of late, however, a remarkable outbreak of such reports from other parts of the country.

To begin at home, there is the report from Albany, April 29, that Albert Stolpp, of Brooklyn, has filed official notice with the Secretary of State that he has discovered a well-defined vein of gold and silver in the town of Cornwall, Orange County, N. Y.

A dispatch from Milwaukee, Wis., April 23, says: "Much excitement prevails at Ashland over the reported discoveries of gold and silver, in paying quantities, at Brunschwiller and Silver Creek, fourteen miles south of Ashland."

From the Baltimore *Gazette*, of April 22, we learn that persons residing in the vicinity of Catonsville, Baltimore County, have indulged in a good deal of speculation the past few days in regard to the value of a gold deposit discovered by Mr. F. Marion Hay upon a tract of land owned by him and situated eight miles from Baltimore, on the old Frederick road, in close proximity to "Glenwild," the country seat of Mr. George Appold. Immediately after purchasing the property, about one year ago, Mr. Hay sank an artesian well to the depth of 150 feet, and being satisfied that valuable mineral existed, began to sink a shaft six feet in width, but was compelled to suspend operations during the winter. The shaft has now been completed, and the quartz containing the gold was reported yesterday by those engaged in the work as having been assayed at $30 per ton. Mr. Hay is sanguine that the precious metal will be found in paying quantities, and operations thus far seem to verify his prediction. The work progresses night and day, two sets of men being employed.

A dispatch from Atlanta, Georgia, dated April 13, says that considerable excitement prevails in White County over the find of rich pockets of gold in Nacoochee Valley. Over a hundred nuggets were taken out in four days, one of which, shown in Atlanta, weighs over a pound and an ounce. The yield grows richer as the washing proceeds.

Another report from the same place, dated April 24, says that the gold fever is spreading, especially in White County. Lumsden Bros., at Nacoochee, have taken out 2,700 pennyweights in nuggets from 80 square feet of earth at a total expense of $65. From a pocket 30 inches square they gathered 212 pennyweights in small nuggets. Another party that struck the same lead took out, before they began to clean up, a nugget that weighed 106 pennyweights, and several others not quite so heavy.

Favorable reports are also made from the lately reopened gold mines of North Carolina.

All these may be genuine "finds," to be followed by profitable developments; nevertheless it will not do to base extravagant hopes upon them. Too often, as Prof. Stewart remarks in a recent report on certain Maine mines, such discoveries are made "by new-fledged prospectors, who are utterly ignorant of the elementary principles of geology and mineralogy. They hastily squat on a protruding trap dike, and develop 'the find' by excavating a shallow potato pit, and imagine themselves bonanza kings if they encounter a stringer of mundic or fragment of copper pyrites. 'It takes a mint to work a mine.' Skill, capital, and experience are needed to run a mine successfully; and any attempt to manage the business without these will end disastrously."

Where the Islands and Sand Bars in the Mississippi River Come From.

From a series of daily observations extending from the early part of February to the latter part of October, 1879, taken at St. Charles, Mo., under the direction of officers of the United States Engineer Corps, it has been ascertained that the average quantity of earthy matter carried in suspension past that point by the Missouri River, between one foot of the bottom and the surface, amounts to 14,858 lb. per second, or 1,283,731,200 lb. each twenty-four hours. The matter thus carried along weighs, approximately, 100 lb. per cubic foot when dry, giving an average of 12,837,312 cubic feet of earth transported each twenty-four hours during the entire year, enough to cover one square mile with a depth of nearly six inches.

During the months of June and July the average quantity per twenty-four hours amounted to 47,396,448 cubic feet, enough to cover a square mile with a depth of one foot and eight inches. The maximum quantity observed for any twenty-four hours was on July 3, when it reached the enormous amount of 111,067,200 cubic feet, sufficient to cover a square mile to a depth of four feet. These figures do not take into account the material that is held in suspension within the lowest foot of the depth, or that which is being rolled along the bottom. If these quantities could be ascertained within any reasonable limit of approximation to correctness, there is no doubt but they would show an amount far in excess of that which has already been determined.—*Missouri Republican.*

ANOTHER LOST FIELD GLASS.

The articles which appeared in this paper some months ago relative to Prof. Barker's paper before the American Science Association on a curious case of crystallization in Canada balsam, have called out a note from Prof. Liversidge, of the University of Sydney, New South Wales, inclosing a printed paper on the same phenomenon read by him before the Royal Society of New South Wales, December 1, 1875. The paper is illustrated by two fine engravings from photographs, representing "some peculiar and interesting examples of fracture." Prof. Liversidge said:

"They were met with upon the lenses of a field-glass, or, to speak more precisely, between the surfaces of the achromatic combinations of the two object glasses of a field-glass, which had been lost upon the Liverpool Plains, and there left exposed to the sun and weather for a period of five or six years. The long-continued exposure to alternate heat and cold had evidently caused the Canada balsam, or other material used for cementing the crown and flint glass portions of the lenses together, to contract and crack along certain lines; the contraction and consequent fractures being due to the loss of turpentine from the balsam by gradual volatilization."

Our readers will remember that Prof. Barker's supposed crystallization of gum took place between the lenses of a field glass which had been lost in the Yellowstone country and there exposed to the weather for a number of months. The true explanation of the crystalline appearance was given by Mr. Hopkins in the SCIENTIFIC AMERICAN of Jan. 31, 1880.

Arctic Relief.

Captain Hooper, commanding the revenue steamer Corwin, has been ordered to leave San Francisco, Cal., May 22, for the relief of ice-bound whalers and to search for the Arctic exploring vessel Jeannette. He will proceed direct to Ounalaska, where he will take in a fresh supply of coal; then go on to Norton's Sound, touching at the seal islands by the way. He is to push through Behring Straits into the Arctic Ocean as soon as those waters are open, and assist such whalers as may need help, making meantime, as his letter of instruction reads, careful inquiries regarding the progress and whereabouts of the steamer Jeannette, engaged in making explorations under the command of Lieutenant Commander De Long, United States Navy, and, if practicable, communicate with and extend any needed assistance to that vessel.

A FAST RIVER STEAMER.

During her trial trip, May 12, the new iron hull steamboat Albany, for the Hudson River day line to Albany, ran a distance of 16 miles in 37½ minutes, a speed of nearly 26 miles an hour. The state of the tide was not reported. Her owners expect that she will easily run 24 miles an hour.

The Albany is the largest steamer built thus far for the day service, and will have ample accommodation for 2,000 passengers. The dimensions of the hull are 296 feet in length, 40 feet beam (73½ feet over all), and 11½ feet depth of hold. The engines were made by Fletcher, Harrison & Co., and are of the vertical beam condensing pattern, with a 73 inch cylinder, a 12 foot stroke, and capable of running up to 3,000 horse power. There are three boilers, 38 feet long each, and 8 feet 10 inches in diameter of shell. The joiner work is being done by Mr. John E. Hoffmeyer. Every recent improvement looking toward increased safety has been provided. The hull, which is of iron, was built by the Harlan and Hollingworth Company, of Wilmington, Del. The engine frame is also of iron, and very compact.

There are three decks, the main, saloon, and upper decks. the main and saloon decks will be for the use of passengers, and the upper deck for the officers. The dining room is on the main deck instead of in the hold, as is usual. The saloon will be elaborately frescoed and upholstered. The forward and after parts are left open on the sides. The after portion is covered by the upper deck. The forward part is entirely open. She will be ready for service about the middle of June.

IMPROVEMENTS AT COHOES.

The importance of Cohoes, N. Y., as a manufacturing city largely depends, as our readers are doubtless aware, upon the magnificent water power furnished by the falls of the Mohawk River at that point, as improved by the Cohoes Water Power Company. This company owns the entire power of the river from half a mile above the falls to a mile below, the total fall in that distance being 120 feet. The water is used in five successive canals, having falls of 18 to 25 feet, and again from the level of the State dam built below the falls to supply the Erie Canal at this point.

From the *Northern Budget* we learn that the Cohoes Company have just begun an important extension of their works. The first part includes the cutting of a channel through solid rock from Van Rensselaer street, up Ontario street, to intersect the canal at Lansing's Mill, a distance of 600 feet, the width of the cut being 35 feet, and the depth 20 feet. From the corner of Ontario street a similar canal, 800 feet long, 30 feet wide, and 20 feet deep through solid rock, is to be cut beside the railway track, to connect with the canal at the Cohoes foundry. Both these cuttings are to be securely arched. The rock removed will be used for filling in land in rear of Root's Mill. The water to feed this canal is now running to waste from the Lansing Mill. The land along the canal will furnish 2,000 feet of mill frontage. The further improvements in contemplation involve an extension of the Rensselaer street canal a distance 1,500 feet. Two lines of canal will be constructed the entire distance, making available a fall of 40 feet. These improvements will give, the *Budget* remarks, a water power second to none in the world, and will in time no doubt convert the city of spindles into the largest cotton manufacturing center on this continent.

POISONOUS FRYING PANS.

When our rival tea dealers began to offer badly printed and gaudily colored chromos to draw custom, it was thought that this form of trade debasement had reached its lowest development. The tea men of Dublin, however, have gone on from æsthetic to physical poisoning, and have distributed throughout that city large numbers of frying pans coated with an alloy of tin and lead, the use of which has resulted in numerous cases of serious poisoning. At a late meeting of the Section of Physical and Experimental Science of the Royal Dublin Society, Dr. Reynolds, the president, exhibited one of these dangerous frying pans, which had been sent to him for analysis. The pan was of the ordinary sheet iron sort, but instead of having the usual coating of tin, was covered with an alloy very rich in lead, making it exceedingly dangerous to public health. On inquiry, Dr. Reynolds had found, he said, that large numbers of those pans were being presented with more or less large quantities of tea through the city, and he might tell them that the friend of his who suffered from cooking conducted in one of those pans had nearly lost her life. Her servant—a very much stronger person—consumed very much more of the food that was in the pan, and consumed not only the sausages, he believed, but, foolishly enough, took also of the gravy, or whatever it was, and accordingly took a larger dose of the lead. Not only did she suffer from very serious symptoms, but was obliged to go to the hospital, and he did not know whether or not she had yet left it. Of course, in some cases, a small dose of the lead might do little or no harm, but there were many chances that an amount of lead which must be considerable, taken up by any acid-producing food, might enter the system, and positively cause symptoms resembling in some respects, as all kinds of irritant poisons did, those of cholera, and it was possible that many cases of death, which might be set down readily enough to ordinary English cholera, might have been produced by the introduction into the system of considerable quantities of lead.

On being asked how to detect the dangerous frying pans, Dr. Reynolds described and experimentally illustrated the following simple method. A little nitric acid diluted with water was boiled in the suspected pan. The mixture was then further diluted with pure water and poured into a clean vessel. The presence of lead was shown by adding a little iodide of potassium, which produced at once a yellow precipitate of iodide of lead.

The tea dealers had probably bought these pans to "give away," because they were cheap, knowing nothing of their dangerous character. Whether any of the sort have reached our markets we do not know. It would be well, however, for buyers to be on their guard. Five cents' worth of iodide of potassium and nitric acid, which can be had of any druggist, would suffice for the test.

CARP CULTURE.

A leather-back carp, weighing 7½ lb., has lately been taken in the government ponds at Washington. It was one of the original fish brought to this country by Mr. Hessel three years and a half ago. This shows a rate of growth far exceeding that of the same fish under similar circumstances in Europe. Several marked advantages are claimed for the German carp for profitable cultivation. Any kind of pond, no matter how restricted, can be used. Difficulties of temperature or purity of water are scarcely factors in carp culture. Providing the water is not too cold, carp thrive rapidly. In fact, no natural water has yet been found too warm for them. Being vegetable feeders, carp thrive on the plants growing in the water, or may be given offal, like pigs, or boiled grain, like chickens. A large pond may be dug on arable land, allowed to grow carp for two or three years, the fish marketed, and the ground be brought under culture again.

The profitableness of carp culture is shown by the following experience reported in a California paper. A gentleman in that State bought six carp in January, 1876. One of them soon died. From the other five he raised the first year 2,044 fish, and the year after 2,672. In 1878 he sold two of his old fish, and raised 4,000 from the remaining three. He had four shallow fish ponds, costing $50 each, and covering about half an acre of low ground comparatively worthless for other uses. For his original fish he paid $30, and $10 for food stuff, making a total outlay of $240. In four years he sold $415 dollars' worth of fish, and had from 4,000 to 6,000 left, after supplying his own table with fish for eighteen months.

There are thousands of small ponds throughout the country which might, with little trouble and large profit, be converted into carp ponds.

STOVE CASTINGS.

In a communication, too long to print, Mr. L. H. Bingham, of Harmor, Ohio, suggests several possible improvements in stove castings.

As a rule, he thinks too little metal is put into modern castings. He finds the lining of stoves not more than one-eighth of an inch in thickness, when three-eighths would be too little for durability. In one type of cooking stoves—a very pretty, convenient, and popular pattern—the flue divisions are not half thick enough to stand the heat, and the door frames are equally deficient in weight.

Mr. Bingham notes also that stoves with boiler attachments cannot be used for baking without having the boiler in place and full of water. To remedy this defect he proposes the insertion of a damper so constructed as to shut up closely between the boiler and the flues, and, when desired, to let down under the boiler, for the boiler to stand on when in.

Another suggestion is that stoves with boiler attachments be cast with a straight back, so that the boiler may be removed at pleasure, or used as a fruit drier. This, he thinks, could easily be done by casting the back of the stove straight, with the back wall in two parts, the upper section slipping in or out at will. By slightly modifying the present construction of such stoves and giving them a straight back, they can easily be made to take on any style of back attachments that may be cast for them.

MUYBRIDGE'S ZOOGYROSCOPE.

Our readers will recall the interesting illustrations of the motions of a trotting horse, drawn from Mr. E. J. Muybridge's instantaneous photographs, which appeared in this paper, October 19, 1878. The suggestion then made that the motions of horses and other animals might be happily exhibited by an arrangement of such photographs in connection with a zootrope has been carried out; and, according to the San Francisco *Call*, of May 5, a private exhibition of the device had been given by Mr Muybridge in the gallery of the San Francisco Art Association. Mr. Muybridge calls his instrument a zoogyroscope. It is described as a circular glass having a series of photographs of the animal to be represented in motion, the photographs being successively illuminated by an oxyhydrogen lantern, as the glass is turned, throwing a single continuous yet ever-changing picture upon the screen.

While the separate photographs had shown the successive positions of a trotting or running horse in making a single stride, the zoogyroscope threw upon the screen apparently the living, moving animal. Nothing was wanting but the clatter of the hoofs upon the turf and an occasional breath of steam from the nostrils to make the spectator believe that he had before him genuine flesh and blood steeds. In the views of hurdle leaping the simulation was still more admirable, even to the motion of the tail as the animal gathered for the jump, the raising of his head, all were there. Views of an ox trotting, a wild bull on the charge, greyhounds and deer running, and birds flying in mid-air were shown, also athletes in various positions.

NEW YORK ACADEMY OF SCIENCES.

A meeting of the New York Academy of Sciences was held Monday evening, May 17, 1880, President Newberry in the chair.

Prof. Newberry exhibited a specimen of Hübnerite from Dakota. The tungsten in this mineral is replaced in part by manganese. Prof. Egleston remarked that the specimen was not so brown as Hübnerite from other localities, and that it probably contained less manganese. An analysis would reveal whether Hübnerite is really a distinct species.

A NEW PROCESS FOR PROTECTING GOODS FROM MOISTURE.

Prof. Kroeh exhibited some samples of delicately colored silks, velvets, and other fabrics that had been treated by a new process for the purpose of making them shed water. He showed that untreated portions of these goods were quickly wetted through when water was poured upon them, while the water rolled off in drops like globules of mercury from the treated portions. The inventor, Mr. D. M. Lamb, of New York, gives the name of Neptunite to the material by means of which this result is obtained. It appears to be some preparation of rubber dissolved in naphtha, but its accurate composition or the details of its preparation are not made public. It differs essentially from water proofing in that it does not fill up the pores and meshes of fabrics, but impregnates their fiber, leaving the air to circulate freely through them. Wearing materials of all kinds, such as silks, satins, velvets, woolen and cotton goods, kid gloves, ostrich feathers, furs, carpets, have been treated successfully without injury to the most delicate tints. Arnold's writing fluid, coffee, and claret have been spilt upon delicate silks so prepared and washed off again without leaving a trace. Ladies attired in such materials may brave the dampness and rain unscathed, and it is whispered that even their crimps may be made to keep their waviness by this means. It is claimed that the wearing qualities of goods are not only not injured but positively improved by the operation of rendering them water repellent. If this prove true, the company formed to introduce the process, under the presidency of the Hon. Hugh McCullough, is likely to reap a rich harvest; for no one will want to wear any other kind of goods It is claimed, furthermore, that water-repellent fabrics will neither shrink, mildew, decay, nor be attacked by moths. Time alone can show how well founded these claims are.

A communication from the council was read recommending to the Academy that the resignation of Dr. Martin be not accepted. A vote was taken, and the recommendation of the council was unanimously sustained.

Prof. Thomas Egleston then delivered an address

ON THE ORIGIN OF GOLD NUGGETS AND OF ALLUVIAL GOLD DEPOSITS.

Placer mines, in which gold nuggets are found, consist of alluvial deposits or ancient river beds. By far the greater portion of the gold in them is in a fine state of division. Near the surface the deposit is worth perhaps 30 or 40 cents per cubic yard, while further down it may reach a value as high as a dollar and a half. The commonly accepted explanation of the occurrence of nuggets in these places is that they were the result of the breaking down of auriferous quartz veins. This, Prof. Egleston maintained, could not be the case, because of their mammellar structure and chemical composition. Their structure is not such as would result from the transportation by water of the laminated gold of quartz veins. The latter, too, is often quite impure, being alloyed with silver, sometimes to the extent of 66 per cent, while the gold of nuggets is almost perfectly pure. In view of these considerations, and on the basis of the experiments directly to be described, Prof. Egleston proposed another explanation, declaring, as he said, with confidence, though not without expecting to be contradicted, that the gold in question was produced by deposition from solution. Gold, he said, had hitherto been considered by chemists as one of the most insoluble substances in nature, but in reality it is quite soluble. Sonnenstadt had shown that every ton of sea water contained 0·9 gramme of gold. This quantity is indeed extremely minute, but it must be remembered that nature is able to compensate for this minuteness by continuing her operations through thousands and millions of years.

