

THE WORLD'S COLUMBIAN EXPOSITION-AN ENTRANCE TO THE PALACE OF AGRICULTURE.-[See page 138.]

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PROGRESS OF BAILWAYS IN THE UNITED STATES. From Poor's Manual for 1893 we learn that the total length of track existing at the close of 1892 was 175,223 miles, for which the aggregate liabilities of the various companies was, in round numbers, eleven thousand and eighty-nine millions of dollars (\$11,089,000,000). The aggregate amount paid for operating expenses for 1892 was eight hundred and forty-six millions six hundred and thirty-three thousand dollars (\$846.633.000). The total traffic receipts were one thousand two hundred and five millions of dollars (\$1,205,272,023), and the net earnings \$358,638,520. The number of passengers carried was 575,769,678, and of freight 749,331,860 tons.

Out of this nearly two hundred and thirty-three millions of dollars were paid for interest, and a little over eighty-three millions went for dividends.

The aggregate rolling stock at the close of 1892 was as follows: Number of locomotives, 35,754; passenger cars, 26,321; baggage cars, 7,900; freight cars, 1,168,867.

ARMOUR INSTITUTE.

Armour Institute, the great technical school of Chicago, will open its doors on September 14 to 400 students, who have been enrolled by the president, Dr. Frank W. Gunsalus. The equipment in mechanical and electrical engineering is very fine, and some idea of the shops may be obtained when it is stated that a 150 horse power engine can be built in the machine shop. The equipment of electrical testing instruments is very remarkable, nearly all of them being purchased from the exhibits of the Fair, the buying being done medals. The number will be limited and each will be by Mr. Stine, who is a juror of awards in the electrical department. The four years' course in electrical engineering at the institute will be very thorough, and will into souvenir canes, etc. Built and equipped at a aim to prepare students to hold responsible positions in electrical companies, for the commercial side of the science is to be treated in a more practical manner than in the other institutions which have courses in electrical engineering. The Armour Institute's electrical department is divided into four laboratories. The main laboratory will be fitted up with fifteen dynamos and motors as well as all the leading makes of transformers, and regular station voltmeters, ammeters, meters, etc. The second section will be known as the galvanometer laboratory and will contain much of the high class apparatus purchased at the Fair. The institute will offer to electric light stations and colleges a testing bureau for standardizing resistances. The third laboratory is on the ground floor and all the apparatus will be mounted on stone piers to prevent vibration. The fourth laboratory will be devoted to the measurement of the candle power of lamps and will be fitted with the best photometric apparatus obtainable. The Armour Institute has every chance of having a brilliant future.

COLOR PHOTOGRAPHY.

The subject of color photography has occupied the minds of investigators from the earliest days of the art. Even Daguerre and Niepce in their work with the mercurialized film on polished silver gave an approach to its latest development, the Lippman process. We have given notices of this assumed triumph of photography-but which has been virtually relegated to its proper place, the science of physics. Lippman's process simply consists in the production of a film, by photographic printing or exposure, whose thickness varies with the color of the light which has fallen on it. This film, by the interference of light, produces the well known colors of thin films, the same that are seen in the soap bubble. Lippman has succeeded to a limited extent in producing an image of the spectrum. This is about as far as color photography has yet gone.

The low actinism of colors belonging to the red end of the spectrum necessitates a very long exposure. This objection might be overcome. But the whole development up to date is one of great interest from the physical standpoint, while it is of but little value from the photographic standpoint. It indicates in the art sense a very short step in advance. The production of a portrait or landscape by the Lippman process is yet an achievement to be metal is wetted by means of a paint brush or sponge for. Its accomplishment is very problematical. It is of interest to note the status of color photography, as an exaggerated report of the Lippman processes has been extensively circalated. When it is realized that the daguerreotype itself presents a strong analogy to Lippman's work, it will be evident that we should not be too sanguine of our hopes of an early realization of color photography. Intelligence of the Horse. Recently a New Jersey farmer, while passing along the street in New York, heard the well known "neigh" of his good old horse, which had been stolen from his barn last winter, six months having elapsed. The farmer turned, and there, sure enough, was the affectionate old animal, hitched to a butcher's wagon. The horse had recognized his master, and gave him the ac- a mixture of gold or silver cyanate with carbonate of customed signal. The farmer recovered his property and the thief was arrested.

The Pioneer Steamer of the Pacific Ocean,

Nearly threescore years have passed since the Hudson's Bay Company's steamer Beaver floated down the Thames. The Beaver was the first European steamer to round Cape Horn and was the pioneer steamer of the Pacific Ocean, the passage from London to Astoria, Oregon, consuming 163 days. The Beaver was 101 feet long, 20 feet broad and the depth was 11½ feet, the tonnage being 109¾. The boiler and the two side lever engines, of 35 horse power each, were made by Boulton & Watt at their Birmingham works. The engines cost £4,500 and weighed 52 tons. The vessel was built in the most substantial manner of live oak and greenheart, the timbers being held together by copper bolts. The Beaver was used as a fur trading vessel by the company, and on one of these trips coal was discovered on Vancouver Island. In 1849, during the gold excitement, many miners took passage on this little black steamer. In steaming out of Burrard Inlet in the fall of 1888 she struck a rock, and, wrapped in a sheet of troubled waters, with head resting on a huge barnacle-clad bowlder, the Pacific pioneer steamer Beaver passed into history. Unsuccessful efforts were made to float the Beaver and she remained on the rocks nearly four years. An attempt was made to take the Beaver to the World's Fair, but was abandoned, owing to her damaged condition and the cost of transportation. Messrs. McCain & Menzies, well known contractors of Vancouver, B. C., purchased the vessel and obtained 975 pounds of old brass and copper, which will be made up into souvenir stamped with a number, to prevent any possibility of counterfeiting. The timber has also been worked up period when steam navigation was in its infancy, it is scarcely a wonder that there should be a call for souvenirs of the first steam vessel to plow the broad Pacific.



The mining of this valuable metal is chiefly in Russia, and the following information is given by Mr. Geo. F. Kunz in the report of the mineral industries in the United States at the eleventh census. The two deposits in the Ural Mountains are the Goro-Blagodat or Isa region, in the basin of the river Isa, and the Nisjne Tagilsk or Demidoff district, on the Martin River. The former is under government control, while the latter is worked by private enterprise. In the latter field there were three large wasning plants and a fourth is being erected. Besides these, the peasants have many small workings, for which they pay two-thirds of the produce as a royalty. The deposits are placers composed of serpentine bowlders, mixed with chrome iron ore, the platinum-bearing sand forming a layer of 6 inches to 10 inches in thickness on the bed rock, at a depth of 30 to 40 feet. The sand is mined by driving levels from a shaft, and is only worked in the winter, when the washing plants have to stand idle, as the water is all frozen. For washing the material, it is hauled in cartloads of about 1,500 pounds and emptied into a revolving screen. The small stuff is stirred up in water by two women and the heavier materials settle in riffles in the troughs. Both the tailings and the heavy sand are rewashed. In two shifts of 12 hourseach shift, however, including 4 hours' rest-about 640 tons of sand are washed, yielding 2.7 pounds of platinum in each machine. The average daily yield of the whole of this district is about 9 pounds, worth about $\pounds 2$ per ounce, and the yearly production is about 1,620 pounds.

No details of the cost of mining are available, but the cost of labor for washing in the three plants for the 180 days during which the work could be done is about £7,000 Wages are not extravagantly high, as a driver gets 13 rubles a day for himself, horse, and cart, and he has to haul 60 loads daily. For each machine, 40 drivers, besides 16 workmen at 70 kopeks each and 4 women at 40 kopeks each, are employed.

Metal Surfaced Paper.

A well polished yellow brass or nickeled sheet of

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with a solution of higher alkaline sulphide or hydrosulphide, for instance, a solution containing 5 parts by weight of potassium trisulphide or hydrosulphide to 100 parts of water, and in addition, 1 per cent of spirit which is added to remove any greasy particles which may be present. The plate is then immersed for a short time in a neutral solution of copper sulphate (1 to 5) and transferred to an acid copper bath in which copper is deposited on it. It is immersed in a zinc bath in which it receives a deposit of that metal, and is subsequently treated with a solution of hydro-sulphate of ammonia, mercaptan, or similar compound or allylesulphide previous to pasting the paper thereon or causing the paper to adhere by paste in which the said substances are mixed. The metallic surface of the paper so produced is rubbed over, when dry, with potash in order to produce a real gold or silver paper.— C. Endruiveit, Berlin, Germany.



In the Transportation building the exhibits of bicycles occupy a larger part of one of the galleries, and include every kind of bicycle as well as their accessories. The array of wheels is very fine. All the leading manufacturers are represented.

An exhibit of much interest is the tent, camping outfit, and palanquin used by Mrs. French-Sheldon during her recent travels in Africa. The palanquin is made of cane and bamboo, very light, and covered with waterproof material.

Another novel vehicle is a replica of an ancient chariot. The original was found in a tomb at Thebes, Egypt, and is believed to be a Scythian racing chariot. It is now in the Royal Egyptian Museum, Florence, Italy.

South American methods of transportation are well illustrated by life-sized reproductions of the animals used, as well as models of the men and women. These include a Colombian rider's outfit—a man mounted on a fine steed with gorgeous equipments; an "arriero," or mule driver, from Bogota; a pack mule with panniers; a burro with pack saddle; a "lechero," or milk woman, mounted on a mule; a saddled llama; a male cargadore or pack carrier, also a female cargadore; a cargadore or pack carrier, with "silla" or chair on his shown treated by sulphuric acid, then chilled till a pany. back for carrying passengers; and a sedan chair of the style used by ladies in Bogota.

Japan exhibits several models of engineering works, one of which is of a cantilever bridge built in 1662, or 231 years ago. This bridge has a span of 161 feet. Another model represents the Kintai bridge of five spans. Other models show a pontoon bridge on the Ogaki Canal sluice, built in 1691 and still used.

In the English section there are exhibited a thrash ing engine made by Trevithick in 1812, Earl Durham's bicycle "Dandy Horse," bicycle of fifty years ago, and a model of the Forth bridge on a scale of one inch to forty reet.

Methods and means of transportation in Jerusalem and Syria are illustrated by the exhibit of the United States Consul Merrill. The type of boat now used on the Sea of Galilee is shown, and is said to be the same style of boat used in the time of Christ. Other articles are a palanquin from Jerusalem, a box in which women are carried in wedding processions, a bag for carrying children, a chair for teaching babies to walk, leather bottles for wine, a water jar to be carried on the head, etc.

Steamship traveling is finely illustrated in the French section. Paintings are presented which illustrate the harbor of New York, port of Algiers, port of Marseilles, passengers embarking at Havre for New York, the smoking room on one of the steamers of the Compagnie Generale Transatlantique, interior view of the workshops where these steamers are built, showing the work of constructing a steamer, the engine, propeller and shaft lying about; a dining saloon, where passengers are at the tables.

Germany shows many models of vessels, also models of engineering works, a section of the North Canal at Kiel, and railway engineering undertakings. A model is shown of a boat that was unearthed in the marshes of the Baltic Sea, and which is believed to be about 1.500 years old.