The speaker's own experiments continued during the last five months show that gold is soluble at high temperatures and pressures in a variety of other solvents. Spongy gold exposed to the action of ammonium nitrate during that length of time imparted a distinctly yellow color to the solution. Faint traces were also found in solutions of bromide and iodide of potassium. Some of these solutions were exposed in sealed tubes to a temperature of 154°, and then to 214°. With solutions of sodium chloride and sodium carbonate no trace of gold was obtained. In another series of experiments 50 c.c. of water, containing about one-quarter gramme of gold, were exposed in vials, one with 1 c.c. of petroleum, and the others with one-half gramme of leather, leaves, and peat, and one-quarter gramme of cork. After five months the vial containing petroleum was found to contain upon the surface of the liquid minute crystals of gold, visible in strong sunlight. They are probably hexagonal prisms terminated by rhombic dodecahedra. The leather and cork were found to be entirely pseudomorphed. The action of the peat indicated that the presence of the organic acids of the soil favored the precipitation of the gold. Prof. Egleston believes that these and other experiments now going on in his laboratory warrant the conclusion that the gold of nuggets and alluvial deposits is due to chemical solutions filtering through the soil and precipitating their gold. This may account for the tradition prevalent among miners of the Carolinas and Virginia, that an abandoned placer left undisturbed for about twenty years, will yield a new crop of gold that may be even richer than the first.

Prof. Egleston concluded his address by describing some experiments on the nature of the so-called rustiness of certain kinds of gold, a property that prevents it from amalgamating readily. In deep placer mining the amount of gold actually obtained is only thirty-three per cent of the amount shown by the assay. Hence the importance of investigating the causes of the loss. Gold heated and cooled slowly will amalgamate at once, if heated and cooled suddenly it will not. A momentary immersion into sulphureted hydrogen or ammonium hydrosulphide prevents amalgamation. To test the statement, that the presence of four-thousandths of antimony prevented the amalgamation of Callao gold, he alloyed some gold with three or four per cent of antimony, but found that it would readily combine with mercury. He had also succeeded in dissolving out all the mercury from an amalgam, thus showing that it was not a definite compound.

The paper was discussed by Profs. Julian, Leeds, and Newberry. The latter asserted his belief that gold was doubtless extensively deposited from solution, but did not think nuggets were formed in this way. They are always found in connection with quartz veins, and do not differ essentially from them in composition. C. F. K.

MILK AND BUTTER PRESERVATIVES.

A high German authority in dairy matters, Dr. De Kleuze, of Munich, says that the preserving compounds so widely advertised are nearly always composed of varying proportions of bicarbonate of soda, sometimes mixed with common salt, boracic acid, borax, mixtures of borax with common salt, salicylic acid, and of late a mixture containing half of boracic acid and half of sulphate of potassium. Bicarbonate of soda has been in use a long time, and is still largely used. It acts by neutralizing the lactic acid which is formed in the milk, but its action is not satisfactory, as it is liable to give the milk a soapy taste. Salicylic acid is also unsatisfactory as well as expensive. Boracic acid is a powerful antiseptic, and preferable to borax.

For dairy use Dr. De Kleuze finds the above-mentioned mixture of boracic acid and sulphate of potassium superior to all other preservatives, and perfectly harmless as well as cheap. It can be obtained at any druggist. Sixty grains to a gallon of milk or a pound of butter is sufficient to prevent souring or rancidity.

Electric Lights on Buoys.

The whistling buoys now in use weigh about fifteen tons each, and in their plunging, even during calm weather, a force of nearly three horse power is evolved. To utilize this waste energy Mr. Edison has devised a small dynamo machine to be carried by the buoy, the current from which will sustain an electric light equal to one gas jet. If successful, these self illuminating buoys must be of great use to mariners.

IMPROVED FOLDING MIRROR.

In the folding mirror shown in the annexed engraving four sets of mirrors are attached to a single support, which is adapted to revolve on the vertical standard. Each set of mirrors consists of a stationary mirror and three hinged mirrors, two of which are at the ends of the stationary one, the third being hinged to the top so as to swing in a vertical plane. This mirror is provided with a hook, by which it may be secured at an angle of about forty-five degrees.

A person standing before this mirror will not only see a front view of the face, but will see side views in the lateral mirrors, and the upper mirror will reflect the image of the person foreshortened. Thus four different views may be had simultaneously. This invention is well adapted for use in the dressing room, and is especially useful in clothing and millinery shops or in other places where clothing is inspected or fitted.

Further information in regard to this invention may be obtained by addressing Mrs. C. McEvoy, P. O. Box 184, Millbury, Mass.

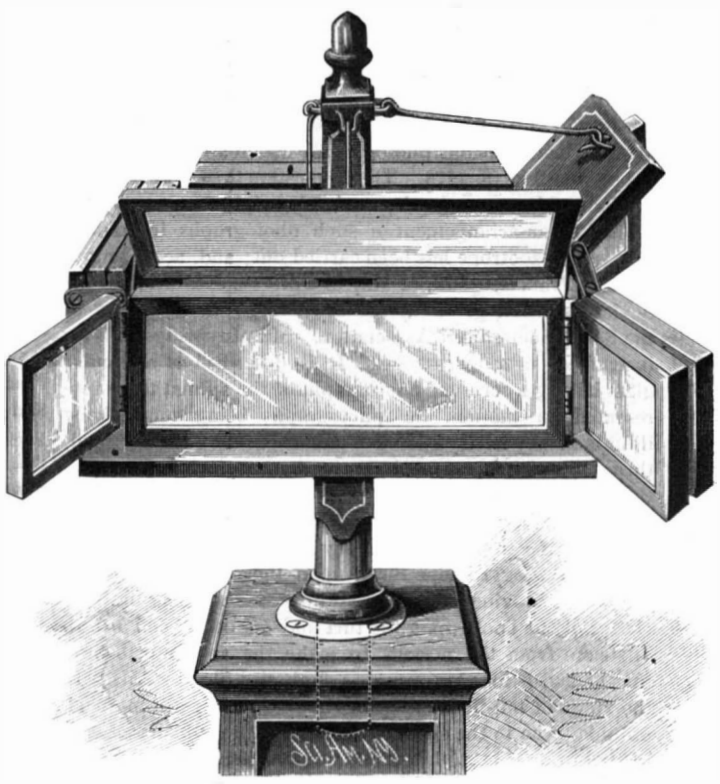
Improved Plan for Street Sprinkling.

At a recent meeting of the St. Louis Engineer Club, Col. Henry Flad explained a new device for sprinkling streets direct from the waterworks mains in a very rapid and efficient manner. The apparatus consists of three sections of four-inch wrought iron pipe connected between and at the ends with a hose and couplings, the pipe section being mounted on wheels for convenient transport. In connection with each section of pipe is arranged an automatic sprinkling nozzle, so adjustable that it can be readily adapted to any width of street. Half a block is sprinkled at a time, and ten blocks can be sprinkled in an hour. The connection being made with the waterworks mains insures a full head of water and very rapid and thorough work.

This system is specially intended for sprinkling residence streets at night. It will not answer at all for day sprinkling or for streets devoted to traffic. The estimated cost of this method is about one-tenth that of the present mode.

The Human Manufactory.

A man may eat and drink heartily all day, says an unknown writer, and sit and lounge about, doing nothing, in one sense of the word; but his body must keep hard at work all the time, or it will die. Suppose the stomach refused to work within ten minutes after a hearty dinner, the man would die in convulsions in a few hours; or cholera or cramp—colic would rack and wreck him. Supposing the pores of the skin—meaning thereby the glandular apparatus with which they are connected—should go on a "strike," he would in an hour be burning up with fever; oppression would weigh upon the system, and soon become insupportable. Suppose the liver became mulish, the appetite would be annihilated, food would be loathed, torturing pains would invade the small of the back, and the head would ache to bursting. Suppose the kidneys shut up shop, and danger most imminent, sufferings unbearable, and death more certain, would be the speedy and unenviable result. If the little workshops of the eye should close, in an hour he could not shut nor open them without physical force, and in another hour he would be blind; or if those of the tongue should close, it would become dry as a bone and stiff as steel.



NOVEL FOLDING MIRROR.

To keep such a complication of machinery in working order for a lifetime is a miracle of wisdom; but to work them by the pleasures of eating and drinking is a miracle of beneficence.

EDISON'S NEW ELECTRICAL RAILWAY.

But for the chronic aptitude of this generation never to wonder at anything, we might expect to witness expressions of surprise as it becomes known that we are to be whisked through the country at the rate of thirty, forty, or fifty miles an hour by an agent invisible and unknown save by its effects; but the moment electricity is suggested as a motive power for railways, the never-to-be-surprised public say "Why not?" Nevertheless the practical application of the electric current to this purpose seems never to have had a prospect of success before the experiments of Dr. Siemens, in Berlin, in 1879, and the present extended experiments of Mr. Edison. It is a subject fraught with difficulties, and while it has always offered a seemingly promising field for inventors, the expense attending experiments of this class has been a most effectual barrier to progress.

Mr. Edison, more fortunate in this respect than many of our experimenters, has not been hampered by monetary difficulties, and having had ample means for carrying out his ideas in practice, he has been enabled to develop his inventions more rapidly perhaps than any other man living.

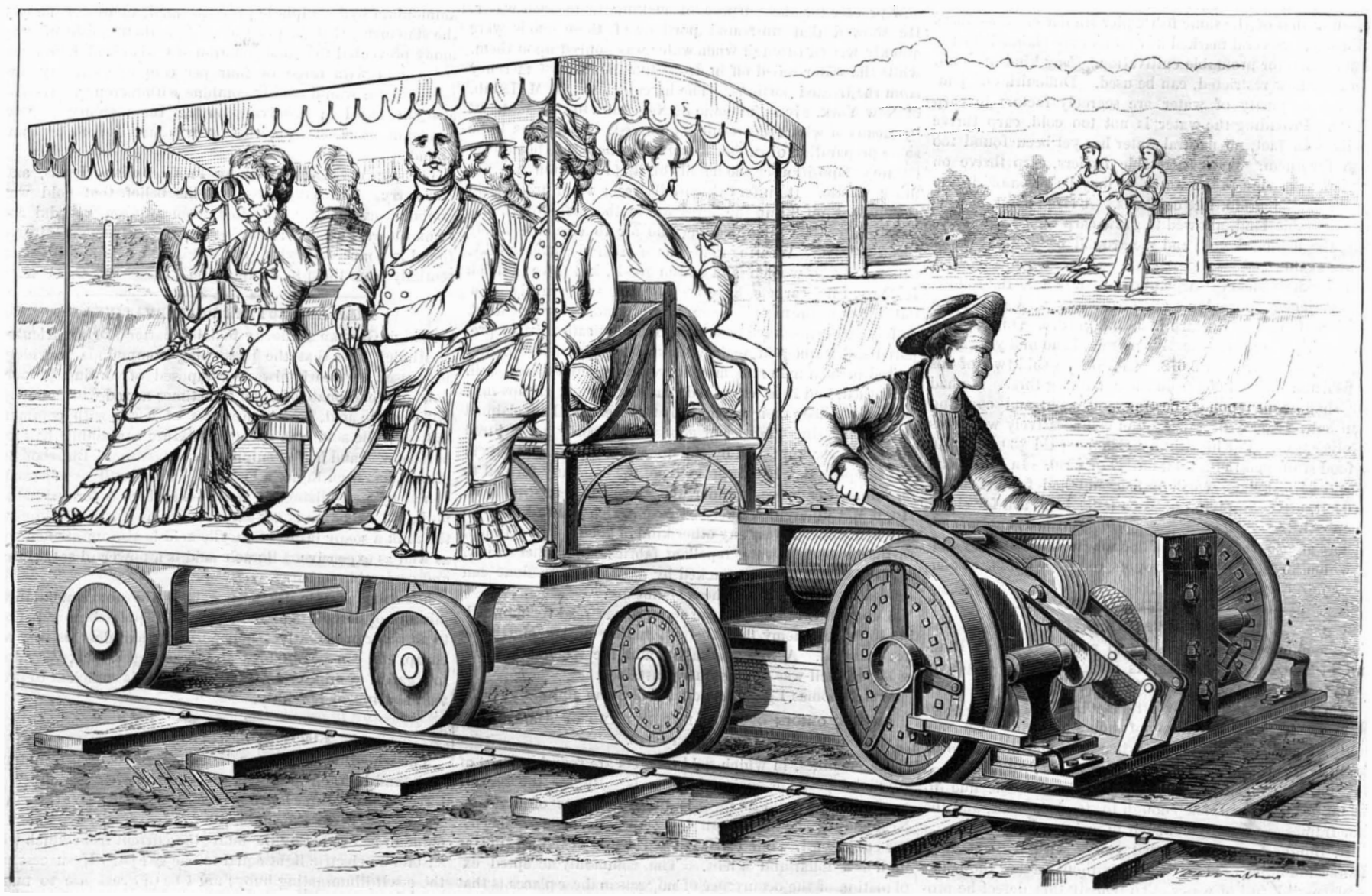
His new electric railway at Menlo Park is built over natural ground, with little or no grading, and with no regard for curves or grades. It is at present something over half a mile long, and is soon to be extended to form a mile circle. The present rolling stock consists of one electric locomotive and one open car. The general appearance of the railway and its equipments will be seen in our engraving. The motor is precisely like one of Mr. Edison's electrical generators, figured and described in our columns some time since, and the motive power is supplied by his stationary engine, the power being converted into electrical energy by a single generator.

The current thus created is conveyed to the track by two copper wires, one wire being connected with each rail. The armature of the locomotive makes four revolutions to one of the drive wheels. The machine is managed about like a steam locomotive, and it pushes ahead with wonderful energy.

By invitation of Mr. Edison, representatives of this journal were present at a recent trial of this novel motor, and had the pleasure of riding, with some twelve or fourteen other passengers, at a break-neck rate up and down the grades, around sharp curves, over humps and bumps, at the rate of twenty five to thirty miles an hour. Our experiences were sufficient to enable us to see the desirableness of a little smoother road, and to convince us that there was no lack of power in the machine. Mr. Edison says that he realizes in the locomotive seventy per cent of the power applied to the generator. He will soon add four more cars, and apply improvements which he has in contemplation.

This grand experiment is designed to test the applicability of the electric current to this purpose, and to develop a railway system suitable for plantations, large farms, and for mining districts, and perhaps it is not entirely visionary to expect that our street and elevated railways may at no very distant day be successfully operated by electricity.

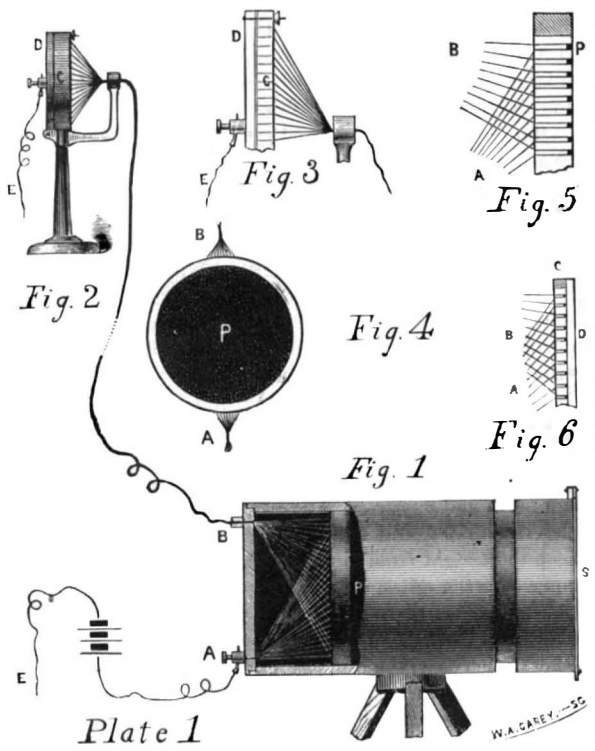
When the motor is complete and the road thoroughly equipped, we hope to be able to present our readers with further details.



EDISON'S ELECTRICAL RAILWAY.

SEEING BY ELECTRICITY.

The art of transmitting images by means of electric currents is now in about the same state of advancement that the art of transmitting speech by telephone had attained in 1876, and it remains to be seen whether it will develop as rapidly and successfully as the art of telephony. Professor Bell's announcement that he had filed at the Franklin Institute a sealed description of a method of "seeing by telegraph" brings to mind an invention for a similar purpose, submitted

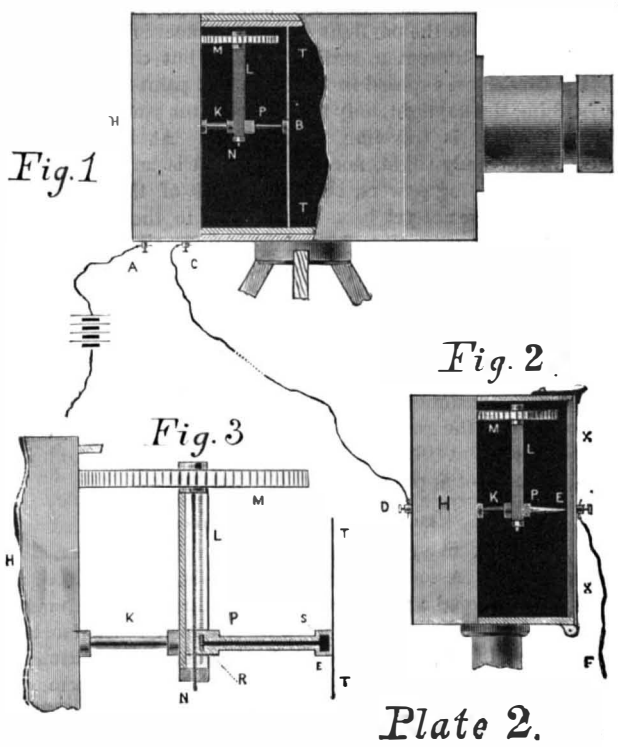


SELENIUM CAMERA.

to us some months since by the inventor, Mr. Geo. R. Carey, of the Surveyor's Office, City Hall, Boston, Mass. By consent of Mr. Carey we present herewith engravings and descriptions of his wonderful instruments.

Figs. 1 and 2, Plate 1, are instruments for transmitting and recording at long distances, permanently or otherwise, by means of electricity, the picture of any object that may be projected by the lens of camera, Fig. 1, upon its disk, P. The operation of this device depends upon the changes in electrical conductivity produced by the action of light in the metalloid selenium. The disk, P, is drilled through perpendicularly to its face, with numerous small holes, each of which is filled partly or entirely with selenium, the selenium forming part of an electrical circuit.

The wires from the disk, P, are insulated and are wound into a cable after leaving binding screw, B. These wires pass through disk, C (Fig. 2), in the receiving instrument at a distant point, and are arranged in the same relative position as in disk, P (Fig. 1).



INSTRUMENT FOR TRANSMITTING AND RECORDING IMAGES.

A chemically prepared paper is placed between disks, C and D, for the image of any object projected upon disk, P (Fig. 1), to be printed upon.

Fig. 3 is a sectional view of Fig. 2, showing wires and the chemically prepared paper.

Fig. 5 is a sectional view of disk, P (Fig. 1), showing selenium points and conducting wires.

Fig. 6 is a sectional view of another receiving instrument with platinum or carbon points, covered with a glass cap, there being a vacuum between glass cap, D, and insulating plate or disk, C.

These points are rendered incandescent by the passage of the electrical current, thereby giving a luminous image instead of printing the same. These platinum or carbon points are arranged relatively the same as the selenium points in Plate P (Figs. 1 and 4); each platinum or carbon point is connected with one of the wires from selenium point in disk, P (Fig. 1), and forms part of an electrical circuit.

The operation of the apparatus is as follows: If a white letter, A, upon a black ground be projected upon disk, P (Fig. 1), all parts of disk will be *dark*, excepting where the letter, A, is, when it will be light; and the selenium points in the light will allow the electric current to pass, and if the wires leading from disk, P (Fig. 1), are arranged in the same relative position when passing through disk, C (Fig. 2), the electricity will print upon the chemically prepared paper between C and D (Fig. 2), a copy of the letter, A, as projected upon disk, P (Fig. 1). By this means any object so projected and so transmitted will be reproduced in a manner similar to that by which the letter, A, was reproduced.

Figs. 1 and 2, Plate 2, are instruments for transmitting and recording by means of electricity the picture of any object that may be projected upon the glass plate at T T (Fig. 1), by the camera lens.. The operation of these instruments depends upon the changes in electrical conductivity produced by the action of light on the metalloid selenium.

The clock-work revolves the shaft, K, causing the arm, L, and wheel, M, to describe a circle of revolution. The screw, N, being fastened firmly to wheel, M, turns as wheel, M, revolves on its axis, thus drawing the sliding piece, P, and selenium point, disk, or ring, B, towards the wheel, M—see Fig. 3. These two motions cause the point, disk, or ring, B, to describe a spiral line upon the glass, T T, thus passing over every part of the picture projected upon glass, T T.

The selenium point, disk, or ring will allow the electrical current to flow through it in proportion to the intensity of the lights and shades of the picture projected upon glass plate, T T.

The electric currents enter camera at A, and pass directly to the selenium point, disk, or ring, B; thence through the sliding piece, P, and shaft, K, by an insulated wire to binding screw, C (Fig. 1); from this screw by wire to binding screw, D (Fig. 2), through shaft, K, and sliding piece, P, to point, E (Fig. 2); then through the chemically prepared paper placed against the inner surface of the metallic plate, X X, by wire, F, to the ground, thus completing the circuit and leaving upon the above mentioned chemically prepared paper an image or permanent impression of any object projected upon the glass plate, T T, by the camera lens.

Fig. 2 is the receiving instrument, which has a clock movement similar to that of Fig. 1, with the exception of the metallic point, E, in place of the selenium point, disk, or ring (Fig. 1), at B.

Fig. 3 is an enlarged view of clock-work and machinery shown in Figs. 1 and 2.

Oil in Allegany County, New York.

The Albany *Journal*, of April 22, reports that oil in paying quantities is being developed near Wellsville, in Allegany County, about forty miles to the northeast of what is known as the Bradford district in Pennsylvania. On Monday, April 19, an undoubted forty-barrel well was struck at a point less than three miles from Wellsville. It is near the Triangle Well, which has been flowing moderately for two or three months, and about six miles from the Pennsylvania line. The event causes great excitement in that locality, as the fact is now placed beyond doubt that the Bradford belt, as it is called, extends indefinitely in a northeasterly direction into New York State. The region between Olean and Wellsville is now in fair way of being developed into first class oil territory.

NOVEL ANIMAL MOTOR.

Animals have always been used as a source of motive power, but the machinery for utilizing this power has generally been of such clumsy and imperfect construction that

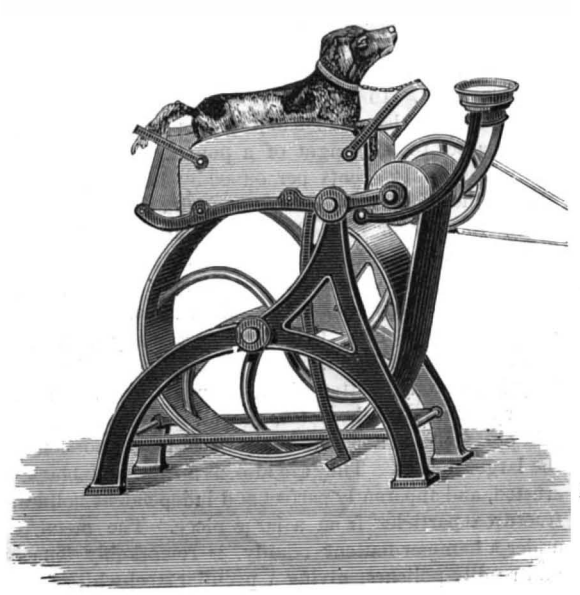


Fig. 1.—NEW ANIMAL MOTOR.

but a small percentage of the actual power was realized, besides making it extremely uncomfortable for an animal.

Mr. Richard, of Paris, has invented a very neat, practical and useful motor, which was exhibited at the last Agricultural Exhibition and at the Exhibition of Sciences Applied to Industries. The annexed cuts—for which we are indebted to *La Nature*—give a very good illustration of this novel motor. The animal, in this case a dog, is placed in a box or crib resting upon a shaft supporting the entire upper part of the machine. In Fig. 1 the animal is represented at rest, and the weight of the animal, maintaining its center of gravity, does not act upon the main driving wheel. But as soon as the box is in the position indicated by dotted lines in Fig. 2, that is, as soon as the tangent forms an acute angle with the vertical, the weight of the animal is sufficient to turn the wheel in the direction indicated by the arrows. The animal will naturally try to advance up the inclined surface, and will rotate the wheel by this action, as its weight continually acts upon the wheel. A fixed platform, E, is arranged below

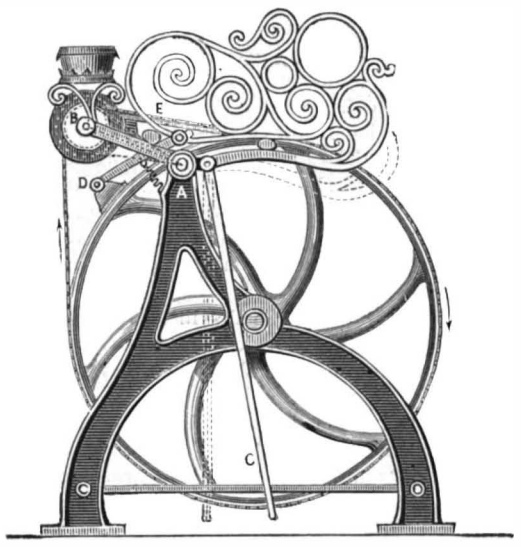
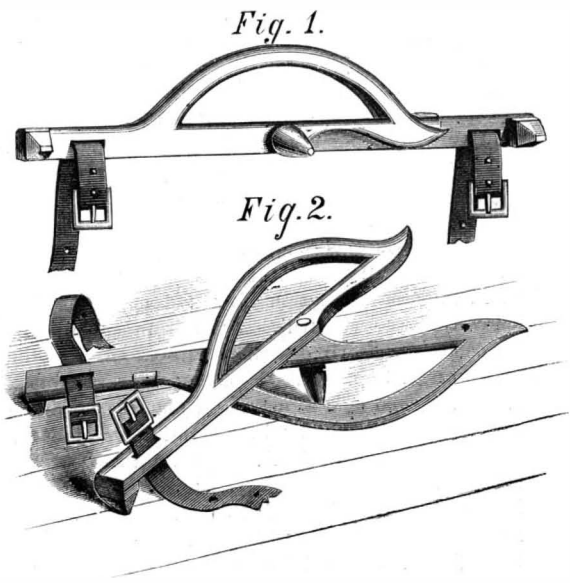


Fig. 2.—VERTICAL SECTION OF MOTOR.

at the side of the endless belt as a resting place for the animal, and a cup containing water is arranged in front of the box, so that the animal can drink while resting. Mr. Richard is a manufacturer of military uniforms, and runs a large number of sewing machines with his improved quadruped motor.

A NOVEL COMBINATION.

Americans are famous for making novel combinations, and it would seem that the last combination that would naturally suggest itself would be a shawl strap handle and a bootjack. Nevertheless we are able to present our readers with an engraving of an exceedingly simple and practical device that is peculiarly adapted to the double duty it is intended to perform. The device will be understood by reference to the engraving. Two similar castings are pivoted together, so that they may be arranged as shown in Fig. 1, when the device answers as a shawl strap handle. By turning the parts on these pivots, as shown in Fig. 2, the device forms a complete bootjack.



MARSDEN'S STRAP HANDLE AND BOOTJACK.

This novel combination is the invention of Mr. Mark W. Marsden, of Connersville, Pa.

New Brunswick Red Granite.

An inexhaustible supply of fine red granite, equal if not superior in quality to the famous "Scotch" granite of Aberdeen, exists in Charlotte County, New Brunswick. Several attempts to develop quarries have been made during the past decade, but, owing to lack of transportation facilities and other hinderances, they have generally resulted in failure. Latterly there has been a considerable revival of effort in the work of getting out and cutting the granite, and a still greater impetus is expected from the completion this summer of the railway from St. Johns to the frontier at St. Stephen and Calais, Maine.

MISCELLANEOUS INVENTIONS.

An improvement in the class of cheese cutters having a rotary table or platform and vertically-operating slicer or knife, has been patented by Mr. Walter R. Green, of Salt Lake, Utah Ter. The improvement consists in the construction and arrangement of parts whereby the rotating table or platform on which the cheese is placed is supported at the edge, instead of centrally, by means of a pivot, and thus rendered more firm and steady both when at rest and in motion.

Mr. Jacob G. Fletcher, of Washington, D. C., has patented for artists' use an improved canvas stretcher which shall have all the qualities experience has decided to be necessary or most desirable, and it consists in constructing the bars or pieces composing the stretcher proper with plain miter joints, which are opened by means of wedges, and in providing said bars with holes and grooves for the purpose of receiving the fastening device, which is constructed of metal and approximately U-shaped, and when applied to the stretcher frame is sunk or embedded in the wood flush with the surface thereof.

An improved handle for candlesticks, which may either be used for lifting the candlestick or for hanging the same up against the wall, has been patented by Mr. William Selkirk, of Galveston, Texas. It consists in forming the ordinary circular finger loop in one piece with an upward extension provided with a slot, which may be placed upon a nail on the wall.

Mr. Michael Posz, of Shelbyville, Ind., has patented a bill and letter file case provided with mechanism connecting with a treadle for operating the springs that press the papers being filed.

An improved commode, which is simple and convenient, has been patented by Mr. John Finsterer, of Philadelphia, Pa. It consists in the arrangement of arms attached to the lid of the commode in such a manner that when the lid is opened these arms rise with it and are secured automatically, so that the person that sits on the commode may rest comfortably and not be in danger of breaking the lid.

An improved grate for fireplaces has been patented by Mr. Joseph Bunford Samuel, of Philadelphia, Pa. The object of this invention is to furnish grates for fireplaces so constructed that the top bar of the grate may be adjusted to serve as andirons when a wood fire is to be used.

Messrs. James Skidmore, Joseph M. Liston, and Orestes Skidmore, of Charleston, Ill., have patented an improvement in hame tugs for connecting the hames with the traces in the ordinary form of harness. It consists in the peculiar construction and arrangement of the metal clip or plate in connection with the leather tug.

Mr. James C. Stanley, of New Hartford, Conn., has patented certain improvements in the thread boards and thread guides of spinning and twisting machines, whereby the thread guide can be adjusted so that the threads, when delivered from the rolls, will run through the guide centrally with the spindle tip, and thereby escape the usual stretching and breaking.

An improvement in spring vehicles, patented by Mr. William B. Thomas, of Elmira, N. Y., is designed to keep the back springs of a spring wagon under a slight strain when there is no load in the rear part of the wagon, to prevent the rattling and undue wear of the spring joints, and to cause the wagon to ride easier.

An improved ticket holder has been patented by Mr. Samuel Herzberg, of Pontiac, Ill. It is designed for holding the tickets on which are marked the sizes and other particulars of goods, such as pantaloons and other clothing.

Mr. Emile F. Espérandieu, of Nashville, Tenn., has invented a velocipede of the tricycle class which is adapted for carrying packages, merchandise, or any articles of light weight, and which may be propelled by working swinging treadles having springs that aid in moving them backward.

Mr. Lewis B. Morgan, of West Liberty, West Va., has patented an improvement in plow and cultivator handles, which consists in a construction and arrangement of parts, which cannot be clearly described without an engraving.

An improved implement or machine for running slight furrows in plowed land as marks for planting corn or other seed, or for crossing out land for planting an orchard, etc., has been patented by Mr. Washington Barron, of Summit Bridge, Del.

Mr. Archibald H. Kerr, of Midway, Texas, has patented a composition for whitewashing houses, walls, fences, outbuildings, etc., designed for great smoothness, brilliancy, and durability; and it consists in a compound of lime, whiting, plaster of Paris, glue, carbonate of soda, biborate of soda or borax, and sulphate of soda, in certain specific proportions.

Messrs. Ebenezer Fisher and John Watson, of Kincardine, Ontario, Canada, has patented an improved die for forging metallic horse collar frames. This die has been developed after a long series of experiments. With it the desired perfection of operation and result may be obtained with certainty and precision, and a collar frame produced having the desired form, proportions, and lines of curvature required for greatest strength and lightness combined.

Mr. John B. Fogt, of Anna, O., has patented an improvement in that class of riding rakes in which the wire teeth are attached to the axle and the driver's seat attached to the hinged thills or shafts, so that upon releasing a locking lever the rake will be dumped automatically by the weight of the driver.

An improved adjustable seat for mowers, reapers, wheeled horse hay rakes, and various other agricultural machines, for farm wagons and other vehicles, or for use in any other situation in which it may be applicable, has been patented by Messrs. Samuel Hedges, of Wheeling, and Lewis B. Morgan, of West Liberty, West Virginia. It is capable of oscillation or adjustment laterally on a fixed point of support, so that it may be kept in horizontal position despite the lateral inclination of the body of the machine or vehicle while passing along a hill side or other inclined surface.

Mr. Talbot C. Key, of White Sulphur Springs, Ga., has patented a portable hay and cotton press, an improvement in the class of portable presses which are mounted on wheels and thus adapted to be conveniently transported from one locality to another without requiring a separate vehicle therefor. The invention consists in hinging the press box to the beams of the truck, so that it can be laid down on its side, for the purpose of transportation, etc , and in the means for securing the press box in the vertical position when required for work.

Mr. David C. Williams, of Florence, Ala., has invented a fruit picker, which consists in a ring fixed on the end of the staff, and having wire fingers projecting from its top portion for the purpose of detaching fruit; also, a basket or fruit receptacle pivoted to and within said ring, so that when the picker is put in use the inclination of the staff or pole will cause the basket to tilt and one edge thereof to approach the wire fingers, which are holding and pulling the fruit, and hence when the latter falls it is sure to pass into the basket or receptacle.

What they Knew Four Thousand Years Ago.

The *Popular Science Monthly* for June publishes abstracts from the address of Chief Justice Daly before the Geographical Society, in which he says:

From one of these books, compiled after the manner of our modern encyclopædias, and the compilation of which is shown to have been made more than 2,000 years B.C., it has been ascertained, what has long been supposed, that Chaldea was the parent land of astronomy; for it is found, from this compilation and from other bricks, that the Babylonians catalogued the stars, and distinguished and named the constellations; that they arranged the twelve constellations that form our present zodiac to show the course of the sun's path in the heavens; divided time into weeks, months, and years; that they divided the week, as we now have it, into seven days, six being days of labor and the seventh a day of rest, to which they gave a name from which we have derived our word "sabbath," and which day, as a day of rest from all labor of every kind, they observed as rigorously as the Jew or the Puritan. The motion of the heavenly bodies and the phenomena of the weather were noted down, and a connection, as I have before stated, detected, as M. de Perville claims to have discovered, between the weather and the changes of the moon. They invented the sun dial to mark the movements of the heavenly bodies, the water clock to measure time, and they speak in this work of the spots on the sun, a fact they could only have known by the aid of telescopes, which it is supposed they possessed, from observations that they have noted down of the rising of Venus and the fact that Layard found a crystal lens in the ruins of Nineveh. These "bricks" contain an account of the Deluge, substantially the same as the narrative in the Bible, except that the names are different. They disclose that houses and land were then sold, leased, and mortgaged, that money was loaned at interest, and that the market gardeners, to use an American phrase, "worked on shares," that the farmer, when plowing with his oxen, beguiled his labor with short and homely songs, two of which have been found, and connect this very remote civilization with the usages of to-day.

More about the Iowa Meteor.

At the time of the fall of the Estherville Meteor, May 10, 1879, some boys, who were herding cattle near a lake five or six miles from where the larger fragments fell, reported that just after the passage of the great body over their heads they saw and heard a shower as of hailstones falling on the water near by. In April last, people began to pick up near the borders of that lake small pieces of meteor from the size of a pea to the weight of a pound. These soon found ready buyers at 25 cents per ounce by local traders. People left their farms—men, women, and children—and went out to the meteor ground, now freshly burned over, the belt being a strip of country commencing at or near Four Mile Lake, in the western part of Emmett County, and running southwesterly about eight miles, the width being from one-half to one mile. Upon this belt many thousands of small pieces were found. They are most generally metallic, very little stony matter about them, though some of the larger ones are of the same general appearance, and contain chrysolite in about the same relative proportion as in the larger masses. They are also, as a rule, very black, well crusted, and apparently perfect and independent bolides, not fractured particles from a large piece. The metal, cold, under a hammer flattens readily, is remarkably tenacious, and readily polishes, giving a peculiar steel-white or silver gray.

Mr. Charles P. Birge, of Keokuk, who furnishes these facts in a letter to the New York *Times*, estimates the weight of matter thus recovered at 75 lb., and thinks it highly probable that much of the iron hail penetrated the ground and water, and is thereby wholly lost. So the inference is fair that the total weight of the fall is greatly in excess of the 800 lb thus far recovered, the larger masses weighing 437, 170, and 92½ lb., and minor fragments about 50 lb.

A Ship Railway Wanted in Oregon.

The *Alta California* suggests that there is no better place on the continent for testing a ship railway than at the Cascades in Oregon, to transport laden steamboats past the lower rapids of the Columbia River. The rapids there are only six miles long; the grade of the road need not exceed 15 feet to the mile anywhere; the boats to be carried are not near so heavy as those that demand transportation at Panama, and a large traffic demands greatly increased facilities for passing the rapids.