In the navigation section of this country are large minous, weighs 50,250 pounds and is from the Roslyn models in relief of the works of the Union Iron Works mines in Kititas County. The Zulus, the South American Indians, the Turks, at San Francisco and of the Newport News Shipbuild-The main part of the building is devoted largely to Dahomans, South Sea Islanders, and East Indians, took part in the aquatic contest before the 25,000 specing Company, Virginia. The several government war exhibits of the resources of the soil. The center is occutators. The distance was 1,550 feet, and Adolphus, vessels that have been constructed at the Union Iron pied by a block some thirty-five feet square, which rep-Works are represented by miniature vessels floating resents a farm. At one side is a house and other farm a native of British Guiana, received the \$5 gold just off the docks of these works. The model of the buildings and the rest of the area is divided into piece. Nicaragua Canal is 30 feet long. Water is used to The Rajah of Kapurthala gave the visitors to the grain and other fields, with horses, farming machinery and men in miniature, going through the operations of Fair on August 15 a glimpse of royal splendor. The represent the canal and its connections. A model of the Mississippi River raft boat Juniata is shown, towplowing and harvesting. Rajah was invited by the director-general to review a ing an immense raft of logs, also a relief map of the The Maryland building contains exhibits which give procession which was arranged in his honor. The State of New York, showing the canal systems and an excellent idea of the oyster industry. Models of Rajah appeared in a military costume, over which was boats. a loose robe of silk ornamented with gold and glitteroyster boats are shown and a model of an oyster pack-The pavilion of the Standard Oil Company is a ing establishment. ing with jewels. His attendants bore the insignia of white and gold colonnade in Italian Renaissance style, The original commission which made Christopher rank which obtains in India; over his head was a in which Ionic columns alternate with tall lamps and Columbus an admiral is now exhibited in a separate gorgeous silk umbrella, and a servant cooled him with vases of handsome oils. In the center is a lighthouse. glass case on the altar in the chapel of the convent of a fan of peacock feathers blazing with all the colors A collection of all the varieties of crude petroleum found La Rabida. A United States soldier guards this priceof the rainbow. The line of the aquatic procession in the United States is presented. There are about less document. An inscription says : "This is the bewas through the ponds to the lagoon and the MacMon-200 of these specimens, and they are graded by color nies fountain. The barge of the Rajah was decorated ginning of American history." from black to pale straw. These oils are in the origi-A plaster reproduction of the fishing house which with rugs and shawls. A red carpet protected the Ranal condition in which they came from the ground. Izaak Walton built on the banks of the River Dove, in jah's feet from the cruel gravel when he walked to the Some of the oils, which are black and thick like tar. England, has been erected among the trees on the reviewing stand. He was seated on a throne which was are ten times more valuable than the more attractive shore of the north lagoon. "Piscatoribus sacrum" is erected on the grand stand. The Rajah enjoyed the amber oils. Black oils are obtained from nearly the inscription over the doorway, and this is followed procession immensely, and the people all thoroughly every State where petroleum is found-New York, by the date 1674. enjoyed seeing the Indian potentate in all his glory.

Pennsylvania, Indiana, Ohio, Kentucky, Illinois, Kansas, Texas, Colorado, Wyoming, New Mexico and California. Blackest and thickest of all is the oil from designed to hold the bottles, which are held in position Louisiana. Among these crude oils is a most unique collection of the sands from which the oils are derived. Hanging in the windows are a large number of transparent photographs showing the processes of obtaining and handling petroleum. One of these transparencies, 50×80 inches in size, represents a relief map of the United States, on which is marked every locality in which petroleum has been found and the color of the oil. Along the front of the exhibit the geology of the oil regions is represented by a profile section from Olean, N. Y., westward through Pennsylvania and Ohio to Fort Wayne, Ind. Here miniature derricks and tanks show where the oil wells are located. Tiny threads of glass filled with petroleum indicate the depth of wells whose lower bobbin carries over 1,000 yards of thread. and grade of oil produced.

How oils and other products are prepared is shown in a miniature working refinery of glass.

which radiate from a huge bottle of crude oil in receipts of the concession, the amount involved being the order in which they are obtained. This central \$6,130. bottle holds one barrel-which is the quantity delivered by the pipes lines of the United States during every second of time throughout the year. The primary divisions are naphtha, burning oils and residuum or petroleum tar. One case displays the naphtha derivatives. In a larger case all the oils are collected which boil at higher temperatures than naphtha. All these distillates require treatment with sulphuric acid before they yield the merchantable product. A third case shows a jar of residuum; other specimens show how it is redistilled, yielding a light oil for fuel and a heavier distillate for lubricating oils. There is also a piece of "tar still coke," which is the final resiquantity of paraffine wax is crystallized out. This is pressed out and pressed again, yielding successively soft paraffine, "chewing gum stock," or hard paraffine wax for candles. A mound of pure white paraffine is the starting point for candles. Other cases show how the black unattractive coke is transformed into carbons for electric lights, battery cells and other uses, and also the uses for paraffine wax, the latest use being lemonade straws. These are simply pieces of paper rolled up and coated with this wax.

The exhibit of the evolution of the oil lamp begins with a large pebble hollowed on one side, filled with oil and supplied with a wick. This is used by the Esquimaux. The next queer lamp is a shell laid on a three-pronged stick with a bit of twisted bark for a wick. This is from Japan. Then there are East India lamps of clay; a Bedouin Arab glass lamp; old Roman terra cotta and bronze lamps; Jewish hanging lamps; Flemish lamps, a horological lamp, Moorish lamps, and so on down to latest improved modern lamps.

The State of Washington makes a creditable exhibit in its State building. In front of the building is a mast, one straight piece of fir, three and one-half feet in diameter at the base and two hundred and fifteen feet high. The south wing of the building and the north wing each rest on one piece of timber three feet by three and a half feet in size and one hundred and twenty-five feet long. Each of these pieces was cut from a yellow fir tree seven feet eleven inches in dia- 350. meter and three hundred and forty feet high. A lifesized full length picture of Washington has a frame seventy-seven different kinds of wood found in this State.

The display of coal, gold and silver ores is large. One handled, is twenty-six feet long, five feet four inches high and five feet eight inches wide. It is semi-bitu-

An apparatus for sterilizing milk is exhibited in the Agricultural building. It consists of a steam chamber by springs. Steam is turned into the chamber, and, as soon as the air is expelled from the bottles by the heat. a vent in the chamber is closed and the milk is subjected to the action of the steam for thirty minutes.

The wheelmen have had their day at the Exposition. and the display last week closed with a procession of over 1,000 bicycles. Many wheels were elaborately decorated and illuminated during the evening.

The Associated American Exhibitors of the World's Columbian Exposition have elected to honorary membership the "Queen of Inventors," Mrs. Harriet Ruth Tracy, of New York, for her notable invention of a rotary shuttle, lock and chain-stitch sewing machine, Several other inventions by this lady are also shown.

The Algerian village and the theater are in the hands of the sheriff. The seizure was made on a suit The manufactured products are arranged on stands of the Columbian Exposition for a percentage on the

> The Swedish commissioners on behalf of the Swedish government have sent a letter to the Foreign Office tendering their national building to the South Park commissioners to be held in trust for the people of Chicago.

The attendants who push the so-called "gospel chairs" struck on August 15, owing to a 25 per cent reduction in their salary of \$30 a month. Many of them took off their pretty uniforms, entered the grounds and offered to push visitors for 35 cents an hour. The company got 40 cents for the use of their chairs, so the visitors paid the same as if the regular force of chair pushers was propelling the chairs, but due left in the still. The "heavy distillate" is next the 35 cents went to the pusher and not the com-

> Electrical thief catchers are in operation in some of the sections. Their operation is as follows: Ross & Co., of London, have an exhibit in the British section of the Manufactures building. For some time they have been missing valuable lenses. Finally the case reached such proportions that it was decided to lay a trap for the thief.

Several lenses were temptingly displayed within seemingly easy reach, but underneath each lay one end of an electric wire, to the other end of which was attached a bell. The mechanism was so arranged that, as soon as one of these lenses was touched, an electric bell would ring out like a telephone. The guards in that section of the gallery were told of the trap and instructed what action to take when the alarm sounded.

Just before the Manufactures building was closed Sunday night an elderly man, eminently respectable in appearance and neatly dressed, passed along the aisle and soon the gong was heard. The guards rushed in and there on the floor lay the lenses whose theft the old gentleman had undertaken. He was arrested.

The total paid attendance to August 15 is 7,736,706. Rand & McNally's "A Week at the Fair" gives, under an article signed by D. H. Burnham, director of works, the estimated attendance at the Chicago Fair as 35,000,000. The attendance at the Centennial was 9,910,996; at Paris, 1878, 16,032,725; Paris, 1889, 28,149,-

Owing to the reductions made by the Western lines, the rural population is now making the trip in large made entirely of small pieces of wood, inlaid with numbers. The increased interest in the agricultural exhibits shows that a large portion of the attendance is made up of farmers and their families.

An international swimming match was held in the piece of coal, believed to be the largest lump ever lagoon on August 11. Captain Concas, of the Spanish caravels, Paul B. Du Chaillu, and Magnus Andersen, of the Viking ship, were the judges appointed. The heathen from the Midway enjoyed the affair hugely.

A KINDERGARTEN TEACHING DEVICE. An exceedingly simple educational device, adapted for use in the kindergarten method of instruction, is shown in the illustration, and has been patented by Mr. Jose Gallegos, of Ocos, Guatemala, C. A. A light cylin-



GALLEGOS' DEVICE TO TEACH ARITHMETIC.

drical case, with a glass front, is divided by radial ribs into numerous compartments open at their inner ends, where there is a central recess, in which is placed a circular pocket. This pocket is revoluble by means of a knob or handle at the back of the case, as shown in the sectional view, Fig. 2, and has in one side a slot to permit the balls to pass through, one by one, into the several compartments between the ribs. By permitting one or more balls to pass through the slot, as of the same name. The azure blue of the Mediter

multiply as the balls are distributed, counting being taught as the balls are dropped one by one through the slot. The device is also designed to serve to some extent to amuse small pupils.

A MACHINE FOR FINISHING SAWS.

A new method of finishing saws. with a machine adapted to facilitate the work, form the subject of a patent recently issued to Mr. Thomas I. St. Louis, of Cadott. Wis. It is designed by this means to prevent the cracking of the saws by removing their sharp edges, destroying the cross creases, and breaking up and removing the case-hardening made by the emery wheel in grinding the teeth. The saw is held upon an anvil on the front side of the frame of the machine, in such a position that each tooth may be engaged by a die in the shape of a pin projecting from a crank disk, as shown in the illustration, the pin-shaped die having a groove in its working edge which straddles the top edge of the saw tooth. The

main driving shaft, the shaft frame being yieldingly held on the main frame of the machine by a spring connecting it at one end with the base of the machine. A laterally sliding pinion and clutch on the main driving shaft afford the means of causing the rotation of the crank shaft as desired on moving a shifting lever. With the saw held in position, as shown, the rotation of the crank disk moves the die in contact with the top edge of the saw tooth, the die rolling off thereon and finally engaging and roll-



ing in the throat, at the same time pushing the saw lin and Vienna. All these establishments are named forward as the rotation of the disk continues, the on the border of the showcases. yielding frame swinging upward according to the downward movement of the die. The distance of the die from the center of the crank disk is such that at every revolution the saw blade will be moved forward a sufficient distance to cause the die to engage the next tooth on the succeeding revolution, the die in each case exerting a rolling pressure along the top edges of the tooth, in the base of the throat, and up on the forward edge of the succeeding tooth.

A GOLD AND SILVER REFINING ESTABLISHMENT.

An exhibit in the German department of the Mining building highly pleasing to the eye, through its refined elegance, is the pavilion of the Deutsche Gold u. Silber Scheide-Anstalt, vorm. Roessler (the German Gold and Silver Refinery, late Roessler), Frankfort-on-the-Main, located on the main aisle dividing the building from east to west. The large showcase is entirely constructed of walnut with gold ornamentations, the chemicals, etc., manufactured by the concern and its branches being shown to the right and left in large glass cases, while the background is formed by a plastic and pictorial representation of the different establishments.

Well executed models of the works and the central office in Frankfort-on-the-Main and of the desilverizing establishment at Hoboken, near Antwerp, are mounted in the foreground. To the left is seen the Mediterranean port of Mazarron, in the Spanish province of Cartagena, with the silver-lead ore smelters of the Compania Metalurgina de Mazarron, the Spanish branch of the concern. To the right, the painting represents the Bergstrasse in Odenwald, with the quinine factory Auerbach and the ruin of the old castle shown in Fig. 1, the pupil may be taught to add and ranean, with its bright sky overhead, the brilliant col-



A DEVICE TO TEACH SPELLING

This is a cheap and simple device, which may be easily carried in the pocket. It consists of a nall a light frame, flush with the back side of which is in serted a glass, while its top or outer portion has flanged



GALLEGOS' DEVICE TO TEACH SPELLING.

edges adapted to inclose a slide block designed to be moved along over the glass. The device may be applied to words or numbers upon a book or any other surface, so as to cover a portion and expose other portions, dividing the word into syllables and letters, as may be desirable in teaching small children, or exposing successive figures as may be advantageous in teaching the reading of numbers. The improvement has been patented by Mr. Jose Gallegos, Ocos, Guatemala, Central America.

An Adhesive Cement, Equal proportions of gum tragacanth and tapioca

are ground together and heated with water at about 70° Fah., after which there are added about 50 per cent of gum hog and an equal amount of starch, and the whole mixture heated at from 70°-120° Fah. The cement thus produced is said to be superior to any hitherto known for the requirement of silk and cotton manufacturers, calico printers, book binders, hat and boot makers, etc.

AN IMPROVED BALANCED SLIDE VALVE.

The valve shown in the illustration, recently patented by Mr. George S. Neeley, of Pacific, Mo., is of very simple and durable construction, and is designed to reduce the friction to a minimum and utilize the steam to the greatest advantage. Fig. 1 is a sectional view showing the valve in position on a steam chest, Fig. 2 being a plan view. The ports of the valve are moved by the valve stem to alternately connect with the ports at either end of the cylinder, the valve

crank disk is held on a transverse shaft mounted in oring of the southern landscape, and the more somber ports diverging from a common port registering at all a slightly swinging frame, which has its fulcrum on the hues of the Hessian Mountains, all combine to produce times with a port in a plate held loosely on the top of a striking effect and to pelieve the exhibits, otherwise of a strictly commercial character.

The German gold and silver refinery of the company refines about 9,000,000 ounces gold and silver during a year, and its total sales in 1892 amounted to 10,000,000 ounces silver and 200,000 ounces gold. The chemical works of the concern have a large output of nitrate of silver, chloride of gold, cyanide of potassium, metal oxides, and other chemicals for pharmaceutical and industrial uses. Their ceramic department manufactures liquid bright gold and many hundred shades of overglaze and underglaze colors, the total sales of colors and chemicals being more than 14,000,000 marks per year. The year's production of the quinine factory

the valve. On this plate is a hollow piston fitting steam tight in a cylinder in the cover of the steam chest, the upper end of the cylinder being closed by a cover through which extends the steam supply pipe, while on the under side of the cover is a spring pressing on the hollow piston, to hold it in contact with the plate. The area of the piston is about one-fifth more than that of the port in the plate, and, while all the steam passages are very direct, it is designed that, by the interposition of the plate between the hollow piston and the slide valve, the latter will be sufficiently counterbalanced to insure easy running, with the least possible friction.



THE COLUMBIAN EXPOSITION-A GERMAN GOLD AND SILVER REFINERY EXHIBIT.

ST. LOUIS' SAW FINISHING MACHINE.

Auerbach is over 2,000.000 ounces of quinine.

A flat showcase in front of the models contains refined gold in ribbons and grain silver to the value of many thousand dollars. In another case the Roessler & Edelmann's new desilverizing process is demonstrated by a series of products. This patented process, which introduces the aid of aluminum in the old zinc desilverizing process, is for the first time exhibited in any world's exposition. A pamphlet describing fully the process points out as its principal merits the saving of time and material. It is in use in the above named desilverizing works in Hoboken, near Antwerp, where about 67,000,000 pounds of lead, 4,000,000 ounces of silver, and 5.000 ounces of gold are yearly produced.

The Roessler & Hasslacher Chemical Company, an independent New York corporation, with works in Perth Amboy, N. J., whose products were described in a recent issue, is the American branch of the Frankfort concern. Bernhard Roessler & Co. and Louis Rocesler & Co. are the branches of the concern in Ber-



NEELEY'S BALANCED SLIDE VALVE.

The Malleability of Iron.

The mill manager of Messrs. W. Hallam & Co., of the Upper Forest Tin Works, near Swansea, succeeded in making a sheet of the finest appearance and thinness that has ever yet been seen by mortal eye. The iron from which the sheet was rolled was made on the premises. It was worked in a finery with charcoal and the usual blast; afterward taken to the hammer, to be formed into a r gular flat bottom; from thence conveyed to the balling furnace, and when sufficiently heated taken up to the rolls, lengthened, and cut by shears into proper lengths, piled up, and transferred to the balling furnace again; when heated it was passed through the rolls, back again into the balling furnace, and when duly brought to the proper pitch was taken to the rolls, and made into a thoroughly good bar.

It was then taken to the tin mills and rolled till it was supposed to be thinner than 23 grains, afterward passed through the cold rolls to give it the necessary polish, and it stands on record as the thinnest sheet of | for a sleeve, through which passes the boring spindle,

inches, or 55 inches in surface, and weight but 20 grains, which being brought to the standard of $8 \times 5\frac{1}{2}$ inches, or 44 surface inches, is but 16 grains, or 30 per cent less than any previous effort, and required at least 4,800 to make one inch in thickness.-Paper Maker's Journal, England.

Great Circle Sailing.

The advantages to be derived from sailing upon the arc of a great circle are described in the North Atlantic Pilot Chart for July, issued by the United States Hydrographic Department, as follows:

It is too common a practice among mariners to accept the straight line of the Mercator chart, i. e., the rhumb line, as a direct route. The rhumb line, in itself, offers the single advantage of a true course (technically, so called) which is constant: but this is more an imaginary than a real advantage, because the true course must frequently be corrected for the magnetic variation, and the original rhumb is never strictly maintained over long distances.

Although the chart serves to direct a vessel's course and to mark her progress, the vessel herself actually sails upon the surface of the sphere. When her course is shaped by the rhumb, she approaches her port in a roundabout way, in reality never heading for her port until it is in sight. The rhumb line of the sphere is a spiral, which has the property of making a constant angle with the meridians. Upon the Mercator chart it projects as a straight line, and thus presents a false appearance of minimum distance.

A glance at a globe, or at a thread stretched across its surface, makes it apparent that the shortest distance between any two places upon the surface of the sphere is along the great circle which joins them, and that it

seen that a vessel, in pursuing a great circle route, Practicability of Increased Tractive Power on the practically sails upon a series of short rhumbs closely approximating a great circle.

The distance saved by a greaterircle route, as compared with a rhumb route, varies greatly, according to conditions. Between Yokohama, Japan, and Cape Flattery, Washington, it is 268 nautical miles; from Belle Isle to Malin Head it is only 36 miles, the total distance being only 1,692 miles.

IMPROVED CIRCULAR AND ELLIPTICAL BORING MACHINE.

We illustrate from Engineering a circular and elliptical boring machine constructed by Messrs. G. & A. of the main frame or standard, which is of box section, there is bolted a slide or bed having planed V's and carrying a belt, cone and spur-driving gear. On the



IMPROVED CIRCULAR AND ELLIPTICAL BORING MACHINE.

is only while maintaining her great circle course that and bevel wheel are securely fixed, the former gearing weight of the locomotive. Before radical steps are the vessel heads for her port as if it were constantly in into a bevel pinion on the end of the spur wheel shaft, taken, if ever they are, to modify existing structures of sight. Except when sailing along a meridian, or the the motion of either driving arrangement being con-elevated roads, it should be seriously considered equator, the true course upon a great circle changes veyed direct from three-stepped cone or double gear, whether longer trains would not be more profitable gradually with the advance of the vessel, but so slowly as desired. The spindle carries a double-ended tool than the five-car trains now run. slide having 8¼ inches in vertical travel, the tool boxes of which are movable horizontally for boring diameters from $3\frac{1}{2}$ inches to 60 inches. By using one tool box and giving motion along the slide to the saddle by means of worm, worm wheel, disk and connecting bars, holes may be bored varying from a complete circle to those of an elliptical form, whose transverse and conjugate diameters have not more than a difference of 7 inches. The spindle is counterbalanced by lever and weight, and has 14 inches vertical travel by hand or self-acting feed when the double-ended slide is removed. On the upper tool slide there is fitted a compound table adjustable by hand by means of screws. The upper table is furnished with J-slots for securing the work required to be operated upon.

New York Elevated Railroad Structures.

The experience of the "Alley" elevated road in Chicago shows very conclusively, says the Railroad Gazette, that six, seven, and even eight-car trains are readily handled, so far as loading and unloading are concerned, whenever the platforms are made of snitable length. This is practically a demonstration that the capacity of existing elevated roads can be increased materially by hauling a greater number of cars at the hours when more capacity is needed. In Chicago, for instance, the number of trains that

can be sent out from Congress Street in an hour is limited to the delivery of a single stub terminal. The Harvey, Albion Works, Govan. On the upper surface headway so far has been about 21/2 minutes. With a six-car train this accommodates about 500 passengers each 2½ minutes, or 14,400 passengers an hour. With eight-car trains it would be 19,200 passengers an hour. front of the bed there is fitted a saddle with a bearing The only extra cost of hauling the greater number of passengers lies in the increased number of guards on iron ever rolled. The sheet in question was 10×5½ which is 8 inches in diameter. On this sleeve a worm the trains and some additional expense for fuel. The

increased fuel used is not in proportion to the increase in train, being much less; so that the total train expense per passenger is materially decreased by using the longer train. The result then is a decrease in train expense per passenger, and increase in total capacity by using more cars per train.