Many thousand tons of wheat were detained in Eastern Washington through the winter because transportation was impossible. The president of the Astoria Chamber of Commerce, Mr. Bowlby, in a report made in January last said:

"Last season it cost $10.50 per ton to carry wheat from Walla Walla to Portland, and $11.50 to Astoria. Thirty miles of that distance is by rail, and cost $4.50 per ton, while the remainder, 235 miles to Portland, by boat, over two portages, cost only $6, and the 323 miles to Astoria, over the same portages, cost but $7 per ton.

"The Columbia River is the natural highway and outlet for the country drained by it, and unless navigated and improved that section of country will soon be choked by its own great growth. The portage road at the Cascades was run night and day from August till the upper rivers were closed with ice, and with great difficulty was it possible to keep the freight from being blocked. This portage, a distance of seven miles, with rolling stock, is maintained, and freight is taken from the boat on to the cars, and from the cars to the boat, provided the boats and cars await each other; otherwise, the grain is moved from the boat to the warehouse, and fourthly, to the boat below.

"We estimate the freight passing over the road at 1,000 tons per day for the past six months, which, counting 300 days in the year, would be 225,000 tons last year, which, at 50 cents per ton, cost the farmers of the upper country the sum of $112,500 for a portage ride of seven miles."

The federal government has announced the intention of constructing canals around the obstacles to commerce, and has begun work in a slow way at the Cascades. The *Alta* insists that it is the duty of Congress either to push the canals at both rapids, or to make a contract with Eads to authorize him to finish a ship railway this summer at the Cascades, with the intention of supplying the upper rapids at the Dalles in the same manner in 1881, if the experiment at the Cascades should be successful.

The ship railway has immense possibilities. It should be tried without delay; the idea is American in its origin, and its value should be tested here; and the best place and the best man for it are the Cascades and Eads.

Luminous Paint in Railway Cars.

The experiment of coating the interior of a railway carriage with Belmain's luminous paint has been tried in England with considerable success. The English *Railway News* says that a first-class carriage was chosen for the experiments, and in the daylight its appearance is very little, if any at all, different to ordinary paint, but during the time the carriage is exposed to the light the paint is rapidly absorbing the daylight, only to give forth the same the moment the carriage is traveling in the dark. At first the light emitted is only slight, not that the paint is any different in its illuminating powers, but the pupils of the eyes of the traveler have not yet been accustomed to the light; for, as the journey proceeds, the carriage appears to be completely lighted up, so much so that the passengers are enabled easily to recognize the features of their fellow travelers, while the time by a watch is clearly discernible.

It is thought that for trains running long journeys, with tunnels occasionally intervening, the paint will be very valuable, inasmuch as the oil and gas can be entirely abandoned, and the great waste at present experienced avoided. How the paint illumination would work on dark, cloudy days does not appear.

Butter, Eggs, and Cheese.

At the recent annual session of the National Butter, Egg, and Cheese Association at Indianapolis, Mayor Lord, of Elgin, Ill., read a paper on the milk industry. The magnitude of the industry was shown by reference to the fact that there are 13,000,000 milch cows in the country, requiring the annual product of 52,000,000 acres of land to feed them, and giving employment to 650,000 men. Estimating the cows at $30 each, the horses at $80, and land at $30 per acre, together with $200,000,000 for agricultural and dairy implements, and the total amount invested in the industry is $2,219,280,000. This is considerably more than the amount invested in banking and the commercial and manufacturing interests of the country, which is $1,800,964,586

Effects of Heat on Granites.

Mr. Hiram A. Cutting, State Geologist, of Vermont, has been testing the capacity of different sorts of granite to with stand heat. He tested twenty two specimens of the best known quarries, and found that while all were unaffected by 500° Fah., damage usually began at 600°, was serious and frequent at 800°, and at 1,000° all the specimens were ruined, the stone from Mount Desert standing the test perhaps better than any other. He gives it as his opinion that the effect of water on heated granite is rather apparent than real.

AMERICAN INDUSTRIES.—No. 44.

THE MANUFACTURE OF WESTON'S DIFFERENTIAL PULLEY BLOCKS, SAFETY HOISTS, ETC.

The invention of the differential pulley block by Mr. T. A. Weston, some years ago, was the accomplishment of a radical improvement in one of the oldest mechanical appli ances known to man. The ordinary tackle block, in more or less perfect form, is known to have been in use among the early Egyptians, and probably dates back to the earliest days of civilization. The device, like the art of sewing prior to the invention of the sewing machine, continued without essential change until Mr. Weston at a single stroke increased its efficiency thirty or forty fold, gave it its self-sustaining capacity, and added that quality of safety which gives to the differential block its greatest value. First introduced in England, the invention spread rapidly over the entire mechanical world, and has now long been recognized as an indispensable adjunct in mechanical operations of all kinds. Its greatest charm lies in its *absolute simplicity*, for it is the reduction of a mechanical problem to its simplest possible terms. To this fact may be attributed the extraordinarily rapid adoption of the device as soon as introduced, and the universal popularity and esteem in which it is held.

In the ordinary or "direct" style of block one man can lift from one thousand to two thousand pounds. By means of the recently added "geared" style of block the lifting capacity of each man is increased to from two thousand to five thousand pounds. With both styles the load is always self-sustained, and *cannot run down*. To effect lowering it is necessary to reverse the motion of the chains, by pulling on them, when the load will descend, but only so fast and so long as the chains are moved by hand. If at any time the chains be let go, either in hoisting or lowering, the load immediately comes to rest.

In the illustrations on the first page of this paper are shown the principal details of the manufacture, as well as some of the most important uses to which these hoisting devices are put. In the differential pulley, as is well known, the wheels in each block are made with sprockets, in which the links of an endless chain must lie smoothly and fit exactly. The chain passes around but one wheel in the lower block, but in the upper block are two wheels on the same shaft, one a small fraction larger than the other. In hoisting, the chain is taken up on the larger, and paid off from the smaller of these two wheels, while in lowering the reverse occurs, the effect on the load being due to the *difference* in the diameters of the wheels. This difference, as already stated, is very slight, and the differential effect that is obtained, therefore, gives the operator an immense leverage in handling the load. In making what is styled the "direct" differential pulley blocks, the loop in the chain which hangs loose and free from the upper pulley is used to pull upon in raising or lowering the load, and this loop is lengthened or shortened as the load goes up or down; but in the "geared" pulleys, which have been since introduced, an extra wheel is added to the upper block, from which an endless hand chain depends, the length of which does not change. By this simple addition to the "direct" differential pulley its power can be increased from three to five fold without making the blocks or apparatus any more cumbersome or complicated.

The prime essential in these pulleys, and the condition without which they would be worth little more than so much old iron, is to have the shape and pitch of the sprockets in the wheels exactly right, and then to make the chains so they will fit perfectly, without danger of stretching. When, therefore, the Yale Lock Manufacturing Company, about five years ago, purchased the patents of Thomas A. Weston on differential pulleys and other hoisting apparatus, they set themselves to making such improvements in the manufacture, and to the attainment of such exactness in workmanship as would leave nothing to be desired on this score. The company already had a wide reputation for the excellence of their locks, but in the new field they then commenced to work they achieved a success in every way commensurate with that they had won in the specialty with which they have been for so many years identified.

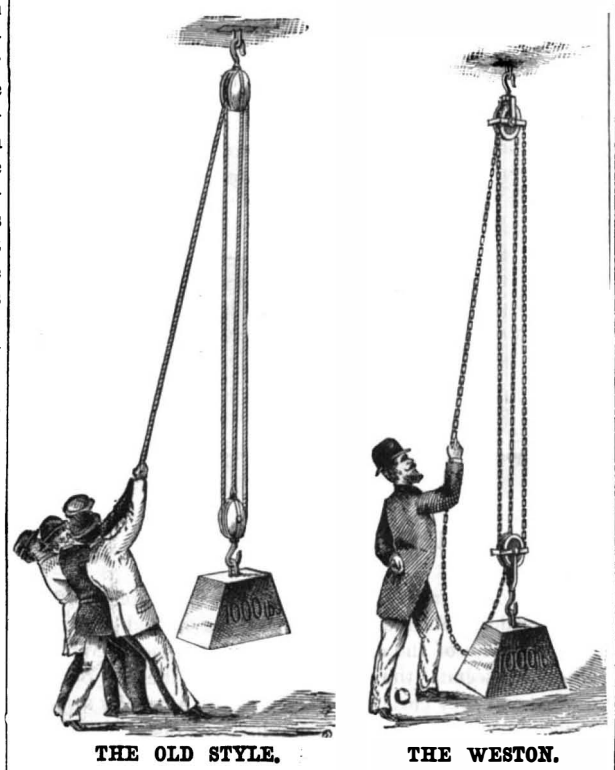
In our illustrations, the chain making, as shown to the left at the top of the page, is conducted in a blacksmith shop where are twenty-one forges. The chains for the differential pulleys are all made by hand, and Welsh and English workmen are found most competent in this specialty. They work very rapidly, each link of the chain being made of a piece of Norway rod iron cut off at an exact length, and made as true as it could be cut out with a die. In this department also is a steam hammer, and an apparatus especially designed by the company for bending the hooks for the wrought iron tackle blocks. These hooks are flattened a little to give them greater width through the point where the greatest strain comes, and it has been a matter of no little study and experiment with the company to determine exactly what shape was best for giving the greatest strength, so that the hook would not straighten out under the load, and in all parts, as well as with its joining with the block, the strength would be proportionate.

The machine shop, as shown in the other engraving at the top of the page, is fully fitted up with lathes, planing machines, etc., and all the requisite tools for finishing the various parts of the work, and in this department is also conducted the gauging of the chains and testing of the blocks, which are shown in separate views. The gauging of the chains is carried on according to a plan especially designed for this work, and every link of each length destined for use in the differential pulleys is here gauged. The links are first purposely made a little short of the length they are finally intended to be, the chain is then laid on a gauge which represents just the circumference of the sprocket wheel, and stretched until it fits exactly therein. This is intended to take out all the "stretch" which would occur in use, and to give the links just the shape at which the chain will endure the greatest strain. The chains tested here include those for one eighth ton pulleys, made of three sixteenths inch iron, up to those for ten ton pulleys, made of seven eighths inch iron. The testing of the blocks, shown in the adjoining view, explains itself. no hoisting apparatus is ever sent from the shop until it has all been put together and tested as to its capacity to lift, without stretching, the entire load which it is built to carry.

The "Light Traveler," for warehouse use, showing how these pulleys can be arranged to run on overhead rails, affords a good illustration of the advantages which can be secured by such an arrangement in stores where goods are to be stored in quantities, and yet give such convenience of access that cases may be readily taken, for inspection or removal, from any part of a large warehouse.

In the "Hoisting Crab and Derrick Winch," shown in another view, the Weston patent brake is used, so that the load is always self-sustained, and the handles may be at any time suddenly "let go" without the weight "running down." To lower the load the handles must be turned backward, but unless this is done the suspended weight remains stationary.

In the jib and traveling cranes, shown at the bottom of the page, the further application of the principles of this patent hoisting machinery for the moving of heavier bodies is represented. All the several motions for moving the load are made by direct pull, and, while the appliances are so simple that nothing can possibly get out of order, there is absolute safety against the load running down except by the positive action of the workmen having it in charge.



THE OLD STYLE. THE WESTON.

In the illustrations on this page one will be at once recognized as an apt portrayal of the difference between the hoisting of heavy weights by these improved differential pulleys and the doing of the same work in the old fashioned way. In the other is shown what is called the "double lift," for hoisting or letting down expeditiously only moderately heavy loads. It is extensively used in stores and factories, and consists of a chain, with hook on each end, passing over a sheave which can be rotated by a hand rope and wheel. It is provided with Weston's patent brake, so that if the rope is let go the load will remain suspended and can never run down. As one hook ascends the other descends, and is thus ready for the next load, one man being able to lift a full load at the rate of about twelve feet per minute, and lighter loads proportionately faster, while the speed for lowering may be regulated as desired.

By the improvements which the Yale Lock Manufacturing Company have introduced in the manufacture of these various devices for hoisting and managing heavy loads they not only have greatly increased efficiency, but absolute safety, as against the cumbrous and dangerous methods heretofore used, and their differential pulley blocks, safety hoists, traveling and jib cranes, etc., are now meeting with constantly widening demand for use in machine shops, factories, forges, mills, steamships, as well as in laying street mains, pulling stumps of trees, and in fact to a diversity of uses which it would require a catalogue to enumerate.

The works of the company are located at Stamford, Conn., and they have salesrooms of their own at 53 Chambers street, New York; 36 Pearl street, Boston; 506 Commerce street, Philadelphia; and 64 Lake street, Chicago. Their goods, as above described, are largely handled by all dealers in machinery, engineers' supplies, etc, and the company will be happy to furnish, on application, an illustrated catalogue of the goods of their manufacture.

Correspondence.

Cotton Size and Cotton Sizing.

To the Editor of the Scientific American:

With reference to the article in the SCIENTIFIC AMERICAN of February 7th last, describing the English practice of over-sizing cottons, and advising American manufacturers not to follow their example, I wish to bring to notice the fact that the people of this commercial part of the continent have begun to know that "not all that is white is cotton;" and it may be a surprise to the English manufacturers and traders to learn that the consumers now ask for American unbleached goods, in preference to the very white finished English cottons. The motive is this: practical experience has shown them that the former will become whiter after washing, and the weaving more compact, while the latter will be less white, the weaving more separated, and more than half of the weight of the goods will be lost in the first washing.

I am confident that this single yet forcible fact must be ufficient evidence in favor and encouragement of all kinds of honest manufacturing, whether in cottons or anything else.

The present fever for fraudulent adulterations, as now entered into by many of the manufacturers in England, in order to compete with cheap German and French manufactures, is simply ruinous to British commerce, and its evil effects will have to be borne directly or indirectly by the entire kingdom. To say that the cotton goods now introduced here from England are the same in quality to those of ten years ago, would be an absurdity. The English linen goods, which have stood unquestionably ahead of all others, are to-day so adulterated that some grades and trademarks, stamped "pure linen," "guaranteed all linen," etc., are, in fiber, half cotton, half linen, and in all cases heavily sized. But it is not only in all kinds of woven goods that England is suffering from great competition; in fancy goods and hardware she has a dangerous neighbor in the French Republic, which is in a good way to monopolize the trade of this country.

Adulterated manufactures will not last long anywhere to-day. People have time now to think, and a little to say in everything. Even the Indians in the vast Pampas readily know polished nickel from silver. Honesty and honest productions will, in the end, pay the best. In support of this assertion let us look at Messrs. Rogers & Son's cutlery. The steel used to-day in the different articles manufactured by this firm is as good if not better in quality than that furnished in their very first productions. For this and no other reason consumers here will pay two dollars gold for a Rogers & Son's three-blade penknife, and will not pay a half dollar for one of other makes, even should it have six blades.

Regarding art processes on the whole, one is led to believe that in England the idea still prevails that price is the primary and quality the secondary object with the consumer. In this case, I dare say, the adulterers will think it remarkably droll that the customer here should not pay better price for an article that furnishes him with more stuff.

In conclusion, let the Americans continue to manufacture honestly what they produce, disregarding other nations in the art of adulteration. The time will come when a common black cotton or linen necktie will bring a better price than a silk one, judging from the abominable black silks that are at present forced into public use.

P. DEL VALLE HALSEY.

Buenos Ayres, A. R., March 27, 1880.

Nerve Grafting.

Dr. J. Gluck, of Bucharest, lately brought before the ninth congress of the German Society of Surgery at Berlin some interesting results of experiments in nerve grafting. He cut out a portion of the sciatic nerve of a fowl, and then removed a similar portion of the same nerve from the leg of a rabbit, and placed this in the leg of the fowl, uniting the two ends by sutures. The nerve united, and the paralysis caused, of course, by the excision of the piece of nerve, was recovered from. He repeated the experiment, and exhibited the successful results, showing the fowls with full restoration of power. He was led to these experiments by the result of a case of nerve suture. Paralysis of the median had resulted from extensive destruction of the tissue of the arm by gangrene. Dr. Gluck cut down on the radial nerve and found that part of the nerve was destroyed. He united the two ends by sutures, and the man regained the power of motion, which he had entirely lost. Of course, the experiment in nerve grafting in animals, adds the *Lancet*, do not warrant the expectation that a similar result could be obtained in the case of the human subject. It is well known that the union and regeneration of nerves occur with greater facility in the case of the lower animals than in man.

Black Ants a Cure for Currant Worms.

A correspondent of the *Ohio Farmer* finds the common black ant an efficient protection against the plague of currant worms. He has several colonies of ants close to his currant bushes, and enjoys an abundance of currants, while his neighbors' bushes are overrun with worms. Formerly he took pains to destroy the ant colonies, but on witnessing their attacks upon the worms he has taken pains to protect and encourage them.

MECHANICAL INVENTIONS.

Mr. Thomas G. Glover, Jr., of Bedford, Ind., has patented a light-running hand car that may be easily handled. It is designed for the use of section men and other employes of railroads.

Mr. George W. Dudley, of Waynesborough, Va., has patented a novel saw filing and setting machine, designed especially for saws having a straight row of teeth, and it comprises novel features which cannot be clearly described without engravings.

Mr. Charles S. Peach, of North Adams, Mass., has patented an improvement in ring spinning frames, the object of the invention being to prevent the threads from throwing out and interfering with each other, and to equalize the tension and draught on the thread, whereby the yarn will be wound on the bobbin equally hard and close at top and bottom.

Mr. Heinrich Seck, of Frankfort-on-the-Main, Germany, has patented a preparatory bolting machine so combined with a fine dressing machine that it serves for separating the husks, bran, and coarser particles from the meal, and for sorting the meal itself into different degrees of fineness at one operation.

Mr. Cyrus S. Stevens, of Lowell, Mass., has patented a machine for filing straight and circular saws. The invention consists in certain features of construction and combination for obtaining the necessary movements of the files and the requisite adjustments of the saws.

Mr. Alanson Cary, of New York city, has patented a machine for manufacturing metallic barbed ribbon for the wire used for fences so as to give to such a wire a barbed edge. The invention consists in a machine combining a reciprocating head carrying the cutters, a feed bed, and die plate, feeding rollers, and an intermittent feed motion, whereby the ribbon is fed forward beneath the cutters, and the operation performed rapidly without waste of material.

Messrs. John E. Best and William E. Higgins, of Arlington Heights, Ill., have patented an improved thill coupling jack for compressing the rubber in a thill coupling to allow the thill eye or coupling bolt to be readily inserted.