To make the same time over the road this requires a heavier engine, as elevated railroad motors are, as a rule, worked to their full capacity. In Chicago their capacity is about seven cars per train. So far as the structure is concerned, it is not strained practically any more by a longer train than by a short one, except perhaps on curves; but as the trains are allowed to float around the curves at a slow speed, probably no greater strain would be produced there. The limit of train length with the present form of steam motor lies in the limit of weight that can be made available for adhesion on the locomotive. The locomotives in New York weigh about 47,000 pounds; in Chicago about 58,000 pounds. If all of the weight of the Chicago engines could be made available for adhesion, the locomotives would be sufficiently powerful to haul at least nine cars per train. The steam supply is quite sufficient on those engines for the increased work that would be demanded. As the engines are designed, they have trucks under the tank which carry about 18,000 pounds, or nearly one-third of the total weight. This weight is useless for adhesion, and is, in fact, a dead weight that has to be carried without serving any really useful purpose.

This explains the preliminary facts relating to the point we wish to bring out, which is that the existing elevated railroad structures could be made to carry much longer trains by a proper arrangement of the

that in practice a new course need be set only for each 100 or 200 miles of distance made good. Since the great circle course for any position of the vessel is quickly found, the necessity for a change of course may be easily investigated.

When a great circle route is to be taken, the whole route should be projected upon the sailing chart, either by a continuous line or by frequent points, that it may be examined for general direction, obstructions, meteorological conditions, etc. When a vessel falls of the original great circle, she should not attempt to regain it, for the shortest distance then is upon the great circle that joins her position to her place of destination. Her course is always the great circle course at her actual position. In general, it will suffice for sailing vessels to shape courses as usual, following the general direction of the original great circle as projected, but it is preferably for fast steamers to ascertain the exact with ordinary carmine ink, red lines may be successgreat circle courses. From what has been said it is fully drawn on blue prints.

By mixing a saturated solution of carbonate of soda

Sudden Death to Flies.

"Come inside a minute," said a Fourth Avenue dealer in pianos, yesterday afternoon. "I have discovered the greatest fly trap on earth and I want to show it to you." He led the way to an instrument at the rear of the store on which was a newspaper. On the paper had been placed a bunch of sweet peas. At least a thousand dead flies were lying on the paper in the immediate vicinity of the bunch of flowers. "I threw these here by chance," he continued, "and in about ten minutes I happened to notice that every fly that alighted on the flowers died in a very short time." Even as he spoke a number of the insects which had stopped to suck the deadly sweet had toppled over dead. They alighted with their usual buzz, stopped momentarily, quivered in their legs, flapped their wings weakly several times, and then gave up the ghost.-Louisville Journal

Scientific American.

AUGUST 26, 1893.

Carbonizing Metal.

One method used in Germany for introducing carbon into a molten metal bath is by mixing pulverized anthracite and lime water together, and forming the mass in briquettes under great pressure, these briquettes being then brought into contact with the molten metal; in this way, exactly, the desired proportion of carbon for the formation of steel of various tempers and qualities can be imparted to the converter. The method of recarbonizing is stated to cost only about one-sixth that of the ferro-manganese plan, but the most important advantage presented is the greater accuracy and uniformity with which any required quality of steel may be produced, ranging all the way from the hardest to the very toughest sorts. It is anticipated that rails made according to this new system will have a life of from 35 to 40 years, while girders made in this way possess very great additional durability.-Iron Trade Review.

Xylolith or Wood Stone.

Xylolith, or wood stone, says the American Architect, is coming into extensive use in Germany. A recent number of the Bautechniker gives a variety of additional particulars. Xylolith, or steinholz, or wood stone, is made of magnesia cement, or calcined magnesite, mixed with sawdust, and saturated with a solution of chloride of calcium. The pasty mass, before the cement sets, is spread out into sheets of uniform thickness, and subjected to an enormous pressure, amounting to more than a thousand pounds to the square inch. The compressed sheets are then simply dried in the air. The original invention of this material dates back to 1883, but it is only within the last five years that a single firm, that of Otto Sening & Co., at Pottschappel, near Dresden, has undertaken the manufacture of it on a large scale, and has met with such success that it is already engaged in the erection of extensive additional works in the Austrian territory, to supply the South German market. In 1888, a series of tests of xylolith was made at the royal testing station for building materials in Berlin, covering its chemical as well as mechanical qualities. In resistance to tension it was found, naturally, that the dry material was much superior to the same soaked with water, dry specimens resisting a tension of about 100 pounds per square inch, while pieces saturated with water resisted only two-thirds as much. Soaking the dry material in linseed oil increased the tensile strength about ten per cent, and freezing diminished it slightly. The resistance to compression proved to be about 300 pounds to the square inch. This was diminished about ten per cent by freezing, and increased to about the same extent by careful drying and saturation with linseed oil.

The specific gravity of the new substance was found to be 1.553. The fractured surfaces showed a yellow color, with a perfectly uniform and close grain. When immersed in water, unbroken sheets of perfectly dry material took up 2.1 per cent of their weight of water in twelve hours and 3.8 per cent in two hundred and sixteen hours. Broken pieces absorbed in the same time about twenty per cent more water than the unbroken sheets. To try the resistance to the influences of the weather, a large number of samples were taken, and subjected to boiling in water, brine, sodalye, hydrochloric acid, and solutions of sulphate of iron, sulphate of copper and sulphate of ammonium, alternating the boiling with sudden cooling. After several days' treatment with hydrochloric acid a loss of 2'3 per cent in weight was observed, but the properties of the pieces under test were not perceptibly affected. In the other cases no loss of weight could be detected, nor was there any other apparent alteration, and the liquids used for treating the samples remained perfectly clear. Exposure to superheated steam, in a Papin's digestor, also produced no visible effect. In hardness, the material was found to occupy a position between feldspar and quartz, being scratched by the latter, but not distinctly so by the former. As a conductor of heat, the xylolith was found to rank between asbestos and cork, being, therefore, one of the best nonconductors known. To test its fire-resisting qualities, vere exposed for three hours to the f Bunsen gas burner, by which the actual surface touched by the flame was charred, although there was no crumbling, or extension of the charring beyond the marks of the flame. Similar pieces, laid on the burning coal in the fire box of a drying oven, and kept for some time at a red heat, were rendered brittle, and crumbled at the edges, but kept their shape and cohesion, and showed no sign of breaking into a flame. For use, xylolith is delivered in sheets, from a quarter of an inch to an inch and a half thick, and of all sizes, up to a meter square. The dimensions are almost unchangeable by dryness or moisture. A sheet passed. measuring one meter square when perfectly dry will expand from one to two-tenths of one per cent when soaked in water, and a moist sheet will contract in which are to convey the passengers to the Bois du drying to about the same extent. Being so little Boulogne, for while the Champs de Mars has not grown subject to contraction and expansion, it is extensively smaller since 1867, the size of international expositions used for floors in railroad stations, hospitals and simi- has increased.

lar buildings, and for decks of vessels. It is readily planed, sawed, bored and fashioned with ordinary wood working tools, and may be painted or decorated in the same manner as wood. It is itself nearly waterproof, and with suitable putty in the joints, and a good coat of paint, it may be made entirely so. It is not surprising that a material possessing so many advantages should have come into extensive use abroad, and we trust that its manufacture may be introduced here. It is sold in Germany, in sheets of thickness suitable for flooring, at abont seven cents per square foot, and the laying costs, complete, about four cents more.

EXPERIMENT SHOWING MAGNETIC LAG. BY GRO. M. HOPKINS.

Most students of electricity know theoretically what is meant by magnetic retardation, or magnetic lag, and electrical engineers and manufacturers of electrical machines understand the causes and effects of this action in the armatures of dynamos and motors; but to most people, and especially to students who really desire to fix an idea in their minds, an experimental demonstration is more valuable than any amount of theory.

It is of course impossible to see what goes on in an armature while moving, but it is known that the armature core becomes a magnet by induction, and that its poles are of the opposite name to the adjoining poles of the field magnet. It is also known that time is required for, the magnetization and demagnetization of the armature. The time element is thus seen to be one which cannot be left out of the calculation in designing dynamo-electric machines.

A very simple experiment, which helps to an understanding of what magnetic lag is, is shown in the annexed engraving. A perforated block is inserted



EXPERIMENT SHOWING MAGNETIC LAG.

netic density in the disk lie beyond the poles of the magnet in the direction of the rotation of the disk, and that these points are attracted toward the magnet poles. Owing to the friction of the bearings of the spindle, and to the almost immediate readjustment of the magnetic lines in the material of the disk, the return movement does not represent the entire lag, but it shows in a striking manner what lag is.

The Next World's Fair.

It is announced that the next World's Fair will be held in Antwerp in May, 1894. The Antwerp Exposition will be much smaller than the World's Fair at Chicago. Antwerp has the advantage of being able to take exhibits directly from the vessels in which they are transported, as the river Scheldt will float vessels of 8,000 tons burden. Antwerp is readily reached in a few hours from Paris and all parts of Belgium, Holland, and the Rhine provinces of Germany. London

Blue Focusing Glass.

Photographic Work says: A blue focusing screen has been suggested as eliminating the effect of color in the case of the camera image, and so enabling the photographer to better judge as to how his work will look: the colors of a landscape often giving a charm to the scene which is not realized in the photograph.

It is suggested to wash over the ordinary groundglass screen with an alcoholic solution of an aniline blue; but in this case the screen could not be readily cleaned. Hence a much better course would be to finegrind a piece of blue glass.

It is very easy to make a fine ground focusing screen by using the finest emery of the shops-sold as "flour emery." Thisshould be mixed with water, and worked on one surface of the glass with a rubber consisting of a piece of thick plate glass about an inch square. The progress of the work can be seen by rinsing the emery off, when special attention can be given to any imperfectly ground parts. It is obviously desirable not to scratch the back of the plate, and to insure this the plate should be held steadily on a flat surface while the rubber or muller is being used. A flat-topped bottle stopper often makes a convenient muller.

The August Meteors,

Happening to be in Ithaca, N. Y., on the night of August 10, I watched for Perseids from 10:20 P. M. until midnight, 75th meridian time. With the exception of about three minutes, I kept my face directed toward the radiant point of the meteors during the entire interval of an hour and forty minutes. The sky was cloudless, but covered with a light haze, which slightly dimmed the fainter stars. I counted forty-five meteors. Of these, thirty-five were plainly Perseids. All but one of the others traveled in approximately parallel between the polar extremipaths from near the square of Pegasus toward or ties of a U-magnet to reacross Andromeda. None moved in any other direcceive a pointed spindle attion except one rather large meteor, which shot from west-southwest, passing overhead about 11:45. It tached to a soft iron disk held near the poles of the should be said that my view toward the west as well magnet. The pointed end as toward the south and southeast below the square of the spindle rests upon a of Pegasus was shut off by neighboring buildings cross bar inserted between and trees, so that if any meteors appeared in those the arms of the magnet. quarters moving from Pegasus as a center, I could not The disk, which turns very see them. All of the meteors just described as not freely, absorbs the magtraveling from the Perseid radiant were, with the exnetic lines and becomes ception of the one seen overhead, small and swiftstrongly magnetic. When moving.