An improvement in machines for depositing fine and powdered substances in uniform quantities in packages, has been patented by Mr. James McCrodden, of New York city. The machines are so constructed that they may be readily adjusted for forming larger or smaller packages. They are convenient in operation, filling the packages quickly, and allowing them to be readily inserted and removed.

Mr. Winfield S. Reeve, of Riceville, Iowa, has patented an improvement in trimming shears for blacksmiths' use. The invention consists in connecting the cam lever with the movable jaw by a slotted plate, so that the operator may stand behind and over his work, thus being enabled to cut to a line.

NEW STEAM BOILER.

Our engraving represents an improved compound steam boiler patented by Mr. Robert R. Hind, of Kohla, Hawaii, Hawaiian Islands. It is designed especially for utilizing cane trash or bagasse, or any other light fuel. These boilers have been largely introduced in the Hawaiian Islands, and have earned a reputation for being very economical steam generators, and exceedingly well adapted to any fuel supplying a long flame.

The boiler is composed of a single flue or Cornish boiler, A, and a multitubular boiler, B, placed end to end, leaving a space, C, between them. These boilers are connected together at the top by a steam drum, D, and at the bottom by circulating pipes, E.

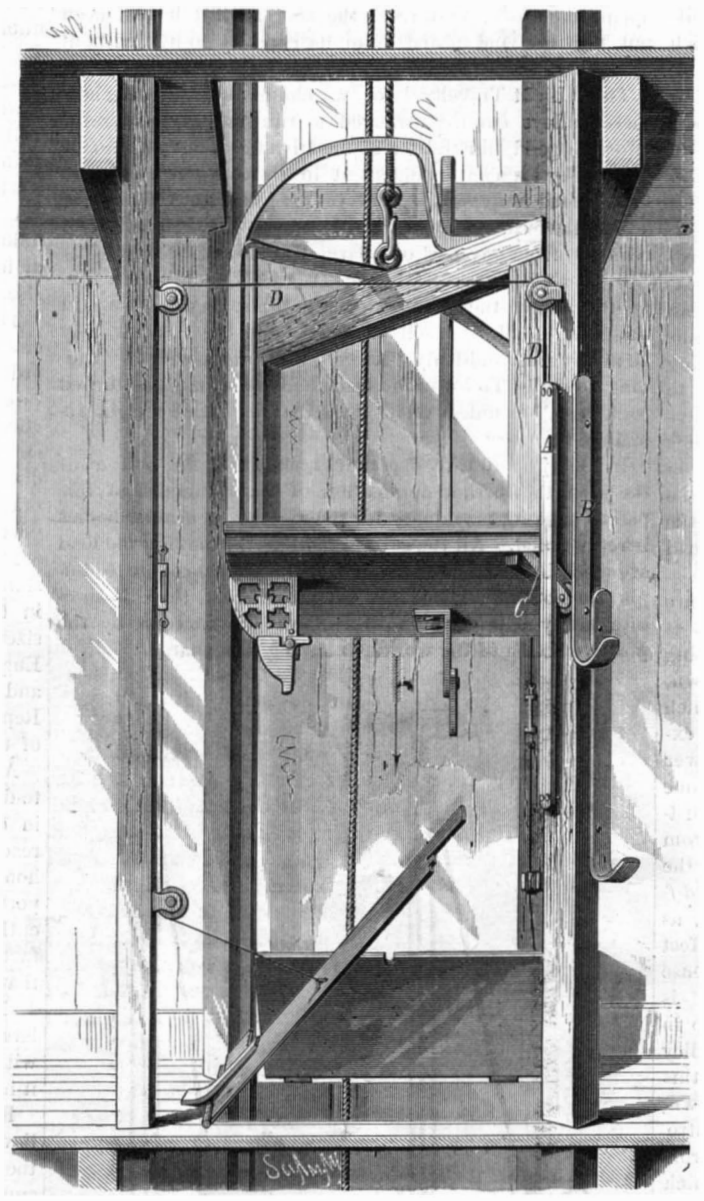
The boiler, A, is set directly over the furnace with its forward end over the grate. The products of combustion and flame follow the direction indicated by the arrows, passing through the single flue of the boiler, A, across the space, C, and through the tubes of the boiler, B, to the chimney. A portion of the heated gas and flame is made to circulate under the boiler, B, before passing to the chimney. This boiler is highly spoken of by owners of sugar plantations in the Hawaiian Islands, and we have no doubt it might be profitably employed in saw mills, planing mills, and in manufactories relying on waste and on light fuel for generating steam.

The inventor would be pleased to correspond with any one desiring further information in relation to this boiler.

HIND'S COMPOUND STEAM BOILER.

IMPROVEMENT IN HATCHWAYS.

The annexed engraving shows an improved device for opening and closing hatchway covers or doors as the elevator approaches, passes through, and recedes from the floor either upon its ascent or descent. The engraving shows the elevator descending, and the doors being opened preparatory to the descent of the elevator through the floor. When the elevator ascends, the bows attached to the top open the covers, and they close gently by their own gravity after the elevator passes, the trip dogs employed in opening the doors acting as checks or counter weights; but when the elevator descends a more difficult problem is encountered, and it is this that the invention shown in the engraving is more particularly intended to meet.



IMPROVED HATCHWAY.

Upon one of the guide posts there are two guides, A B, for receiving vertically sliding trip-dogs, C, to which are attached ropes, D, connected with the covers, one being attached to each cover and running over pulleys, so that as the dogs are engaged by the elevator in its descent the covers will be raised. There are two inclined guides, projecting from the bottom of the elevator to insure the complete opening of the covers.

The trip dogs, C, have sufficient weight to nearly counterbalance the covers, so that but little force is required to operate the mechanism. As the elevator descends the trip dogs are pushed down until they are released at the lower ends of the guides, when the covers will be open and will be kept open by the elevator until it passes that floor, when they will follow the rounded bows at the top of the elevator and close automatically. The inventor informs us that architects and mechanics who have examined the invention pronounce it perfectly practicable. It may be placed upon any elevator without making any alterations in the hatchway.

The expense of the application of this device is very light. It makes no difference which way the doors are made to open, this mechanism will operate them. The frames in which the dogs work can be placed both on one of the elevator guide posts, one on each guide post, or on separate posts built especially for them. The working attachments are alike in size for all hatchways, thus making the cost very much less than where it is necessary to make the working parts of different sizes according to the size of the elevator.

The small wire cables or chains used in operating the covers is provided with a turn buckle to take up the slack in case they stretch. The whole contrivance is so simple that the engineer in charge of the elevator can always keep everything in perfect working order.

Hooks can be arranged to fasten the doors up, if necessary. This will not interfere in the least with the working of the elevator car. This is an advantage over other automatic hatch covers, because in some cases, when a door is broken or in any way out of order, the elevator cannot be worked until the damage is repaired.

For further particulars address the inventor and owner, W. H. K., 75 University Place, New York city.

Elevators.

We have in New York city several thousand elevators; they are used in almost every large and prominent establishment. In the post office building there are fourteen, and it is only a few weeks since that the principal one of these, as far as the knowledge of the public goes, and the one most used by the outside crowd, suddenly fell to pieces. It was a hydraulic elevator, the car being held upon a column of water. This was considered the best and safest of all, and yet the few persons in it at the time of the mishap barely escaped with their lives. Scarcely a month has elapsed since the accident at Fall River, by which Mr. Sevey was killed, and Mr. Crowley died since of his injuries. Since that time there have been eleven elevator accidents, and some one has been injured each time. What is still more alarming, all the elevators except two had safety appliances, and yet in every instance the car or cage fell to the bottom of the well.

Our city is famous for its cloud-seeking buildings. Ground is high, and story after story is added to make room for immense stocks of goods. Elevators duplicated and quadrupled afford easy access to the upper floors. This mode of conveyance is absolutely necessary, and cannot be dispensed with until some better method is discovered. It is idle to speak of safety appliances. We have had too many such catch-penny contrivances. We had a safety fire ladder some months ago by which two noble firemen were killed at the first experimental test in this city. What we need is something that will prove safe under all circumstances. What that will be we do not know, but our merchants who build warehouses a hundred feet high should interest themselves in providing for the absolute safety of the tens of thousands who daily use their elevators. Secretary Sherman, while in town last week, had a conversation with Postmaster James, when the latter urged the necessity of having more and better elevators in the post office building. The Secretary expressed himself heartily in favor of the pro-

posed improvement, and advised the postmaster to go before the Appropriation Committee at Washington with the Supervising Architect and present the need of an appropriation for this purpose.

The improvement is needed, and we hope the new elevators will be such as not to endanger human life. We have had enough of these man-traps.—*The Dry Goods Bulletin.*

[There is certainly ingenuity enough among our inventors to contrive some appliance which will render elevators absolutely safe. Who will do it?—EDS.]

SOUTH AFRICAN ANTELOPES.

The sassaby, or bastard hartebeest, as it is sometimes called, is by no means an uncommon animal, although some few years ago it was only known through the means of a mutilated skin.

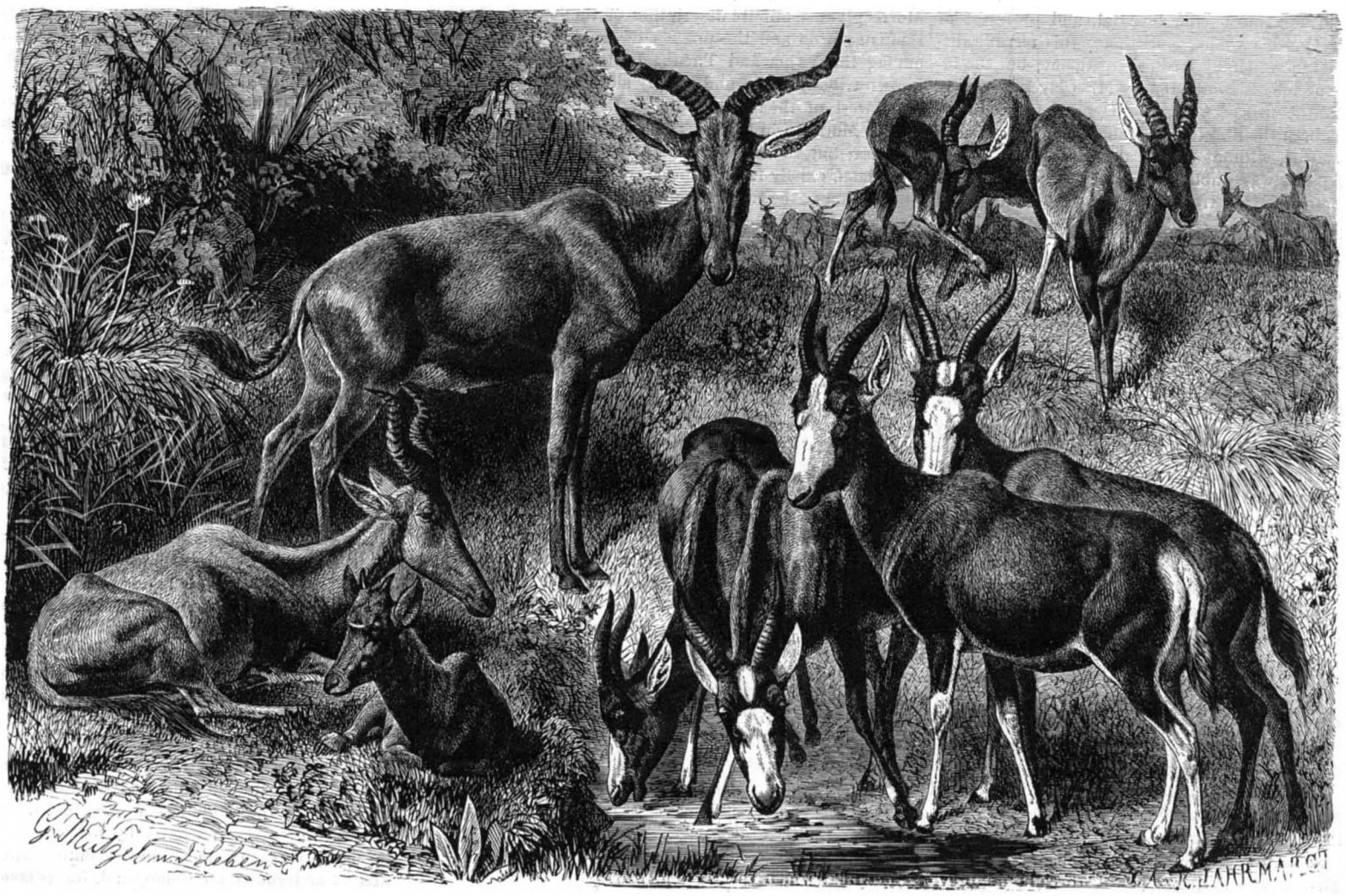
The general color of this animal is reddish-brown, the outer sides of the limbs being dark, and a blackish-brown stripe passing down the middle of the face. Sometimes the body is washed with a bluish-gray. It lives in small herds of six or ten, in the flat districts near the tropic of Capricorn, and is a most welcome sight to the wearied hunter when perishing with thirst. There are many antelopes which are almost independent of water, and can quench their thirst by means of the moist roots and bulbs on which they feed. But the sassaby is a thirsty animal, and needs to drink daily, so that whenever the hunter sees one of these animals he knows that water is at no great distance. It is rather persecuted by the hunters, as its flesh is in great esteem; but as it soon becomes shy and wary, it is not easily to be killed.

Concerning one of these animals, Cumming gives the following curious anecdote: "Having shot a sassaby as I watched the water, he immediately commenced choking from the blood, and his body became swelled in a most extraordinary manner; it continued swelling, with the animal still alive, until it literally resembled a fisherman's float, when the animal died of suffocation. It was not only his body that swelled in that extraordinary manner, but even his head, and legs down to his knees." The poor animal must have been shot through the lungs in such a manner that the air was forced by its efforts at respiration between the skin and flesh, until it assumed that puffy aspect.

The regularly lyrate horns of the bonte-bok, or nunni, serve to distinguish it from its congener the sassaby.

The color of the bonte-bok is a purplish-red, the outside of the limbs deepening into a rich blackish brown, and contrasting strongly with the white hair which appears upon the face, the haunches, and front of the legs. From the vividly contrasting tints of the coat, it has derived the name of pied antelope, or white-faced antelope. The female is not so highly colored as the male, and the throat and under parts of the body are white. This animal is found in the district that borders the colony at the Cape of Good Hope, and lives in little herds of six or eight in number. Herds of much larger dimensions are said to be found in the more northern district. The height of the bonte-bok is nearly four feet at the shoulder, and its length is about six feet, being thus superior to the common stag in size. The horns are black in color, and are furnished with a series of ten or twelve half-rings in their frontal surfaces. Their length is about fourteen or fifteen inches.

The bless-bok (*Damalis albifrons*) has sometimes been confounded with the bonte-bok; there is, however, a marked distinction in the color of the coat. The name, bless-bok, or blaze-buck, is given to this animal on account of the "blaze" of white upon the face, and is equally applicable to the bonte-bok.



Sassaby.—(*Damalis lunatus.*) Bonte-bok.—(*Damalis pygarga.*) Bless-bok.—(*Damalis albifrons.*)

SOUTH AFRICAN ANTELOPES.

The Sponge Fishery of Greece.

The sponge fishery, one of the most profitable occupations, is carried on round the island of Kalimnos by the Hydriots, Speziots, and Kranidiots, who have obtained the highest reputation as divers in this dangerous trade. They go in small boats to the places where the sponges are believed to grow upon the rocks, and then scatter over the sea surface a mixture of oil and fine sand. The sand, of course, sinks, but the oil forms an ever-spreading layer, through which can be seen, as clearly as in a mirror, the places where the sponges lie. The diver carries a large knife in his mouth, and fortified internally by a glass of schnapps, drops over the side, sinking himself by means of a large stone. At the sea bottom he cuts off all the sponges in reach and crams them into a bag, emerging in a short time with his booty. In recent years diving bells have been introduced, consisting of caoutchouc bags connected with the air by means of a pump.

When first obtained the sponges are enveloped in a gelatinous slime. To remove this they are spread on a sandy beach above high water mark, and covered with the sand brought by the tides. This was always the plan in former days. Now sponges are frequently bleached with sulphurous acid or chloride of lime, and sometimes even with potassium manganate and hydrochloric acid.

Thousands of dollars are annually brought to Greece by the sponge fishery.

The Culture of the Rose.

Among other most excellent articles in the June number of *Scribner's Monthly*, is the following on the propagation of roses, which is both timely and instructive:

Every rose will not come from the slip. Of the three great divisions into which the rose family is separated, viz., the damask, the noisette, and the tea, the last two may be propagated with more or less readiness from the slip, or by budding; the first only by dividing the roots, and planting the seed, which latter method is resorted to, however, only when it is desired to obtain new varieties.

The best season for taking rose slips is in June, just after the profuse bloom of early summer is over, although a person who knows exactly how to cut a slip may find good cuttings throughout the warm months. Judgment and discernment are needed for the selection at all seasons. I know a generous lady who sent her friends immense armfuls of boughs, with hardly a real cutting upon them.

One should choose from a good vigorous branch of last year's growth a fresh shoot, containing two or three buds, such as will always be found more or less swollen at the base of the leaf stems. It should be cut from the parent branch diagonally, with a smooth, clean cut that will bring off a little of the old bark as well, in order to make the condition as favorable as possible for the formation of roots.

Have ready a box or pot of rich mould. With a round, pointed stick, make a hole several inches deep, and fill it up with clean sand; insert the end of the slip in this sand to the depth of one or two inches; be sure to make it firm in the soil, and the sand acting as a percolator for moisture, you may keep your slip well watered. You can soon see, by the swelling of the buds and the dropping off of the old leaves, whether the slip is indeed taking root, but do not attempt to remove it to the place where you would wish it permanently to remain, until it has put out several sets of new leaves.

An ingenious way to raise a set of slips has been recommended by Mrs. Loudon, which we have tried with unvarying success. It is to take an earthenware flower pot, gallon size, and fill it more than half full of broken potsherds, pebbles, bits of slate, or such things; now set in the middle, on top of these refuse materials, another similar flower pot, half pint size, with the hole at its bottom stopped up tightly with a cork; let its mouth be even with that of the large, outer one; fill up the interstices with silver sand or other pure sand, and set in a row of slips all around, cut according to the directions given above. Keep the inner pot full of water all the time, but do not water the slips directly. In about six weeks your slips will have fine roots, and can be potted. A hand glass always hastens the process of rooting, and enables you to take advantage of the sunshine, but if you are not provided with one, be careful to keep your plants in the shade until they show certain signs of independence of life.