A few of the Perseids were as bright as first and secand magnitude stars and left heantiful though evanescent trails. These bright meteors had a distinct reddish tint. One of them, which shot straight across underneath the Pole star at 10:45, was at least as bright as Sirius. Its visible path was not less than 20° in length. It was yellow bordered with a flare of red, but at the tion of rotation. This is moment of extinction these colors were swallowed up proved by the action of in an outburst of white and vivid green. After its the disk when it stops. It disappearance a greenish white train, five or six degrees long, remained visible along the latter portion distance in a retrograde of its track for half a minute. This train undulated direction, showing that rapidly like a ribbon streaming in the wind, and graduthe points of greatest magally shrunk and faded until it vanished, when a fourth magnitude star suddenly made its presence manifest at the point where the last shred of the meteoric train had been seen. The star had not been noticed when it was behind the train.

At about 10:55, while my eyes were fixed in the direction of the radiant, a faint stellar object made its appearance a few degrees northeast of Chi Persei, and quickly brightened until it equaled a third magnitude star, when it vanished. It was evidently a meteor coming "end on "toward my eyes. I had a distinct impression that its light appeared drawn out into an excessively brief trail, like a short dash in the Morse alphabet, which would indicate that the meteor was not moving exactly in the line of sight. But the deviation was so slight that I could form no accurate estimate of its amount. The point where this meteor appeared was, by estimation based on a subsequent consultation of a star chart, in right ascension 2 h. 50 m., declination north 58°.

About half an hour before beginning my watch I saw

and Antwerp are only eight or nine hours apart by the three Perseids within two minutes. Two of them were Harwich route or the Ostend route, while Antwerp is large and reddish, making conspicuous trails. They directly accessible from the United States by the Red appeared not more than fifteen seconds apart. Both Star line, which furnishes first-class accommodations started from near the radiant point and they moved in at moderate rates. In Belgium there is no hostility to paths almost exactly at right angles to one another. government appropriations and no municipal preju-The effect was surprising and beautiful.

dice. There will be no sandbagging by the railroads, It seemed to me during my watch that the larger and it is to be hoped none of the disgraceful wrangles meteors showed a gregarious tendency. If one apwhich have characterized our Fair. Although there is peared after a long interval, during which only small not the slightest possibility that the Antwerp Fair can ones had been visible, it wasalmostinvariably followed compare with ours, still when Paris celebrates the within a short time by another of more than ordinary opening of the new century in 1900 it is probable that size and brilliancy, but not traveling in the same directhe Chicago Exposition will be equaled if not surtion across the sky. Afterward again only small ones were seen for a considerable time.

Already the French engineers are making prepara tions for 1900, plans are being made for the railroads GARRETT P. SERVISS,

It is estimated that about 250,000 canary birds are raised every year in Germany. The most important market is the United States, which take about 100,000 birds per annum.

NASMYTH'S TORPEDO BOAT OF 1853.

More than forty years ago, to wit, February 19, 1853, the SCIENTIFIC AMERICAN published illustrations of James Nasmyth's torpedo boat, which presents several features of novelty, and we have thought it of sufficient interest to our readers to reproduce the description and illustrations as originally given by us. Peculiar interest attaches to this submarine boat of nearly half a century ago from the fact that a selection is soon to be made, by a board of examiners of the Navy Department, of a type of submarine vessel, for the construction of which Congress has appropriated \$200,000. Some fifty or more proposed plans have been

narrowed down to a choice between the Baker and the Holland types, the former of which has had some trials on the Detroit River and the latter in the waters near New York City. Both of these submarine boats have been illustrated and described in the SCIENTIFIC AMERI-CAN; the Baker boat, July 30, 1892, and the Holland boat experimented with also by Lieut. Zalinsky, August7, 1886. The following is the description:

"The annexed engravings are views of a floating, partly submerged propeller, torpedo vessel, proposed by James Nasmyth, of Patricroft, England, for

sight hole, X, and shown attacking the enemy. Fig. 2 is an enlarged view of the great brass mortar and shell. The cap, C, explodes the instant it is brought in contact with the breech, R; this it does in consequence of the protruding end of the shell being crushed against the side of the enemy. The flange, SS, is just so strong as to resist any ordinary pressure, and is thereby made safe till crushed back by contact with the side of the enemy.

"Fig. 3 is a transverse section of the mortar.

Mr. Nasmyth is the inventor of the steam hammer, which bears his name, and various other useful inventions, and, besides, he is a first-rate astronomer and mathematician. The following is his own account of the invention, which was sent to the *Illustrated News*:

"The principles on which the arrangement and construction of the floating mortar is based consist, in the first place, of a monster self-exploding shell, so arranged as to explode on having its breech end crushed against the breech of the mortar, the selfexploding cap being situated there, as will be seen on reference to the engraving.

"In order to enhance the destructive effect upon the enemy's ship, the shell is so far submerged as to tear its way into the enemy six feet under water line.

Next, to protect the shell from the effect of the water while resting in the chamber of the mortar, it is rendered waterproof by being inclosed within a perfectly watertight copper case, which will so effectively



Scientific American.

or three miles per hour, shall be sufficient to overcome the resistance of this flange, and crush the self-exploding cap at the breech end of the shell against that of the mortar, and so cause it to explode and tear its fearful way through the side of the enemy. Thus it will be evident that we can never fail to render the shell effective, inasmuch as that it is the very fact of contact with the side or hull of the enemy that brings the self-exploding agency into action. No ship that has ever been built, either wood or iron, could survive the such circumstances, would produce.

"The next feature is the intimate union of our mor-

and, instead of terrifying her foes by keeping watch and ward on their coasts, as she once did, she is keeping a sharp lookout for the defense of her own coasts by such water hogs as this of Mr. Nasmyth. Prudence. no doubt, is the better part of valor, but we apprehend that this vessel could very easily be taken prisoner by a few boats before it was permitted to drive its snout against the side of an invading war ship. It, no doubt, could be used at night as well as during daylight; but at the same time, we must say that since Mr. Nasmyth fearful hole which a monster shell, exploded under has brought this subject before the public, invading ships will be prepared for it, as they now understand

what it is. Torpedo submarine vessels are not new: examined, and the selection has, it is stated, been tar with the hull of the screw steam vessel, which more than one has been invented in America, and for

Fig. 1.-NASMYTH'S TORPEDO BOAT OF 1853,

destroying large ships of an invading fleet. Fig. 1 transports it direct to the object which we desire to acetous fermentation." The specific gravity is from shows the floating mortar, steered by the man at the destroy. The mortar is (as will be seen on reference to the engraving) made part and parcel of the vessel, and so situated as to unite the most effective mechanical arrangement with the strongest position of the vessel, viz., 'end on,' so that the entire mass of our vessel (mortar and all) is brought into play, as the means whereby the concussion or recoil due to the explosion of the shell is absorbed by the entire mass of the floating mortar, so that no sensible recoil or concussion would be experienced.

"Next is the manner in which the crew who attend to the navigation of the floating morter, together with the steam engine, boiler, and screw, are protected from the action of shot, whether red hot or cold. This object is attained by giving the vessel, in all directions where assailable, such a thickness of timber as that no shot, of whatsoever description, can penetrate to the interior. To insure this, the hull of our floating mortar will be made at least ten feet thick, of poplar wood. which material is admirably adapted for the purpose, by reason of its lightness, toughness, and incombustibility. Red hot shot might lodge in it, but would fail to set it on fire. A red hot shot would only char a few inches of the timber around it and cool at its leisure, and from the extent to which the hull would be submerged, the portion above water presents no surface favorable for the effective action of shot; while, as there will be most ample accommodation in the interior for a high pressure engine and boiler, with direct action screw propeller, there is nothing to prevent our obtaining a velocity of eight or nine miles an hour, although for the actual objects of the vessel a speed of five or six miles would be ample. The draught of the engine furnace would cause perfect ventilation for the crew, which need not consist of more than three or four handy men.

"I would observe, in conclusion, that as this class of vessel is chiefly designed for defense against invasion, and would not have to act against an enemy, probably, at greater distances than one or two miles from our shore, it could speedily return for another shell; the means for lodging which in the chamber of the submerged mortar are most simple, but not needful at present to describe. I conceive, however, that the total destruction of one enemy's ship at each trip

many years they formed a more interesting subject to Robert Fulton than his steamboat. He was furnished with means by Napoleon to blow up an English frigate, but failed, and after that Napoleon seemed to entertain a prejudice against him. Lord Cochrane invented a torpedo submarine vessel, but nothing of any consequence, so far as we are informed, resulted from it, and never will, we suppose."

Genuine Vinegar.

In the British Pharmacopoeia, The Analyst says, vinegar is defined as "an acid liquid, prepared from a mixture of malted and unmalted grain by the

1'017 to 1'019, and it is to contain about 5'41 of real acetic acid (C₂H₄O₂).

The vinegar of the German Pharmacopoia is required to contain at least 6 per cent of absolute acetic acid. In Russia the minimum limit of strength is 5 per cent; in Austria, 6; in Belgium, 5.6; in France, 8 to 9; and in the United States, 4.6 per cent.

In 1874 the Society of Public Analysts adopted 3 per cent of real acetic acid as the minimum limit of strength for vinegar.* This limit certainly cannot be said to err on the side of too great stringency, and there have been very few prosecutions for the sale of vinegar containing less than this very moderate proportion of acetic acid.

With regard to the sale of vinegar, the pharmacist stands in a far more delicate position than the general dealer, for it might be argued, with some plausibility, that, when purchased of a registered pharmacist, an article recognized in the British Pharmacopœia ought to comply with the description of it given by that authority. This would limit the "vinegar" to be sold by pharmacists to the very best quality of malt vinegar; and if the B. P. definition of vinegar were legally applied to-day, a considerable proportion of the trade would probably be caught tripping.

With the single exception of Brannt, who appears to hold that vinegar may be legitimately manufactured from wood acid, while admitting that the product is inferior to the fermentation acid, all the authorities above quoted agree in regarding true vinegar as an



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secure it from the action of the water as that it may remain, if need be, for years in the chamber of the mortar, submerged, as before said, six feet under water line, and ready for service at any time.

"The crush consequent on coming in contact with the side of the enemy is the agent whereby the monster shell is made to explode. A very moderate velocity of the floating mortar would, when brought up against the side of the enemy, prove sufficient for this purpose; so much so, that, in order to obviate the chance of its explosion by accidental contact with any other object, heat. It was said once that, 'A sight of the gray I have so placed the flange joint of the copper case against the mouth of the mortar that the crush against set all Europe in an uproar.' We must say that Engthe side of the enemy, resulting from a speed of two land seems afraid now in trusting in her wooden walls, w 353 per cent of (C3H30)H.-A. H. A.

would be sufficient service.

"Three or four such floating mortars, each of which sending to the bottom of the sea the largest ships an invading enemy might dare to bring toward our shore, would make such a demonstration as would strike terror into the largest fleet that molested a peaceful nation; and not fail to confirm the maxim, that the best way to prevent war is to render the results so terrible as that evil-disposed nations will think twice ere they face such wholesale destruction as our floating mortars would not fail to deal out to them.