Roses need very rich soil to bring them to perfection, thriving best in a mixture of well-rotted manure, sand, and garden loam, and to stint them of nourishment is indeed poor economy.

A Luminous Sea.

Last February the French ironclad L'Armide passed through a considerable stretch of milky or phosphorescent sea between Point de Galle and Aden. Lieutenant Pornain reports that the nights of February 9, 10, 12, and 13 were characterized by the phenomenon in all its splendor, the ship during this time traversing 660 miles (1,100 kilometers) in a mean latitude of 12° north, between the meridians of 61° and 51° east longitude. There was no thunderstorm, the sky was clear, the moon new, the barometer, thermometer, and hygrometer were regular, and a gentle northeast monsoon was blowing. The temperature of the surface of the water was constant at 25°. The sea was like a snow covered field in a clear night, and all traces of undulations were lost sight of. The milky look was hardly disturbed by the motion of the ship and working of the screw (which shows that the layer had considerable thickness). By day all disappeared; but the hue of the sea was somewhat

altered. Looked at attentively over the ship's side at night the water was seen to contain an enormous number of luminous particles pressed close together, and more brilliant close to the side (where disturbed). Some four hundred of these corpuscles, one to two centimeters long, could be counted in a bucket holding ten liters of the water. Drawn out, these were seen to be of gelatinous substance, which quickly dried and disappeared, leaving a dark globule one millimeter in diameter, which, in the microscope, presented a transparent ovoid animalcule, filled with eggs, and moving its fins and tentacles incessantly. A drop of water added to the dark globule brought back its luminosity; and when the creature was bruised in the hand, it gave a bright mark, which was quickly extinguished, and which had no smell. The milky water, kept till day and looked at in the dark, shows no luminosity, even though agitated; nor does the water procured by day and brought into darkness. It remains to be determined what causes the luminosity of those animalcula, and information is also desirable as to the position of the various milky seas on the globe, the times of their appearance, whether they persist in the same place or not, etc. Several of the officers on board the Armide had witnessed the phenomenon before, but never so brilliant or so continuous. The Armide, in going out, had passed thirty leagues further north in February, 1878, without encountering anything of the kind.

New Treatment for Cancer.

The *Lancet* calls attention to an important series of investigations conducted at the Queen's Hospital, Birmingham, as to a new method in the treatment of cancer, by Mr. John Clay, obstetric surgeon to the hospital, and professor of midwifery at Queen's College. Hitherto this terrible disease has proved incurable by medical treatment; but the inquiries and experiments conducted by Mr. Clay lead to the belief that by the use of Chian (or Cyprus) turpentine—which he has been the first to use—cancer can be not only arrested, but cured, without a surgical operation.

Mr. Clay's paper was published in the *Lancet* of March 27. He recommends his treatment especially in cases of cancer of the female generative organs. He says that he had made extended trial of various remedies, both general and local, but at last concluded that if cancer could be cured it must be by medicine administered internally, and must be of such a nature that it could be taken for a long time without affecting special functions or general nutrition. A study of the pathology of cancer led him to the opinion that a carbo-hydrate of some kind might prove beneficial, and for several reasons he decided that Chian turpentine might prove the most suitable. An opportunity was soon presented. A woman, aged 52, came to the hospital with cirrhous cancer of the cervix and body of the uterus. "Hemorrhage was excessive, pain of the back and abdomen agonizing, and cancerous cachexia well marked. The patient evidently had not a long time to live. In such a case it appeared to be justifiable to attempt to relieve the sufferings of the patient, even if the remedy should produce unfavorable symptoms, or should prove of no avail. I therefore prescribed Chian turpentine, six grains; flowers of sulphur, four grains; to be made into two pills, to be taken every four hours. No opiates were prescribed or lotion used. No change was to be made in her diet or occupation. On the fourth day after taking the medicine the patient reported herself greatly relieved from pain, and was in better spirits, but she complained of a large amount of discharge. It was feared that she referred to a discharge of a sanguineous nature. On examination, however, the vagina was found to be filled with a dirty-white secretion, so tenacious as to be capable of being pulled out rope-like, and this, although she had syringed herself three hours previously." The medicine was continued for twelve weeks with excellent results and every appearance of a cure being probable. At the end of that time she suddenly left the town and left no address.

The second case was a younger woman, aged 31. In this instance the cancer appeared to be melted away by the turpentine in four or five weeks.

Mr. Clay reports several other cases in which remarkable benefit evidently resulted, with every prospect of permanent cure. Some cases have been cancer of the breast, abdomen, etc. In a case where the turpentine could not be digested in pills, it was made into an emulsion by Mr. Whinfield, dispenser to the hospital, as follows: An ethereal solution of Chian turpentine was prepared by dissolving 1 oz. of the turpentine in 2 oz. of pure sulphuric ether (anæsthetic). The ether dissolved the turpentine instantly. Of this solution, ½ oz.; solution of tragacanth, 4 oz.; syrup, 1 oz.; flowers of sulphur, 40 grains; water to 16 oz.: 1 oz. three times daily.

Mr. Clay remarks that "ordinary oil of turpentine, if it produces any effect on cancer, is inadmissible on account of the speedy production of its specific effects, even when administered in small doses. The same remark applies with less force to the Venice and Strassburg turpentines; in my hands they have not produced the same beneficial effects on cancerous growths as the Chian turpentine has done. The maximum dose of the last named drug, which can be safely and continuously given, is twenty-five grains daily It is advisable to discontinue the remedy for a few days after ten or twelve weeks' constant administration, and then to resume it as before. The combination with sulphur was given at first, and has been continued. It is doubtful whether much benefit is derived from the combination, but the effects have been so uniformly good with it, that it was thought advisable to continue its use. There is every reason to believe, from the trials made with other substances in combination with the turpentine, such as carbonate of lime, iodide of calcium, ammoniated copper, quinine, bebeerine, hydrastin, etc., that the turpentine is best administered simply, as the most marked and rapid effects have always been manifested when it has been given alone.

"The turpentine appears to act upon the periphery of the growth with great vigor, causing the speedy disappearance of what is usually termed the cancerous infiltration, and thereby arresting the further development of the tumor. It produces equally efficient results on the whole mass, seemingly destroying its vitality, but more slowly. It appears to dissolve all the cancer cells, leaving the vessel to become subsequently atrophied, and the firmer structures to gradually gain a comparatively normal condition.

"It is a most efficient anodyne, causing an entire cessation of pain in a few days, and far more effectually than any sedative that I have ever given. In the cases I have described no sedative was employed in any instance, although in some cases where great pain had existed previously to commencing the treatment, large doses had been given. Whether this arrest of pain arises from the death of the tumor, or, as my son suggests, is due to there being no longer irritation of the sentient nerves (in consequence of tension being withdrawn by the removal of the cells), the fact is the same."

How Ramuau Poison is Made.

In a letter to the *World* from the interior of Peru, Ernest Morris gives a minute description of the ingredients of the ramuau poison and the process of making it, as practiced among the Yajua and Tucuna Indians. These two little-known tribes prepare and supply all the poison used by Indians west of the river Japura in Brazil to the headwaters of the Maranon in Peru. This poison is sometimes called woorara; but the true woorara is prepared by the Indians of Guiana, chiefly from a species of strychnos, while in the preparation of the ramuau poison Mr. Morris is positive no strychnos is used.

During his stay with the Yajuas, Mr. Morris was permitted to accompany the Indians while collecting the plants and roots from which the poison is brewed; but his knowledge of botany is too limited to enable him to describe them scientifically. The following were used, the names being spelled as they are pronounced by the Yajuas.

No. 1. Ramuau.—This is the principal ingredient. It is a sepoy or climbing woody vine, varying from two to four inches in diameter, and is covered with a thin yellowish bark, which is exceedingly bitter to the taste. The leaves are very large, oblong, and deeply veined, and are of a light green color. The fruit and flower both unknown. Is a native of high land. The bark alone is used. No. 2. Wagana.—A large vine from four to six inches in diameter, with very small heart-shaped leaves, a native of low, flooded lands. It is very abundant. The roots alone are used. No. 3. Tuna.—A small tuberous plant with thick, glossy green leaves and beautifully variegated stalk, a native of low lands. The roots alone are used, and emit a very powerful and disagreeable odor, reminding one of asafœtida. No. 4. Rú-úmi.—A small bush with light green foliage, growing to a height of two feet, a native of low land. The bark and roots are both used, and are extremely bitter. No. 5. Cenu.—A very large bush with long, narrow-pointed leaves and very small white flowers, which are borne in clusters of three at the ends of branches. It is a native of high land, and is also bitter to the taste. The bark only is used. No. 6. Ne-wa-tu.—A small tree growing about twelve feet high. The trunk, which varies from two to five inches in diameter, is covered with a thin, light-green bark. The leaves are oblong and of a dark green. It is a native of high land. No. 7. No wu se; No. 8. Pupetu; No. 9. Ramre.—These are all small trees, the bark of which is used. No. 10, Mucutu, and No. 11, Newatu, are small shrubs. No. 12. Ramawe.—A bush attaining the height of three feet, with alternate fleshy, dark green leaves, which, upon being pressed, yield a whitish liquid, which, mixed with No. 9, gives to the poison that intensely bitter taste which it possesses when fresh. No. 13. Yellow peppers.

Many of the ingredients used in preparing this poison could, in Mr. Morris's opinion, be dispensed with. From four to six days are required to make one little pot, or two tablespoonfuls, of the ramuau. After the Indians have obtained a sufficient quantity of the plants and roots—and one would be astonished at the number they collect—they sit down on the floor, and both men and women carefully scrape the bark from the vine ramuau (No. 1), the principal ingredient. The bark is thrown into an earthen vessel, after which it is beaten and then pressed. It yields a whitish liquid, strong smelling and very bitter.

This liquid is put into a small earthen pot, conical in shape, and a great curiosity in itself, and suspended by a cord about eighteen inches above a slow fire. After a few hours Nos. 2 and 4 are added, after they have been treated in the same manner as No. 1. After the second day the mixture becomes almost black, and has the consistency of molasses. All this time it is very carefully watched by the Indians, who now and then taste it. Great attention is paid to the fire beneath the pot, for if the poison becomes the least scorched or burnt it is entirely worthless. After thirty-six hours No. 6 is added. During this time he had repeatedly tried the strength of the poison upon frogs. Grasping the animal by the hind leg he would, with a sharp-pointed stick, insert the fresh poison into the foot, but without any effect. But when tuna (No. 3) was added, the poison became very black, and, upon tasting it, he found that even if it was not strong enough to kill the frog, it was strong enough to take all the skin off his tongue.

This was now left to simmer for about ten hours, when the Indians tried its strength upon frogs, which are the hardest animal to kill with this poison. A few moments after being pierced with the poisoned arrow the animal died—too quickly, my interpreter said. So the Indians added one ingredient after another, the last being the small yellow peppers. Again and again they experimented, and when the frogs made one or two hops and then died, the poison was pronounced complete.

The poison made by the Tucuna and Yajua Indians is put in little earthen pots, made expressly for it, and never in gourds. These pots are hidden in the damp woods, where the poison does not become hardened. Often the poison is so strong as to be almost worthless, as birds and game shot with arrows tipped with it prove unfit to eat, and in a few hours putrefy.

ENGINEERING INVENTIONS.

It is well known that the cause of smoke is that the fresh air, entering the incandescent coal from below through the grate, has often all its oxygen consumed before it has passed half way through the layer of coal, so that the upper part of the layer cannot burn, but is simply heated by the underlying incandescent coal, while the products of the combustion of the lower layer of burning coal pass through the upper heated and not-burning layer, and carry with them the combustible gases evolved by the heat, but which cannot take fire for the want of free oxygen. In order to furnish these combustible gases ascending through the upper layer of coal with the necessary oxygen to burn, Mr. Benjamin F. Sherman, of Ballston, Spa, N. Y., has devised a means of introducing air in the furnace with a downward injection upon the fire by a vertically adjustable arrangement of pipes, which may be placed close to the coals or further from them, according to the requirement of the case.

Mr. John U. Sumpter, of Lynchburg, Va., has patented an improvement in the class of axle journal lubricators whose action depends upon capillary attraction, the vehicle for conveying the lubricant to the journals being fibrous material, such as felt, tow, cotton, or fabric of some kind. This invention relates to the means for holding the fibrous material and supporting it in contact with a journal.

An improved railroad gate has been patented by Mr. Samuel L. P. Garrett, of Lewisburg, Tenn. The object of this invention is to provide a railroad gate that an approaching train will open by the pressure of the flanges of the wheels upon a horizontal bar fixed parallel with the rails and rising a little above them.

Theories of Light and Color.

A good deal regarding light was known to the ancients. They knew the law of reflection and something of that of refraction, as shown by the reference of Seneca to the broken appearance of an oar when thrust into the water. Another phenomenon, that of the rainbow standing out in the sky as a sort of challenge to the human eye, could not escape detection. At one particular angle, as shown by Descartes, beams reflected by or emerging from a drop of rain were so welded together as to form a condensed sheath of rays, and it was in this condensed sheath that you saw the colors of the rainbow. Milton, in 1672, proved by the use of the prism, acted on by a beam of light thrown through an aperture in a window shutter into a dark room, that white light is not homogenal, but is composed of various constituents more or less refrangible, of which red is the least and violet the most refrangible. This premised, Professor Tyndall, by a series of beautiful and interesting experiments from apparatus managed by his assistant, threw upon a white screen disks of several colors in order to prove the true effect of intermixture. Thus the ordinarily received theory that combination of yellow and blue produces green was shown to be erroneous, the true effect of the combination of those two colors being, as proved to ocular demonstration, white. By the same means the true complementary colors were displayed. Fixing the eye on a white disk until the lecturer counted twenty and the special illumination of the disk was withdrawn, the spectator saw remaining the filmy semblance of the complementary color, black. Blue left orange, red left green.—*Professor Tyndall at the Royal Institution.*

What We Think with.

Without phosphorus, no thought. So declared a famous German physiological chemist, some years ago. That particular brain substance, which he supposed to be essential to thought, has heretofore been known as protogen with phosphoric acid. Considering this name not sufficiently clear and definite, another German chemist has proposed for it the following precise and significant combination of seventy-two letters: Oxaethyltrimethylammoniumoxydhydrateleylopalmethyloglycerinphosphorsaüre. If mental derangement is in any way due to deficiency in the elements of this highly complicated compound, or to any snarling of its multitudinous constituents, the wonder is that anybody can ever think straight. And what a lot of it that German must have had in his head when he contrived such a name for it!

Manufacture of Antique Plate.

According to the London *Industrial Guardian* the manufacture of pseudo-antique articles in bronze, china, and plate is carried to a greater extent than most people are aware of. It is no exaggeration to say that this stuff is manufactured and sold in tons. The ways in which the public is imposed upon and the government, in many cases, defrauded by those who manufacture and vend it are various. First, there is what may be called the "hereditary plate trick." This plan is to get up articles after the antique, and to engrave upon them a fictitious inscription, as *e.g.*, "Presented by Lord A—— to his esteemed friend the Earl of B——, on his coming of age, A.D. 1750." The next step taken by some ingenious swindler is to write to some descendant of Lord A——, or of the Earl of B——, informing him that Mr. —— has obtained possession of an interesting *relique* of his distinguished ancestor, and to suggest the advantage of his lordship keeping it in the family. Then there is what may be styled the "ordinary trick" of the trade. The method here lacks the invention of the other, but it is sufficiently ingenious for the gulls for whom it is intended. The dealer purchases some ancient article, say a saltcellar, worth about £1 sterling. He then takes this to some needy and unscrupulous silversmith, and induces him to clip the Hallmark from this genuine article and to solder or affix it to the bottom of some spurious article of a much larger size. Sometimes the silver of the latter is of a much inferior quality to that of the former, but not always. The article is then displayed in the dealer's window, with a well-devised advertisement, and sold as a genuine antique at a fancy price.

The "spoon trick" is probably the most lucrative method of swindling the public known to the *pseudo*-antique artificer, and at the same time the most difficult to detect. It is managed as follows: The dealer purchases some old spoons, and, cutting off the shanks, beats the portion on either side of the Hallmark out thin, and then incorporates it with some vessel of inferior workmanship; or, cutting out the mark only, solders it into the "wire" running along the base of a cup or vase. This can be done by an ordinary workman so neatly as to defy detection by any but an expert. In all of these instances it will be observed that a genuine mark is used, the imposture consisting solely of fixing the antique stamp to a modern vessel, and thereby inducing the unwary customer to pay an exorbitant sum for the article. But there are members of the fraternity of knaves who descend to a deeper depth of rascality. Probably they do not see the advantage of being nice in iniquity. At all events they do not scruple to forge the Hallmark as well as the age of the article which they sell. This is easily accomplished with the aid of Chaffers' book of Hallmarks, which was originally intended as a shield to honest dealers, but which has become a two-edged sword in the hands of knaves. To give the article thus stamped with forgery an antique appearance, the dealer oxidizes it with sulphur fumes, and sells it for twice or twenty times its value. Lastly, there is the "foreign plate trick." This consists of manufacturing articles in imitation of German, Dutch, and other foreign productions, and marking them as if they were such. The dealer by this means robs the government of the duty of 1*s.* 6*d.* an ounce which he would otherwise have to pay, and in many instances obtains the price of genuine silver for a composition little better than nickel.

We suspect that a great majority of the antique *treasures* are of the above class which American travelers bring home from abroad, which were obtained through the special influence of some newly made acquaintance, or the self-sacrificing dealer who had always desired the special article should go to America; he assuring the purchaser that the round sum demanded was of minor consideration compared with the fact of the relic going to the States.

And it seems almost a pity to have the delusion expelled by an exposure of the tricks of the modern artificer, thus rendering the possessor of the supposed to be veritable antique suspicious of the genuineness of his treasure.

A Rising Industrial City.

Among the rapidly growing manufacturing towns of Connecticut few if any are making more substantial progress or enjoy brighter prospects of future development than Birmingham, at the junction of the Housatonic and Naugatuck rivers, ten miles west of New Haven.