"The fear of an invasion has been very strong in the minds of the people of Britain ever since Louis Napoleon became President of France, and at present the excitement, we can perceive, is approaching fever coat of Napoleon (the great we mean) was enough to



Fig. S.

acid liquid produced by the acetous fermentation of alcoholic liquids, and consequently regard acetic acid from wood as not answering to the description of genuine vinegar.

IT is said a female codfish will lay 45,000,000 eggs during a single season. Piscatorial authorities say that were it not for the work of the natural enemies of fish they would fill all the available space in the seas, rivers, and oceans.

* By the term "real acetic acid" there is good reason to believe tha acetic anhydride was intended. Three per cent of (C2H2O)20 corresponds

broadening until they reached the brinks, which were

about thirty feet wide. Thus a main ditch consisted,

so to speak, of one watercourse within another; so

that if at any time a small current of water only could be supplied at the head-gate, owing, perhaps, to

drouth, the lower and narrower ditch was doubtless

always filled sufficiently to supply the towns beyond,

while during the rainy season the upper and much

broader Portion of the great canal would readily accom-

Several years ago, when the Mormons first settled at

Mesa City and began the irrigation and cultivation of

the fertile plain about them, they utilized this ancient

canal bed for a considerable distance, including that portion encircling the knoll of volcanic tuff mentioned.

The writer has been informed by one of the founders

of this settlement and builders of the Mesa canal, which

is nine miles in length, that the saving to them by

In tracing the routes once pursued by many of the

canals, great depressions-the sites of ancient reser-

voirs-are observable. The remains of one of these

reservoirs, nearly a mile long by about half a mile wide,

occur on the open plain at the terminus of one of the

main canals that formed the source of water supply of

Los Muertos, and about three miles southwest there-

using the ancient canal was from \$20,000 to \$25,000.

modate all surplus waters.

WARBURTON ROAD BRIDGE-MANCHESTER SHIP CANAL.

We present herewith an illustration of the Warburton Road bridge over the Manchester Ship Canal. The canal was constructed to enable sea-going vessels to reach Manchester, and thus avoid expensive railway transfers of freight at Liverpool.

The Manchester Ship Canal is 35½ miles long, 26 feet leep, and 120 feet wide at the bottom. Docks are built at intervals to accommodate the largest vessels which traverse the canal. The docks at Runcorn, Salford, and Manchester are very extensive. The total capital stock of the company is £9,812,000.

Engineering works, as locks and bridges, were ne cessitated by the country which the canal traverses and the exigences of travel, and these works required the skill of the best civil engineers. The most important problem connected with the scheme, next to the cutting of the canal itself, was the providing for the traffic which exists between the two sides of the river Merseyand the Irwell. Four roads cross the canal, one at Barton, one at Warburton, and two at Warrington. In addition to the road bridges, the Bridgewater Canal and five railroad bridges, as well as the famous Runcorn Viaduct, cross the canal. In the final plans, swing bridges were abandoned and high level bridges were substituted. The Warburton Road bridge was designed by Mr. E. Leader Williams, M. Inst. C. E., and is a fine example of a cantilever bridge. For the illustration we are in-

should expect, for there is no presumption that the meat of which they were made was bad. Indeed, the contamination must have taken place after they left the baker's oven. The ptomaines of decomposed meat may pass through the baking process without change; but it is hardly possible to suppose that living bacteria could survive such an ordeal.

This, then, is a matter entirely different from the ordinary ptomaine poisoning due to the use of bad meat, and it raises a question of considerable interest. The pork pie, be it ever so good and fresh, forms a most admirable culture medium for microbes, and when we think of the late revelations concerning the disgraceful sanitary condition of our bake houses, we cannot but wonder that outbreaks like that at Camberwell do not occur more frequently. Short of actual poisoning, however, we suspect that the question is one of no little practical importance to the public, that cooked meats are pretty often contaminated with bacteria, and that a large proportion of sick-headaches summer diarrhea, and the like are to be accounted for in this way.-Chem. and Drug.

Prehistoric Irrigation in Arizona.

In the July Anthropologist, Mr. F. W. Hodge gives some interesting notes on this subject, from which we take the following:

from. It is possible that this great depression was, in In none of the extensive archæologic remains of part at least, a natural sink, deepened by artificial Southern Arizona are the industry, perseverance, and means to serve more fully the purposes of a storage debted to the Engineer. The Manchester Ship Canal degree of advancement of a large pueblo population basin of surplus waters from the Los Muertos irrigat-



MANCHESTER SHIP CANAL-WARBURTON ROAD BRIDGE

is described and illustrated in the SCIENTIFIC AMERI-|more faithfully illustrated than in the many works of |ing system. Every cluster of communal structures in CAN SUPPLEMENT, Nov. 383, 515, 555, 685, 715, 763.

Pork Pie Poisoning.

The recent extensive outbreak of poisoning n Camberwell has revealed a little-suspected danger that may lurk in the pork pie et hoc genus omne. The outbreak was peculiar in two respects. The symptoms did not come on till after a lapse of from twenty-four to thirty-six hours, and those who scarcely tasted the pies suffered almost as severely as those taken none, was attacked; but it was found that she all its undertakings. had used a knife with which a nie had been divided.

irrigation that abound in the valleys and on the mountain slopes of this section.

Judging from the remai s of extensive ancient works of irrigation, many of which may still be seen passing through tracts cultivated to-day as well as across densely wooded stretches considerably beyond the present non-irrigated area, it is safe to say that the principal canals constructed and used by the ancient inhabitants of the Salado Valley controlled the irrigation of at

Los Muertos was supplied w th a reservoir on a smaller scale than the one just mentioned, a single canal forming both its inlet and outlet. Sometimes a lesser communal dwelling shared with a neighboring structure in the water supply from a single storage basin.

The Iron Industry.

President Richards, in his closing remarks before least 250,000 acres, even without considering the ecothe British Iron and Steel Institute, said : "So successwho indulged freely. One woman, indeed, who had nomical methods employed by a primitive people in ful have we all been in economically increasing production that we have inundated and swamped the The mode of canal con markets for the time being; at pres IOL SOME In ordinary ptomaine poisoning the symptoms pueblo builders was another indication of their patience time past, there is not enough work for half the steeland industry. Their canals are models for the modern producing power of the country. Thus we go on, and we look about in vain for new markets. We compare conceivable manner save by the laborious process of America with 60 millions of people, having 175,000 miles of railway, with India, having 250 millions of hand excavation with stone or wooden implements, the earth being borne away by means of blankets; baskets, people and only 17,000 miles of railway, and wonder or rude litters. Notwithstanding this, the outlines of why, under our sway, it develops at such a wretchedly at least a hundred and fifty miles of ancient main irrislow rate. Where is the trade to come from to keep gating ditches may be readily traced, some of which our workmen employed and our establishments in meander southward from the river a distance of fouroperation? No one seems to be able to answer this teen miles. question; but we know that we have had many Unlike ordinary irrigation ditches, these were conserious depressions before, though none seem so deep, so prolonged as this. The iron and steel trades may the depth of the current as well as to prevent waste be likened to Pandora's box, from which, once filled through seepage. The bed of the canal was about four with all good things and all bad, everything escaped -the good things back to heaven and the evils to within about four feet of the bank, where a "bench," infest and plague the earth ; but there is still left to us that which neverdeserts us, the inestimable blessingperfectly fresh and good. This is exactly what we made. From these benches the banks continued, hope."

come on almost immediately, and their severity is, of course, directly proportionate to the amount of food farmer to imitate; yet they could have been dug in no taken. Here neither of those conditions was fulfilled, and the facts permit of but one interpretation. The pies were, so to speak, only potentially poisonous. They did not contain an actual chemical poison, but they did contain living bacteria, capable of growing in the body, and of producing deadly toxines therein. The period that elapsed before the onset of the symptoms was, no doubt, the incubation period of the bacteria, and with the enormous power of reproduction possessed by these organisms it mattered little structed in such a manner as to control to some extent whether many or few were introduced.

The pies, it is said, were made in Leicester on a Thursday, and sold either on the following day or on feet wide, but the sides broadened in their ascent to Saturday, and no complaint was made by any of those who partook of them that they were otherwise than three feet in width, on each side of the canal had been

THE CENTURY VASE AT THE FAIR.

This most elaborate and highly finished representa tion of American art work in silver, valued at \$25,000, and designed to commemorate the completion of the first century of the republic, forms a portion of the exhibit of the Gorham Manufacturing Company at the Columbian Exposition. Their display is in a pa- gines are two vertical, inverted, four-cylinder, quadru- cancel the Bell patent of 1876. It is evident that the

vilion at the beginning of the United States section, in the Manufactures and Fine Arts building, its main entrance being on the circle bounded by the four countries, the United States, Germany, England, and France, The vase is 4 feet 2 inches high, and its base is 5 feet 4 inches long, the weight of silver in it being 2,000 ounces. The pioneer and Indian on the front of the oval base suggest the first phase of life here, and at the extremities of the oval are festoons of native flowers. Above, on the left, is represented the genius of war, and on the right a lion led by children. The front panel of the vase, rising from the plinth, represents Genius ready to inscribe on the tablet the progress made in literature, science, etc., while surm ounting the vase are four figures, the three subordinate ones representing Europe, Asia, and Africa, while the central and highest shows America inviting all nations to unite with her in an international exposition.

THE SANTA MARIA AT THE FAIR.

The principal vessel of

of the Casino, has attracted constant attention ever and circulating pump engines have a combined horse since she became practically a portion of the great World's Columbian Exposition at Chicago. Crowds inch Whitehead torpedoes. of visitors go aboard of the little craft every day, but the number of such visitors is small compared with the far greater number of those who simply content them- | Bridgeport, Conn., has recently been awarded an imselves with an outside view, on account of the multitude of other attractions which the Fair presents. In our view the Casino is seen nearest the vessel, the Music Hall beyond, and the statue of the Republic on the left.

The arrival at New York of the vessels built to faith- riority.

fully represent the original squadron of Columbus.and the great naval parade and review in honor of the event, were fully described and illustrated in the Sci-ENTIFIC AMERICAN of April 29 and May 6. The Santa Maria, it will be remembered, is the largest of the three vessels of the squadron, but her greatest length is only 75 feet, width 23 feet, and burden from 120 to 130 tons. One would be counted a venturesome navigator who started in these days to cross the ocean in such a craft, and it is the vividness with which this idea presents itself to a visitor familiar with modern facilities for travel that constitutes the never-tiring interest the little craft has for so many thousands of sightseers.



The Berliner Telephone Patent.

Not much has been heard recently, says the *Electri* cal Engineer, of the government suit to annul the Berliner microphone patent. It is quite certain, however, transmitted through two screws, one slightly in ad- that the case will not run on undertermined for seven vance of the other, though not overlapping. The en- or eight years, like the old and still unsettled suit to



THE WORLD'S COLUMBIAN EXPOSITION-THE CENTURY VASE.

the Columbus caravels, moored at her pier alongside ple-expansion, direct acting gangines. The propelling | time to go into the question of infringement under the power of 1,800. The torpedo tubes are for the new 18-

> THE Wilmot & Hobbs Manufacturing Company, of portantgovernment contract for their cold-rolled steel for especially difficult stamped and drawn work. This steel, of which the company is now making a specialty, had been previously submitted to severe competitive tests, and is said to have well demonstrated its supe-

present circumstances of the patent. Moreover, the exceptional control of an entire art enjoyed by the Bell Company for seventeen years, because of the unprecedented scope of the Bell patent, which would have protected it against the use of the Berliner invention had it been in other hands, would probably be deemed by any court of equity a good reason for turning a deaf ear to any plea of urgency on the part of the Bell Company in dealing with an alleged infringer.