The census of 1870 found in Birmingham a population of 2,103. To-day, in spite of the general industrial depression of recent years, the town boasts of 10,000 inhabitants within a radius of two miles. There are ten important manufacturing establishments on the power of the Ousatonic Water Power Company, and as many more, within the limits of the town, on the power of the Birmingham Water Power Company. There are churches of all denominations, excellent schools, a bank with $300,000 capital, a savings bank with over $1,000,000 deposit, gas and water works, telegraphic facilities, two lines of railway, abundant water communication by way of the Housatonic and the Sound, and all the other advantages for business and residence characteristic of a thriving New England town. Much of its rapid growth is primarily due to the enterprise of the Ousatonic Water Power Company, of which D. S. Brinsmade is secretary, in developing the natural advantages of the place in connection with its superior water power. By means of a dam of solid masonry, 22 feet high and 800 feet long across the Housatonic River, the largest and most reliable water power in the State was brought under control ten years ago, and the foundation laid for a large and prosperous industrial city. For after all that may be said of steam power—especially when coal is cheap, as it has been during the recent depression in the coal trade, or when steam power is taken in comparison with unreliable water power—the advantages of a reliable water power like that at Birmingham are incontestable. It is abundant, constant, and cheap, and costs per horse power only about one-third the average for steam power in New England. The Ousatonic Company own a large amount of real estate in the immediate vicinity of their works, providing ample room for mills and for the dwellings of operatives; also lots more remote, admirably adapted for first-class residences; all offered on such liberal terms to desirable parties that it is safe to predict for Birmingham a rate of growth in the immediate future as much more rapid than that of the past decade as the general prosperity of the manufactures of the country promises to be greater.

In addition to the attractions already enumerated Birmingham is favored by close and speedy connection with New York by rail and by water. Two lines of competing railways and a good water route insure reasonable freight rates; and the nearness of the town to the other manufacturing centers in the Naugatuck Valley removes any fears as to the supply of skilled labor. The town is also happily situated on the score of general healthfulness, and the surrounding scenery is fine.

To Distinguish Dyes in Colored Goods.

It is often necessary to know with what coloring matters a pattern has been dyed. In some cases an experienced dyer can soon ascertain, almost at a glance, or by simple methods, which dyestuff has been employed; but with many colors this is sometimes impossible. Especially is this the case with blue dyed fabrics, in which it is not easy to say whether a pattern has been dyed with vat indigo alone, or has been topped with cheaper stuff.

This detection can be made by a chemical analysis, the method consisting in destroying one of the coloring matters by some reagent, and thus prove its existence by the use of the destroying medium. To ascertain which mordant has been used, it is only necessary to burn a certain quantity of the fabric, and to find out by chemical analysis which oxide was present on the fabric. These methods are, however, only of use to chemists; but the following is a simple method that may be employed by anybody to determine the coloring matter. To begin with blue dyed fabrics. *Vat blue*, in the first place, is neither affected by alkalies nor acids (with the exception of nitric acid). Only chlorine and chlorine compounds react on vat blue.

A blue dyed with *sulphate*, or *extract*, or *carmine of indigo*, is readily abstracted by boiling water, and even more so by caustic alkalies.

Prussian blue is easily recognized by using alkalies which destroy it, while chlorine and acids have no effect upon it. However, the alkaline chlorine compounds of commerce (bleaching powder, etc.) react upon it.

Goods dyed with *logwood* give, with acids, a coloration more or less yellowish. In case there is another color associated with logwood, the latter may be extracted with a large quantity of acid. The fabric is then well washed, and the remaining color examined.

The red colors are more difficult to determine; but these colors have not the same importance as the blues.

Colors dyed with *cochineal* and *Brazil wood* (which, however, every dyer can easily distinguish) become gooseberry red when treated with muriatic acid. If it is washed, and then passed through milk of lime, a pretty loose violet is obtained. *Madder red*, treated exactly in the same way, and after the milk of lime bath boiled with soap, acquires a more intense color.

Cochineal red and *Brazil wood red* can be easily distinguished by means of oxalic acid, cochineal red becoming brighter, while the other is more or less destroyed.

Black, which is generally dyed by two methods, either with iron or chrome, when treated with chlorine, is destroyed if dyed with iron; but, if a chrome black, resists to a certain extent, only becoming chestnut brown, even with strong treatment.

To distinguish other colors there are many methods, which are, however, too complicated to be mentioned here. Aniline colors require greater chemical knowledge to distinguish them from each other.

Quenching a Fire in a Coal Mine.

"Anthracite," writing to the *Tribune* from Wilkesbarre, Pa., gives an interesting account of the means lately employed in quenching the fire in the Stanton shaft at that place. The fire began with the burning of the breaker on the night of May 3, 1879. The shaft, 840 feet deep, was filled with water, and when it was pumped out it was found that there was still fire in a part of the mine (a slope up from the bottom of the shaft, about 500 feet in length and 200 feet vertical height), from which the water had been kept by the inclosed air, which had no means of escape.

The fire was burning so briskly that they were compelled to let the shaft fill with water again to prevent the entire mine from getting on fire. To get the water to rise into the A shaped apex of the coal measures where the fire was, they employed Mr. John Muirhead, of Wilkesbarre, to drill a hole six inches in diameter to strike the burning gangway at the highest point to let the air out, so that the water would rise and fill the cavity.

At the depth of 662 feet he found indications of the internal fire, and the borings came up very hot. At 667 feet his drills got fast in the heated rock and coal, for, instead of coming out in the gangway, he was in the solid coal at one side of it. His method of getting his drill loose was rather novel. After all the known methods had failed he had 670 feet of inch pipe, weighing 1,008 pounds, attached to the beam of his drilling machine, and connecting the pipe with a powerful pump he forced a stream of water through the pipe at a pressure of 200 pounds to the square inch. The end of the pipe was fitted with a circular steel bit, and by working the drilling apparatus he succeeded in removing the obstruction and getting his drill out, after drilling to the bottom of the vein—685 feet. The air could not escape; so to remove the partition of coal between the gangway and the hole, they put down a cartridge of giant powder 10 feet long, charged with 100 pounds of giant powder, and fired it with a battery. The powder had only about 30 per cent glycerine, and did not prove strong enough to burst the barrier. Then they put in a larger charge of 80 per cent glycerine and burst the coal out at the bottom. The water filled the hole within 50 feet of the top.

The main interest in this experiment will be reached after the water is pumped out and they have seen what the effect of a large charge of nitro-glycerine has been at that great depth and under the great pressure of over 600 feet of water. Torpedoes are used in oil wells, but the exact effect is not known.

Care Needed in Canning Fruit.

Recently four members of a Brooklyn family were taken violently sick after eating canned cherries. The poisoning was found to be due to a salt of zinc formed by the action of the free acid of the fruit on the zinc screw cover of the jar. In his report the chemist said:

"The presence of a zinc compound in the sirup was unmistakable, and it appeared in such abundance that some lack of precaution is preparing the fruit seemed probable. I learned, however, upon inquiry that the preserving had been done with scrupulous care by a friend of the family. Moreover, the contents of other jars of the collection prepared at the same time had been eaten without unpleasant results. As the jars yet unopened were placed at my disposal through the politeness of Mr. Gilbert [whose family had been poisoned], I selected one having a zinc top with a porcelain lining. There was no indication of zinc in the contents of this jar. I then poured about a fluid ounce of the sirup of this jar into the cover of the first jar and warmed it over a water bath for three quarters of an hour. The solution then yielded promptly to the test for zinc. . . . The case is not without parallel, but it is not sufficiently well known to the public that zinc yields so readily to the action of fruit acids, and consequently that the use of zinc or galvanized iron in the preparation or preservation of canned fruits is not free from danger."

Where the Colors Came From.

A Detroit man received from Japan a couple of Japanese hand-made illustrated books. The illustrations were finely colored. The Detroiter was particularly struck with the brilliancy of two of the colors. He saw that the Japanese had evidently some secrets in the color line that were worth having, so he wrote to his friend in Japan to see the bookmakers, and if possible find out where they got their colors and purchase some to send to Detroit. Yesterday, says the *Free Press*, an answer came from Japan. The gentleman there found where the colors were sold, and on making inquiry at the paint shop, he found that one of the colors came from Basle, Switzerland, while the other came from America.

Polar Shoes.

A Philadelphia firm are making fifty pairs of shoes for the members of Captain Howgate's Polar Expedition. Each pair weighs about five pounds, and are large enough to allow the wearer to protect his feet with three or four pairs of thick stockings. The soles are three-fourths of an inch thick, and between the inner and outer soles are layers of cork. The uppers are thick black Arctic beaver cloth, lined with lamb's wool, with a layer of bladder between.

The Birth Rate in France.

The *Continental Gazette* notes that the birth rate in France is steadily diminishing; so is that of marriage, but in a lesser degree, the number of children resulting from these marriages having greatly declined. In the class composed of petty tradesmen or the well to-do peasants there is seldom more than one child per marriage, and it is stated that in one of the royal communes in Picardy the number of children among the best-off of the peasants is thirty-seven for thirty-five families. What, asks the *Gazette*, is to be the ultimate destiny of France if this decline of the population continues?

Pita—A New Fiber Plant.

The American Consul at Vera Cruz has been calling attention to a new fiber plant, a species of cactus commonly called "pita," which promises to add materially to the resources of Mexico. Some of the fibers are sixteen feet long. The fiber is strong and silky, and capable of minute subdivision. Some months ago a native of Vera Cruz sent some of the fiber to England, where it was woven into handkerchiefs, which were strong and extremely beautiful, appearing more like silver tissue than like linen. The plant grows wild, and there are millions of acres of it.

Molecular Changes in Iron.

At a recent meeting of the Society of Telegraph Engineers, Prof. Hughes communicated the results of his further experiments in this direction. He finds that the brittleness is not due to any flaw in the steel or iron wires which he immersed in the acid, but invariably happens with all kinds of steel or iron. Nor does it arise to any specific proportions of sulphuric or other acid to water. But as far as he has gone he has not found any other metals, such as copper and brass, to behave in like manner, and therefore he is inclined to consider the property as peculiar to the metal iron.

The suggestion made by Mr. W. Chandler Roberts that the brittleness is due to absorption of hydrogen by the iron wire is fully borne out by the tests of Prof. Hughes. The brittle wire shows no change of metallic conductivity when tested by the induction balance, such as would be the result of heating, straining, tempering, or corroding the wire. Again, if the wire is immersed in very weak acid (one-twentieth part of sulphuric acid, say), it takes about thirty minutes for the wire to become fully brittle, whereas on immersing an amalgamated zinc plate in the same liquid also, and connecting it to the iron by means of a wire so as to form a voltaic element giving off abundant hydrogen at the surface of the iron, the full effect is produced in a minute or two, owing apparently to the absorption of the hydrogen by the iron. In the latter case, too, the presence of the zinc protects the iron from the action of the acid, and therefore demonstrates that the brittleness is not due to a mere surface corrosion.

It is not absolutely necessary that the zinc should be in the same cell with the iron, for if a current from a few cells of an external battery is passed through two iron wires acting as electrodes in sulphuric acid and water, both wires become brittle, though in a very different degree, the wire connected with the zinc or negative pole becoming bright and excessively brittle, while that connected with the positive pole is much corroded, and but feebly brittle. Prof. Hughes also finds that with this arrangement, all acids and neutral salts he has tried, as well as ordinary water, produce the brittleness in a space of time proportional to the conductivity of the liquid employed. When water and most neutral salts are used the negative pole is quite bright, but brittle, while the positive is much corroded but not at all changed in pliability.

Prof. Hughes believes the brittleness due to absorption of hydrogen in its "nascent" state, for he has obtained no such effect by continued immersion of the wires in carbureted hydrogen (or ordinary lightning) gas; whereas, as above described, when plunged in a medium containing hydrogen just freed from combination with some other elements, the brittleness is very marked. The hydrogen seems to permeate through the entire mass, for rods one-quarter inch thick require more time to be affected than the smaller needles experimented upon. Mr. Stroh has confirmed this observation by filing and polishing saturated wires down to a mere fraction of their original diameter, and still finding them to retain their brittleness. Once a wire is completely "hydrogenated" it appears also to retain its brittleness indefinitely. If, however, it be heated to a cherry red in the flame of a spirit lamp its flexibility is completely restored, and the hydrogen appears to be driven out of it. Prof. Hughes also remarked, curiously enough, that tension of the wire brought back its original flexibility. In connection with these results Prof. Hughes discovered that a wire immersed in sulphuric acid and water of any proportion, say one-sixteenth of acid, becomes afterward more electro-negative than at the first moment of plunging. In a voltaic cell with plates of amalgamated zinc and iron it is evidently the electromotive force of zinc and *hydrogenated iron* which is obtained. Moreover, Prof. Hughes finds that when the iron has absorbed its full complement of hydrogen the cell becomes constant, and shows but little signs of polarization, though "short circuited" for hours. After a few days' hard work through small resistance there is a slight diminution of electromotive force, owing perhaps to the acidulated water becoming more neutral by the formation of sulphate of zinc and iron. And, singularly enough, to restore the cell to its original electromotive force it is only necessary to *short circuit* it for a few seconds.

Now in most batteries, as is well known, short circuiting is the very thing to reduce the electromotive force, but with the iron-zinc cell, on the contrary, it restores it. The explanation of this anomalous result is doubtless due to the fact pointed out by Prof. Hughes, that it is not iron but hydrogenated iron which forms the electro-negative plate of such a cell, and that this iron is most electro-negative to the zinc when saturated with hydrogen. The highest electromotive of the cell is then obtained. Continued working of the cell probably weakens the electromotive force by robbing the iron of its hydrogen in some way, but on short circuiting the cell again clouds of hydrogen envelop the iron and enable it to absorb its full charge of the gas. It is not at the first instant after breaking the short circuit that the electromotive force is fully restored, but about ten seconds after, apparently when the iron has had time to absorb the hydrogen. Experiments made by Mr. H. R. Kempe, at the instigation of Mr. W. H. Preece, the president, tended on the whole to confirm these results.

An ingenious practical application of iron as a negative was also suggested to Prof. Hughes, namely, the chemical purification of mercury from zinc alloy by immersing the mercury in dilute acid and touching it with an iron wire. So long as any zinc remains in the mercury, hydrogen gas is given off by this conjunction. In proof of this, if after a certain time no hydrogen is given off, the mercury is simply touched with zinc for an instant the hydrogen at once reappears, and is evolved until this trace of zinc is thrown off by the mercury. In concluding his paper Prof. Hughes remarked that though the presence of hydrogen in iron rendered it more brittle, on the other hand it made it more electro-negative, and hence better able to keep free from rust.

A supplementary paper by Mr. Chandler Roberts, F.R.S., chemist to the Mint, established the fact that iron wires immersed in sulphuric acid behaved like the metal palladium and "occluded" or absorbed hydrogen. The late Prof. Graham found that palladium absorbed nine hundred times its own volume of hydrogen, expanding linearly at the same time about two per cent. This expansion was exhibited to the meeting by Mr. Roberts in a very conspicuous way, by means of a long index or lever actuated by the expansion of a palladium rod fed with hydrogen by means of electrolysis in a zinc-palladium cell. Mr. Roberts, by heating the brittle wires of Prof. Hughes *in vacuo*, has found that they occlude or absorb about twenty times their volume, irrespective of the "natural gas" in the metal, which amounts to from three to ten volumes of hydrogen and carbonic oxide.

It is, therefore, beyond a doubt that the brittleness is due to absorption of hydrogen by the wires, but as the president pointed out, this does not solve the problem *how* the gas produces the loss of pliability. That this brittleness is not attended by any loss of tensile strength in the wires would appear from some experiments of Mr. Stroh. Prof. Abel could not offer any explanation of the molecular process.

THE TEMPER OF IRON AND STEEL DUE TO GASES.

Mr. Anderson, chairman of the committee for investigating the true nature of tempering, said that Mr. Edison's experiments on tempering metal *in vacuo* had led him to the theory that what is called the temper of iron and steel is due to the gases, chiefly hydrogen, in the interior of the metal. Hardening the metal or tempering by heating, then suddenly cooling it, had the effect of keeping the gases out of it, and shrinking the particles of metal more closely together so as to increase their cohesion. He, therefore, asked if any hardening of the wires on immersion in the acid had been noticeable; and Mr. Stroh replied that he had found none. The wires were apparently as soft as before. Moreover, it seemed to have been forgotten by the meeting that Prof. Hughes in his paper stated that the wires when tested in the induction balance showed no change of strain or *tempering*.

Prof. Adams then explained that the molecules of hydrogen absorbed by the metal would probably, by separating the molecules of the metal further apart, reduce the force of cohesion, just as the atoms of one metal when alloyed with another lose their original cohesion. Prof. Perry pointed out that there were alloys, such as those of tin and copper, which were really stronger than either of the component metals, and that the cohesion of the iron wires did not seem to be affected longitudinally, for they were as strong as before when subjected to tensile stress. Mr. J. Munro suggested that the brittleness might be due to a mechanical effect in the wires. When a wire is bent one side is in tension while the other is in compression, and perhaps the intruding molecules of the gas would block up the intermolecular spaces on the latter side, and by preventing this compression cause the wire to snap across. At the same time the tensile strength of the wire need not be altered. He also endeavored to account for the fact cited by Prof. Hughes, that subjecting the wires to tension restored their pliability, by supposing that the stretching of the wires allowed the molecules of the gas to escape, or in other words that it "squeezed" them out.

The discussion, which was highly interesting, was terminated by Mr. Treuenfeldt, alluding to the practical importance of the subject in practical telegraphy; and Mr. Willoughby Smith observed that it had long been customary in soldering telegraph wires with a flux of sulphuric acid to see that the acid is properly "killed" with zinc, and to wash the joint carefully thereafter, in order to prevent any free acid from rendering the wire brittle. He might have added that resin is often used instead of a sulphuric acid flux for this reason. The deleterious effects of the acid, however, were, we think, commonly set down to corrosion, and in fine apparatus to a deliquescence causing loss of insulation. —*Engineering.*

How Postal Cards are Made.

In a long article on the history and manufacture of postal cards, the New York *Sunday News* says that the American Phototype Company—to whom the contract for making the postal cards of the United States was awarded in 1877—carried on the business in this city for two years; but to save the expense and risk attending the transportation of paper from the mill at Holyoke, Mass., the business was removed thither in the spring of 1879, a new building being erected for its accommodation. The main portion of the building is divided by a partition through the middle. One side is used by the contractors for manufacturing cards, and the other side by the Special Agent of the Post Office and his subordinates, in the transaction of the government business pertaining to making up of orders, and forwarding cards to the various post offices ordering them. No business, of whatever nature, is transacted with more systematic precision than is maintained in both departments of the postal card agency.

On entering the contractor's side, the first thing noticed is the large piles of paper, which are delivered to the contractors by the Parsons Paper Company in loads of 3,000 sheets each. The works consume on the average about three tons daily at present. The process of manufacturing cards is neither lengthy nor complicated, but is at once so novel and interesting that a brief description is well worth a recital. The sheets are about thirty by twenty-two inches in size, and are just fitted by the plates from which the cards are printed, each plate covering forty cards, four in width and ten in length. The printing is done on two Hoe super-royal presses by skillful pressmen, and as each sheet passes into the press the number of cards is unerringly recorded by registers attached to the presses, and which are carefully locked every night to prevent any tampering. The sheets are then piled up and allowed to dry in order that they may not be damaged by future handling. Incident to the rapidity with which the work is performed, now and then a sheet is misprinted, but this occurs only rarely, the number of cards spoiled in this way being not over one-tenth of one per cent, or one in a thousand on the average.