It is understood that testimony is now being taken in the government suit, and we have no doubt that any unnecessary delay in pushing the case to a conclusion

will be chargeable to the Department of Justice rather than to the defendant.

THE decision of Judge Coxe filed July 18, 1893, affirming the expiration of the Faure storage battery patent in the United States, will not, says Electricity, make the manufacture of this type of accumulator in this country entirely free, as the courts have already construed the scope of this patent to include only the application of the active materials in the form of paste, paint or cement, while the Brush patent, which is yet in force, is broader and covers all forms of active material applied to the plates except where it is in the form of paint, paste or cement, or is formed from the material of the plate itself, as in the Plante type of cell. The decision, however, opens a field in this line of business in which considerable progress may be expected, and it will doubtless be taken advantage of by the manufacturers against whom injunctions have been procured by the company which controlled the Faure patent.

American Bell Telephone

Company has a stronger

motive for seeking dis-

patch than for securing

delay this time. The Ber-

liner patent is on a very

different footing from

that occupied by the Bell

patent when it was attack-

ed by the Department of

Justice. That patent had

been very thoroughly ad-

judicated and upheld by

the courts, and the govern-

ment suit went harmlessly

on its leisurely course dur-

ing the remaining life of

the patent (and still goes on, although the patent is

some months dead), form-

ing no obstacle to the issuance of injunctions against

infringers. But the Berlin-

er patent, which on its face seems fundamental

in respect to nearly all

existing forms of micro-

phone transmitters, has

not yet had the judgment

of any court as to its scope

or validity. In its first or-

deal it is put upon its de-

fense under the attack of

the Attorney-General. It is, therefore, not at all

likely that its owners, the

American Bell Telephone

Company, will institute

any infringement suits

until it knows whether or

not it has a sound patent. A court would hardly take

The New Torpedo Boat Ericsson.

The first steel vessel ever built on the Mississippi is now nearly ready for launching, and her builders, the Iowa Iron Works, of Dubuque, propose to invite the governors of the States in the Mississippi Valley to be present. The Ericsson is guaranteed to have the highest speed of



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MONDON.

provent second prove

WOBLD'S COLUMBIAN EXPOSITION-ENTRANCE TO THE PALACE OF AGRICULTURE BUILDING.

The glory of the Exposition is the Court of Honor, and the glory of the Court of Honor is the Agricultural building. Situated on the south side of the great basin, it extends from the south canal nearly to the Casino, a distance of 800 feet. The building is 500 feet wide, and the cornice line is 65 feet above the grade of the walks. Architecturally the Agricultural building is one of the most successful in the inclosure. The architects were Messrs. McKim, Meade & White, of New York, who are so well known as the architects of the Madison Square Garden, in New York. The building is classical, and of an order designated as heroic by the architects. Pavilions are reared at each corner, and from the center of the building, the center one being 144 feet square. We illustrate one of the corner pavilions surmounted by a dome on which is a group of maidens of heroic size, called the Horoscope Group. These figures are represented as holding aloft a globe about which is a zone with the signs of the zodiac. The figures are made of staff, while the globes are of sheet copper. Each corner pavilion is surmounted by a group representing a distinct race, one the Caucasian, another the Mongolian, the third the Ethiopian, and the fourth the American Indian. Huge Corinthian columns 50 feet high and 5 feet in diameter support the pediment over the porticos. The dome over the main entrance, which is one hundred feet in diameter, is surmounted by St. Gaudens' statue of Diana, formerly in New York. On each corner pavilion are two reproductions of what are called the Four Seasons, making altogether eight of these groups. This group consists of four female figures representing the four seasons of the year, spring, summer, autumn, and winter. They are set back to back ing an average density of 40° B., corresponding to with their arms outstretched for sheaves of wheat extended above their heads.

We have already illustrated the large cattle group in our issue of April 29. From what has been said it will be seen that the decorative scheme of the Agricultural building takes its motive from agriculture, and primarily American agriculture; this is no less true when the minor decorative work is considered, maize, the potato, to bacco, etc., being freely used as decorative motives with excellent effect. The painted decoration ride solution remaining has reached a strength of 20° in the entrance porticos is the work of Mr. GeorgeW. Maynard, of New York, who chose the Pompeian style of mural decoration as the best one adapted to the severely classic outlines of the Agricultural building. Mythological deities and figures representing "Abundance," "Fertility," etc., were chosen. The little bit of color adds greatly to the success of the general effect. We give some details of the other pieces of sculpture on this beautiful building, the description being taken from a former issue.

On the exterior walls of the building, in strong relief, are fifty-four single figures of the Angel of Abundance holding a cornucopia which is overflowing with the fruits of the harvest. These figures are clothed in loose flowing robes and are classical like the others. Between the springs of the arches of the north, east, and west sides of the building are twenty-two more single figures in relief representing a female classically clothed, holding in her hands the signs of the zodiac. On the east front there are two spandrels, also two on the west and one on the north side. Four of these are the same. The two on the west side are immediately under the Horoscope Group and represent a pastoral methods are as follows: scene of a shepherd with a crook in his hand, sitting on the right with two ewes and a lamb. The other spandrel represents the triumph of Ceres, and is on produced is stiffened to a thick paste by stirring the the north front. Ceres, the central figure, is represented tin precipitate into it. as standing erect, holding a sheaf of wheat in her left hand and a shepherd's crook in her right. Further starch solution are mixed with 750 grms. of a wax soludown on the pediment are other reliefs. On the left is tion prepared from 5 lb. of wax and 1½ lb. of potash a reproduction of Flora, Bacchus, and other mythological deities seated in a chariot drawn by two tigers. added. Over against this relief on the right hand is a figure of Mercury and pastoral deities in a car drawn by two dragons. The statuary is all the work of William Philip Martini, of New York, with the exception of Diana, ch is the work of Mr. Angustus St. Gaudens

The exhibits are shown in a choice setting, and the marvelous beauty of the white building makes a lasting impression upon the memory.

Argentine or Silver Paper.

A substance known as argentine hasbeen introduced in Germany for making the so-called silver paper, which is used instead of tinfoil as a packing material. It is a finely-divided form of metallic tin, also known as tin dust, of such a texture as to become an extremely fine powder, which must be perfectly uniform in grain, of a bright metallic gray tint, and entirely free from crystalline particles. The author was for some time in charge of a manufactory of this article, and introduced some modifications in the process, which are described. The raw materials of the manufacture are tin, hydrochloric acid, and zinc. The first may be used in the form of block or grain tin, but generally waste materials, such as bearing metal turnings, which are obtained from railway repairing shops in large quantity, are preferred. These are very variable in composition, including both white and red metal, with the proportion of tin varying from 27.6 to 74.5 per cent. The solution is effected by boiling the alloys with hydrochloric acid in large copper vessels, taking care to keep the stanniferous material in large excess, under which condition the copper is not attacked, while the greater part of the tin dissolves, lead, copper, and antimony remaining wholly or partially undissolved. The solution is filtered through a layer of sand in a hard-wood tub with a double bottom, where the lead chloride contained in the hot liquor crystallizes out on cooling. The residues are passed on to another establishment, to be used in making copper and antimony preparations. The purified solution, consisting essentially of stannous chloride, with traces of antimony, lead, and iron, havabout 23.5 per cent of tin, is diluted from one to two hundred times its volume of water, and transferred to large vats in which plates of zinc are suspended, when, if all conditions are right, the tin precipitates as a uniform gray mass, rendered spongy by the simultaneous evolution of hydrogen, falling, when dried and rubbed through a sieve, to a fine dust.

The precipitate is removed every day, fresh liquor is added, and the process is renewed until the zinc chlo. to 25° B., when it is removed and concentrated to 50°, corresponding to a strength of 52 percent of chloride of zinc. This is readily sold, as it is extensively used for preserving railway alorpers. The finisted product should be as nearly as possible pure tin. An average sample analyzed by the author contained : Hygroscopic water, 0.83 per cent; lead, 0.6 per cent; zinc, 0.83 per cent; the remainder being tin, with small traces of iron, chlorine, and antimony.

As the silver paper is used in wrapping up provisions, the tin dust used in its preparation must not, according to the sanitary laws of the German empire, contain more than 1 per cent of lead.

In the year 1890 the price realized varied from 77. to 77. 10s. per cwt.

Formerly silver paper was made by covering ordinary white paper with a priming of white lead and size, upon which either silver leaf or tinfoil was cemented. At present this has been almost entirely replaced by argentine, which is made to adhere to the paper by the use of so-called wax solutions, prepared by methods which are kept secret. According to the author, the

In the first, 4 kilos. of wax and 34 kilo. of potash are boiled with 50 kilos. of water, and the melting fluid so

In the second, 75 liters of freshly made 4 per cent dissolved in hot water, and 25 kilos. of argentine are

The paste so obtained is printed by rolls on to paper, which dries to a dull gray tone, but becomes bright when burnished by passing through hot calender rollers, when it exactly resembles tin foil.

Sorrespondence.

Color Blindness at the Miller School. To the Editor of the Scientific American :

A report on the color blindness found in this school may be of interest, from the fact that, in accordance with the will of the founder, Samuel Miller, none of our pupils are of wealthy families, while all are from one county, Albemarle.

About two months ago I examined the pupils, some two hundred and sixty, of this school for color blindness, using Dr. Oliver's method, a modification of that of Holmgreen. There were five test skeins of worsted -red, rose, yellow, blue, and green-each with two skeins of darker shade and two of lighter tint. Besides these there were a large number of confusion skeins of different colors, shades, and tints.

The test was made in the usual way, by matching colors. Those who matched the colors correctly, red with red, green with green, etc., as a matter of course, were considered all right, while those who matched such colors as red and green together were considered color blind.

Of the two hundred and sixty persons, students with but few exceptions, examined, one hundred were girls and one hundred and sixty were boys. Not one instance of color blindness was found among the girls, while eight cases of very decided color blindness were found among the boys. Seven of these were cases of red blindness, being unable to distinguish between the so-called rose and green of the same shade. One boy seemed unable to distinguish between any two colors of the same shade, even matching rose, green, and yellow together.

It is stated by high authority that only one of a, thousand women will be found color blind, while one of every twenty men has this defect. The above report, therefore, while interesting, should not be a sur-W. J. HUMPHREYS, Professor of Physics. prise.

The Miller Manual Labor School of Albemarle, Crozet, Va., August 2, 1893.

A Simple Optical Photometer.