After drying thoroughly, the sheets are then passed through the rotary slitter, a machine fitted with circular knives, which cuts them into strips of ten cards each, and trims the edge of the outside strip. The strips are then passed transversely through the rotary cross cutters, the mechanism of which is similar to the "slitters." The cross cutters divide the strips into the single cards, which drop into a rotary hopper containing ten compartments. As soon as each compartment has received twenty-five cards, the hopper revolves and throws the cards out upon a table. A number of girls then take them, and after throwing aside all damaged cards, bind the perfect ones into packs of twenty-five each. Other girls then take the packs, and after recounting them, put them in pasteboard boxes containing twenty packs or five hundred cards each. The boxes are made entirely of one piece of pasteboard, without seam or paste, and after being filled are all weighed. Each box is supposed to weigh three pounds and two ounces. In the rear of the building is a large fire-proof vault with a capacity for storing 25,000,000 cards. By the stipulation of the contract the American Phototype Company is required to keep at least 10,000,000 in store all the time.

So rapidly has the popular demand for postal cards increased that the works have lately been run night and day, employing in all nearly fifty hands, and producing nearly a million cards a day on the average. The government portion of the works is no less interesting than the other. Here the business is carried on in a manner similar to that in the general post offices in large cities. Every post office in the country requiring postal cards sends its order, together with a requisition for other supplies, to the office of the Third Assistant Postmaster General at Washington. There the orders are separated, and all the orders for postal cards are made up in one general order to the agency at Holyoke, the names of ordering post offices being put down alphabetically. An order is sent every day, and often includes the orders of several hundred post offices, and requiring all the way from a few hundred thousand to two, three, and even four million cards to fill it. During the first month in each quarter the orders average much larger than at other times, for, as a rule, a large number of offices order supplies in those months to last for the quarter. As an example of this, there were ordered during the month of January last 36,488,500 domestic cards, while 16,582,000 filled the orders for February.

A large portion of all the cards made are used in the Eastern and Middle States. New York city alone uses about ten per cent of the entire production. Chicago stands next to New York, using more cards than Boston. The Southern States take but few cards.

The total number of cards issued during the fiscal year ending June 30, 1879, was 221,807,000. The department estimate for the year to close June 30 next is 259,514,190, an increase of seventeen per cent over the previous year's issue; but if the number issued for the first eight months of the year should be continued proportionately till the close, the year's consumption would amount to 275,839,750. If a like increase were to be presumed from year to year, before 1890 the yearly issue of postal cards would exceed a thousand millions.

Congress passed an act, March 3, 1879, providing for the issue of international cards at a postage charge of two cents each. It was not, however, until December 1 that the first were issued. The demand for them has not been as large as was anticipated. Up to March 1, this year, three months from the first issue, only 2,500,000 have been ordered, and of this number 1,000,000 went to New York city.

A Remarkable Case of Skin Grafting.

Probably the most extensive case of skin grafting ever attempted has been going on with gratifying success during the past year in Danielsonville, Conn. The patient, Jesse Morgan, eleven years old, fell into a vat of caustic potash on the last day of the year 1878. Both legs were immersed nearly to the hips, and the skin was so completely destroyed that a new growth was impossible. After some months of hopeless and excruciating agony, the older physicians of the place giving up the case as hopeless, a young man, Dr. George J. Ross, undertook to save the boy's life by skin grafting. Over two thousand grafts were used, the boy's mother, the family coachman, and many neighbors and friends contributing thereto. The process was begun in April, 1879, and though the work is not yet complete, the legs are nearly restored to their natural functions. The boy is still weak, but can walk a short distance without a crutch. The grafts are said to grow fastest in the spring months.

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.*

Best American Shot Gun made is the "Colts." Far superior to any English guns for the same price. For description, see SCI. AMERICAN of May 29. Send for circular to Hodgkins & Haigh, Dealers in General Sporting Goods, 300 Broadway, New York.

Lubricene, Gear Grease, Cylinder and Machinery Oils. R. J. Chard, 6 Burling Slip, New York.

Wilson's Business Directory, second edition, and Wilson's Co-partnership Directory for 1880-81, are now ready. Price, $3 each. All orders addressed to the Trow City Directory Company, No. 11 University Place, New York, promptly attended to.

The Oriental Hotel, the largest of all the immense hotels at Manhattan Beach, the Pequot House, New London, Conn., the Old Orchard Beach Hotel, Maine, are now being painted with H. W. Johns' Asbestos Liquid Paints. H. W. Johns M'f'g Co., 87 Maiden Lane, New York, are the sole manufacturers of these paints, which are rapidly superseding all others for large and elegant structures, and for the better classes of dwellings everywhere.

$400 Vertical & Horizontal Engines, 30 H.P. See p. 349.

$5 to $20. A County Right. A Clothes Line Fastener. Sample by mail, 20 cents. J. A. Worley, Cleveland, O.

Free-stone Quarrying Machinery wanted. Circulars, etc., to Box 2606, P. O., Toronto, Ontario.

Oil Cups, $1.50 per dozen. Liberal discount per gross. Send ten 3c. stamps for two samples. James D. Foot, 78 Chambers St., New York.

Improved Solid Emery Wheels and Machinery, Automatic Knife Grinders, Portable Chuck Jaws. *Important*, that users should have prices of these first class goods. American Twist Drill Co., Meredithville, N. H.

Silhouette.—I want a Silhouette Instrument. Address Geo. C. Henning, Washington. D. C.

Suction Fans or Blowers, $10 to $30. Send for circular. R. K. Teller, Unadilla, N. Y.

When you can't get the particular pen of Esterbrook's that you want, write to The Esterbrook Steel Pen Company, 26 John St., New York, for it.

Asbestos Board, Packing, Gaskets, Fibers, Asbestos Materials for Steam & Building Purposes. Boiler & Pipe Covering. Asbestos Pat. Fiber Co., limited, 194 B'way, N.Y.

Information and Recipes on Industrial Processes.—Fruit Drying and Preserving. Inks and Dyes. Ice Making. Cements. Blacking. Waterproofing. Fireproofing. Paints and Lacquers. Preparing Textile Materials. Cleansing and Bleaching. Vinegar and Wine Making. Sugar Making. Tempering and Hardening etc., etc. Park Benjamin's Expert Office, 49 and 50 Astor House, N. Y.

Air Compressors, Blowing Engines, Steam Pumping Machinery, Hydraulic Presses. Philadelphia Hydraulic Works, Philadelphia, Pa.

Geared Power Press, cost $450, for $200. York & S. Clev. O.

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

Power, Foot, & Hand Presses for Metal Workers. Moderate prices. Peerless Punch & Shear Co., 52 Dey St., N.Y.

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

Corrugated Traction Tire for Portable Engines, etc. Sole manufacturers, H. Lloyd, Son & Co., Pittsburg, Pa.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

For Middlings, Mill and Mill Furnishing, see adv. p. 348.

Collection of Ornaments.—A book containing over 1,000 different designs, such as crests, coats of arms, vignettes, scrolls, corners, borders, etc., sent on receipt of $2. Palm & Fechteler, 403 Broadway, New York city.

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

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

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

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

Steel Figures, $1; Letters, $3 a set. York & S., Clev., O.

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

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

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

For Patent Shapers and Planers, see ills. adv. p. 316.

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

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

Bradley's cushioned helve hammers. See illus. ad. p. 334.

Electrical Indicators for giving signal notice of extremes of pressure or temperature. Costs only $20. Attached to any instrument. T. Shaw, 915 Ridge Ave. Phila.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 300.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 317.

Forsaith & Co., Manchester, N. H., & 207 Centre St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 316.

For Separators, Farm & Vertical Engines, see adv. p. 316.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 317.

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

For Alcott's Improved Turbine, see adv. p. 284.

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

For Standard Turbine, see last or next number.

For Power Paper, Lard, Cider Presses, see adv. p. 348.

Burgess' Non-conductor for Heated Surfaces; easily applied, efficient, and inexpensive. Applicable to plain or curved surfaces, pipes, elbows, and valves. See p. 284.

Eagle Anvils, 10 cents per pound. Fully warranted.

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

Wanted—The address of 40,000 Sawyers and Lumbermen for a copy of Emerson's Hand Book of Saws. New edition 1880. Over 100 illustrations and pages of valuable information. Emerson, Smith & Co., Beaver Falls, Pa.

Eclipse Portable Engine. See illustrated adv., p. 349.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 349.

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

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

For Wood-Working Machinery, see illus. adv. p. 348.

Telephones.—Inventors of Improvements in Telephones and Telephonic Apparatus are requested to communicate with the Scottish Telephonic Exchange, Limited, 34 St. Andrew Square, Edinburgh, Scotland. J. G. Lorrain, General Manager.

Pat. Steam Hoisting Mach'y. See illus. adv., p. 348.

Milling, Profiling, Cam Cutting, Revolving Head Screw Machines. Pratt & Whitney Co., Hartford, Conn.

C. J. Pitt & Co., Show Case Manufacturers, 226 Canal St., New York. Orders promptly attended to. Send for illustrated catalogue with prices.

4 to 40 H. P. Steam Engines. See adv. p. 348.

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

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

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

Elevators.—Stokes & Parrish, Phila., Pa. See p. 348.

Mackenzie Cupola and Blower. The very best apparatus for melting iron; and with water bosh for smelting lead, silver, or copper ores. Send for pamphlet. Smith & Sayre Manuf. Co., 21 Courtlandt St., New York.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 365. Totten & Co., Pittsburg.

Penfield (Pulley) Block Works. See illus. adv. p. 348

NEW BOOKS AND PUBLICATIONS

THE SUGAR BEET. An illustrated quarterly paper, devoted to the cultivation and utilization of the Sugar Beet. Philadelphia: Henry Carey Baird & Co. Price 50 cents per annum.

It is seldom that a new industry, or even an old and well established industry, is favored with so handsome and able an exponent. The Sugar Beet would seem to be indispensable to every one interested in the raising of beets and the production of sugar from them. The editors say that the curse of American beet sugar making is amateurism and experimenting. Better stick to the successful plans and processes of the French and German leaders in this industry.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) W. O. D. asks: 1. Will a pump working water from a heater into a boiler work in air if the supply is not sufficient to keep the pipes full? A. Yes. 2. Will the air do any harm? A. No, it would rather be an advantage.

(2) A. P. W. asks: 1. Would a cylinder, 3 inches diameter, 4½ inches stroke, run a side wheel boat, 12 feet long, 3 feet wide, working direct from the shaft (oscillating cylinder)? A. Yes, probably at a speed of about four miles per hour. 2. Can you tell me where to obtain the mercury flasks used in making the boiler described in SUPPLEMENT, No. 182? A. Any druggist can obtain mercury flasks for you. You may also get them from manufacturers of vermilion.

(3) J. W. C. writes: I have a battery of 32 cells (about one pint each) composed of carbon and zinc, but I cannot find the proper solution to make it work properly. I have just amalgamated the zinc very carefully, and used a solution made of the following: 1 gallon sulphuric acid, 3 gallons water, then dissolved 6 lb. of bichromate of potash in 2 gallons of boiling water, mixing the whole, and using when cold. I find that I get a very powerful spark, but not the burning heat that is required when one takes hold of handles attached to the two poles of the battery. And also, I find that the amalgamating substance has entirely disappeared. The battery, I understand, is a modification of Storms' element. Please tell me whether you think I have used the proper solution or not. The zinc and carbon are suspended in the cell about three-eighths of an inch apart. A. Your solution contains too much sulphuric acid. The following will be better: Dissolve 2 lb. bichromate of potash in 10 quarts of hot water. When cold add slowly and carefully 1½ lb. of sulphuric acid. By using an interrupter you will be likely to feel the effects of the current from your 32 cells. By employing a small induction coil having an interrupter, in connection with a single cell of your battery, you will get a secondary current that can be felt without any difficulty.

(4) H. C. B. writes: 1. I have constructed a pantograph as described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158, page 2506. I have no trouble in copying any drawing, either enlarged or reduced in size, but I have not been able to make a drawing the same size as the original. Will you have the kindness to tell me how to arrange the tracing point and pencil, so as that I can make a copy of the same dimensions as the original? A. Change places with the pivot and tracing point; that is, put the tracing point in the center of the middle bar. The tracing will be inverted. 2. Can you give me a good receipt for ebonizing wood? I would like the one which is now used by furniture makers. A See p. 19 (18), Vol. 40, SCIENTIFIC AMERICAN. 3. What is the best wood to use for small articles, such as hanging cabinets, which are to be ebonized? A. Mahogany, holly, maple, black walnut, in fact almost any wood may be ebonized.

(5) T. M. asks: 1. What is the velocity of steam under some certain pressure? A. Velocity flowing into the atmosphere at 30 lb. pressure above atmosphere, 1,400 feet per second; 50 lb. pressure above atmosphere, 1,429 feet per second; 70 lb. pressure above atmosphere, 1,444 feet per second. 2. Is there any difference in the velocity of steam through different sized pipes? A. No difference except that due to difference of friction in pipes.

(6) H. D. writes: I have a side wheel steamboat here that is geared up; the wheels are 10 feet diameter, buckets 11x30 inches, dip 14 inches; the engine is geared up to make 4½ revolutions to the wheel's one; the large gear wheel has wood teeth. There seems to be a good deal of back lash and noise. I want to stop it, or help it, if raising up the buckets would make any difference. A. Raising the buckets would relieve but not remedy the difficulty. Put a fly wheel on the crank shaft of the engines, or fit the gearing closer.

(7) E. G. S. asks how to test his steam boiler by hydraulic pressure. A. Fill the boiler entirely full of water by any convenient means, then with a force pump increase the pressure to the desired degree. Use a pressure gauge on the boiler to indicate the pressure produced within the boiler. Place an air cock or valve in the highest part of the boiler, and be sure all the air has been expelled before you close it.

(8) A. K. E. writes: 1. I desire to make an induction coil 8 inches long with ¾ inch iron wire; core in center wound round with about 7 layers of No. 18 cotton covered wire; and have a large spool to slide over this wound up with about 18 layers of No. 36 silk covered wire, and use a single Grenet battery such as is used in all electrical medical machines, and would like to know how many persons could be charged with this size of coil and receive a reasonable charge. A. Two or three layers of No. 16 wire would be better for the primary than seven layers of No. 18. Such a coil would be altogether too large for giving shocks. It would, if well made, give shocks that might prove dangerous. You will find full instructions for making induction coils in SUPPLEMENT 160. 2. How could I make a shocking attachment for same? A. The arrangement of the interrupter is shown in the article referred to. 3. What acids are used for making brass black and how used? A. See p. 371, Vol. 40, SCIENTIFIC AMERICAN. 4. I have often heard that 9 or 10 bells (electric) can be made to ring on the same circuit. Is it true, and if so, how are the connections made? A. Use single stroke bells.

(9) A. S. P. asks for M. Pellet's method of producing blue lines on white by photo process. A. Chemically pure ferricyanide of potassium, 1 oz.; citric acid, 20 grains; dissolve in 5 ounces soft water. Immerse the paper in this, dry in the dark, expose under a negative, develop in a dilute aqueous solution of ferric chloride, wash in plenty of water.

(10) J. T. W. writes: 1. I have just read your article in the SCIENTIFIC AMERICAN SUPPLEMENT descriptive of the steam yacht Flirt. As you kindly consent to supply further information upon application, I make bold to submit a few queries. The text says: "The furnace is cylindrical, 11 inches diameter, and 16 inches long. The upper end of grate is about 11 inches from top of furnace." There must be an error, since that would bring the grate to the top of furnace. A. This is evidently an error or misprint, as the drawings show. 2. Does the stuffing box of the pump serve for guides, or are there guides besides that? A. The stuffing box is the guide. 3. About how much fuel and what kind does she consume? A. With sharp draught it might burn 25 to 35 lb. per hour less with the ordinary draught. 4. The grate surface, 1 square foot, and heating surface 34 feet, seem small for the quantity of steam consumed. Are these the correct figures? A. We would advise you to increase the boiler 25 per cent. 5. What would the complete machinery (boiler, engine, shaft, propeller, and connections) such as that of the Flirt cost (leaving out the nickel plating)? For how much could the machinery of the Flirt be purchased, if at all? How much would an engine not plated, the size of the Flirt's, cost, not including the shaft, propeller, and boiler? A. Complete about $280, without shaft and propeller about $240.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

May 4, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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

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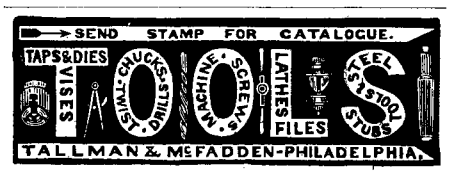

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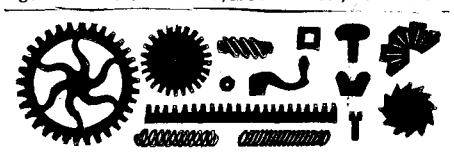

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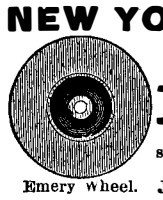

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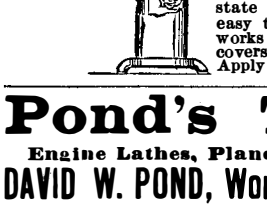

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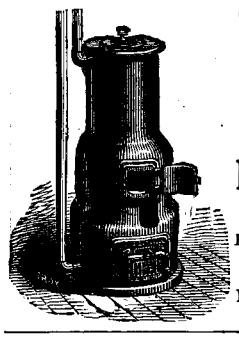

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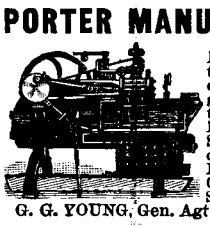

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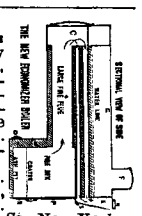

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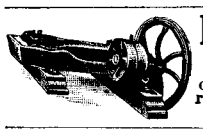

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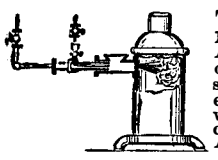

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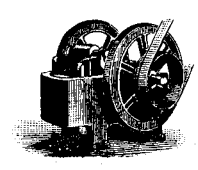

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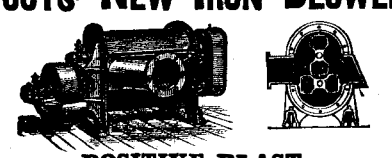

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