A simple optical photometer, serving also to measure the degree of visual acuity, has been devised by Dr. Simonoff. A book of twenty-four pages is arranged; the first being of a clear gray tint, the second of double the intensity, and so on to the last, the color of which is nearly black-being twenty-four times the intensity of the first. On every page are printed a few phrases in black letters of different sizes. The amount of illumination available in a badly-lit apartment may be estimated by turning over the pages of this little book, held at a distance of about a foot from the eyes, until one can no longer read the line of letters of a selected size. With good illumination, the characters on the twentieth or even the twenty-fourth page may be read; but with poorer light legibility ceases at the tenth, or twelfth, or fifteenth page. The appliance is meant for indoor use exclusively, and must, of course, be employed with intelligent reference to the power of the eyes of persons making the test. But it is said to give fairly reliable comparative indications of the degree of lighting in a building; and it is likely to be useful in ascertaining the sufficiency of the lighting of class-rooms and public buildings intended to be used for educational purposes.

The Modern Steamer.

In order to appreciate the great development of the steamship, which borders on the marvelous, the Polytechnic says, we have only to make a few figures as to the possibility of propelling a vessel with oars at the calculated speed of the Campania. If it were possible to place 300 oars on each side, making 600 oars altogether, each worked by three men, there would be 1,800 men at work at one time. As they could not work continuously for twenty-four hours. but only for a total of eight hours each man, divided into four-hour watches, it would be necessary to have a crew of 5,400 men alone to man the oars. If six men could develop one horse the total horse power developed by handled by 1,800 men would be but 300, as against 30,000 in the Campania, or the same power would require the employment of 180,000 oars and a crew of 558,000 men to manipulate them. The first steamer built by the Cunard Company was the Britannia, which was launched February 5, 1840, or fifty-three years ago. She was built of wood, by Robert Duncan, at Port Glasgow, her length being 207 feet; breadth,

The total cost of the building was \$618,000, including the annex, which measures 312 by 550 feet.

In the interior thirty-seven States of the Union and thirty-five foreign nations exhibit agricultural products. Here may be found models of breweries with a capacity of one barrel of beer a day, exhibits of corn, maize, wheat and the complicated machinery used in their cultivation. Preserved meats, Apollinaris water, dairy products, sugar, bread, tea, coffee, spices, vegetable fibers follow one another in quick succession as the visitor hurriedly passes down the long avenues. Some of the oriental countries make choice exhibits, and here may be seen some of the possible uses of the to free your bubble from the pipe on which you blew. bamboo.

In the galleries are attractive exhibits of well known food preparations, with which we have been familiar from childhood, stare us in the face.

Soap Bubble Solution,

According to a communication recently made to the Academy of Sciences the following solution affords very thin and permanent bubbles:

Yellow resin	10 grammee.
Carbonate of potash	10 "
Water	100 c. c.

Boil until completely dissolved, and before use dilute 34} feet; depth, 22} feet; tonnage, 1,156; passengers the solution with four times its volume of water. It is carried, 115; cargo, 224 tons. The engines, by Robert somewhat difficult to float soap bubbles upon carbon Napier, were side levers, with two cylinders, 72 inches dioxide, because, if you managed, after ascore of trials, diameter by 82 inches stroke of piston, driving paddle wheels 28½ feet diameter. Steam of 20 pounds pressure it, the bubble usually bursts the moment it touches was provided by four fiue boilers, with twelve furnaces, which consumed 38 tons of coal per diem. The speed of your heavy gas. Mr. Newth lets us into the secret in food products, Quaker oats, Kingsford's starch his recent book. You must remove every trace of hy the vessel was 8½ knots, with the engine developing and Maillard's chocolate and a thousand and one drochloric acid, which is carried over with the gas, by 710 indicated horse power; coal consumption, over 5 washing, the presence of this acid being fatal to the pounds per indicated horse power : time in making the life of a soap bubble. voyage, 14 days.

Man in South America.

There is no part of the world that offers a more curious subject of speculation as to its future than the continent of South America, as was well set forth in an address before the American Geographical Society, by its president, Mr. Gardiner G. Hubbard.

That the Amazon river system alone drains a basin of fertile land basking under a climate of perpetual summer, greater in area than the whole of Europe, is an astounding fact in itself. This vast territory is practically uninhabited. Its aboriginal population is disappearing, or has disappeared, and the whites, who in sparse number take their place, scarcely pretend to come with the expectation of remaining. There are tracts as large as the whole of France of which we know less than of any equal area on the globe. Tribes of men are living there who are yet absolutely in the stone age, and who, even by barter or distant rumor, never heard of the European race or the use of metals.

The question up to which Mr. Hubbard leads his reader is second in importance to none in anthropology -that of acclimation. Is it possible for the white race, when it shall be endowed with all the resources of art and science which it is soon to have in its grasp, successfully to fight against the terrible odds of a tropical climate? He quotes in his favor the words of the historian, Buckle, and the naturalist, Bates; he might have added others of weight; but it cannot be doubted that most of the medical observers who have devoted themselves to this vast inquiry lean to the opinion that never will the white race flourish under tropical skies .- Science.

Dr. Nansen's Polar Expedition.

After three years' preparation the Polar expedition under Dr. Fridtjof Nansen has finally sailed from Christiania, Norway, for the North in the good ship Fram (Advance), the first vessel that has been especially designed and constructed for Arctic research.

The party consists of twelve men, including Dr. Fridtjof Nansen, as leader of the expedition; Lieutenant Scott Hansen, R.N., as scientific member; and Henrik Blessing, M.D., as surgeon and botanist.

The expedition sails in the vessel Fram, which is a model of strength, but she is a trifle too small for the enormous amount of stores with which she has been loaded and which have brought her so down in the water that the ice sheathing has had to be heightened, while giving her hull the appearance of something between a Dutch koff and a Thames barge. The accommodation on board seems too cramped for twelve men. The main cabin or saloon measures but 6ft.3 in. in height, 131/2 ft. in length, 16 ft. in width at the lower, and 11 ft. at the upper end, while the six sleeping cabins off it are diminutive. In the deck house are a small chart room and Dr. Nansen's study, both small in proportion, and on the whole it gives one the idea of being a neat little doll's house for twelve gigantic puppets. The stove in the saloon consists of an iron case in our builded-up strength we have thought possibly it containing numerous copper tubes, and is heated by paraffin lamps. Lighting will be electric or by means of lamps. The dynamo is worked either by steam, wind or hand power. A large windmill will be erected on deck, where there is also a winch which can be worked by four or more men, and, in order to give the hands sufficient exercise during the darkness, the latter will be daily resorted to in the winter months. The caboose, or kitchen, contains an ordinary cooking range, and also a very compact and handy copper stove heated by lamps, the gift of a London firm. The engines are triple expansion, and to obtain a speed of seven knots consume three and a half tons of coal a day, of which she carries a supply of about 350 tons, calculated for 200 days' continuous steaming at about four to five knots speed. The furnaces are constructed to burn petroleum, or even blubber, and under petroleum the vessel obtained on a trial trip the same speed as with coal.

The provisions are of various kinds, quantities being specially prepared on scientific principles, to give the men's stomachs the least possible expansion with the greatest possible quantity of nutriment. Clothing is furnaces and mills must stop, others must restrict proof many sorts, from woolen jerseys and underclothing duction, and, until that is done, we must expect the garments and waterproof British linen. to fur outer The sledges differ considerably from those taken by world. England is even worse than we are, but she Astrup for the Peary expedition, being much lighter, has endured the depression so long that she has closed from 9 ft, to 10 ft. in length, 11/2 ft. in breadth, and about 6 in. in height. They are said, however, to be wonderfully tough, and capable of bearing heavy disastrous the stop will be to some of these when the loads, and most are shod with German silver to protect the wood. Numerous Norwegian "ski" are also taken. The Fram carries seven large boats, including a naphtha cutter, of the ordinary sealing or whaling type, and will be used for the chase of walrus and seals and other sporting purposes, while two will be specially fitted for escape should any accident happen to the Fram herself. Last summer Dr. Nansen changed his plans, and announced his intention of proceeding, not via Behring Straits, but round the Norwegian and Russian necessary to prevent a block. A linesman was equal coasts, to the spot north of the Liakov Islands which to the occasion. He procured a piece of insulated wire, will be the starting point for the journey on the ice to and, after stripping each end of the insulating material,

chances of not reaching his destination at an early date are very considerably increased, as the ice in the Kara Sea may be impassable, and but very little is known of its conditions on the Siberian coast.-London Daily Graphic.

A TWIN DAISY,

Scores of adulatory verse have been written by poets of "the fields white decked with nodding daisies." Gross dozens of earthen flower holders have been filled, by blooming maidens, with daisies for conspicuous ornamentation. The more practical husbandman, however, utters imprecations till the atmosphere takes on a cerulean hue as he speaks of those pests of his field, "them common daisies."

A very uncommon one, however, is the subject of ur illustration. Not for its economic or pictorial aspect do we show this strange departure from the regular growth, but on account, first, of its oddity, a genuine twin daisy; and second, because if one daisy is good, two on the same stalk must be better.

Daisies were not made alone for poets, maidens, or farmers. There is our old grandmother, bless her soul! when we were ourselves so enfeebled by weakness as to have copious night-sweats, such as fairly saturated the bedding with our oozingstrength, she gathered some of these charming flowers and decorated the interior of the tin teapot with their beauty-practically steeped them into a tea and told us to drink freely of it, when cold. She knew better than farmer or poet that there were other virtues than verse and curse in this little creation of God. It stopped our night-sweats immediately, and



were better to have two daisies grow where but one grew before.

Steel for a Cent a Pound.

In a recent interview with the reporter of one of the Pittsburg papers, Andrew Carnegie, when asked about the condition of the iron business, replied : "Well, I do not need to say anything about that; it speaks for itself. One pound of steel for one cent! The robber baron has ceased to rob and is now being robbed. The eighth wonder of the world is this: 2 pounds of iron ore, purchased on the shores of Lake Superior and transported to Pittsburg; 2 pounds of coal, mined in Connellsville and manufactured into 11/4 pounds of coke and brought to Pittsburg; one-half pound of limestone mined east of the Alleghenies and brought to Pittsburg; a little manganese ore mined in Virginia and brought to Pittsburg; and these 41/2 pounds of material manufactured into one pound of solid steel and sold for one cent! That's all that need be said about the steel business. The capacity of the country to manufacture is beyond its wants. Some continuance of low prices. It is the same all over the many of her works. The longer all parties continue to run, the lower prices will become, and the more end comes."

plunge into the glacial stream is avoided, but the on the top of the car, held the other end against the wire. A connection being thus made, the car was run over the elevated structure to the car shed without accident or delay to the other cars.

Spiders and their Foes,

The spider, rejoicing over the captives ensnared in his silken meshes, and binding them securely in his larder as stores against hungry days, lives in continual danger of a righteous retribution, which awaits him at the hands of many foes; but the ghastliest of all is the ichneumon fly, which does not kill its victim, but merely paralyzes it and renders it a totally passive agent incapable of offering the smallest resistance to the cruel power which enthralls it.

I believe that the English representative of this family makes its nest underground, so it generally escapes observation; but the ichneumon fly of Ceylon works in full light of the sun, where all who care to watch its domestic habits can do so.

It is a green insect, in form resembling a wasp, with a marvelously thin waist. It makes its nest of wellworked clay, and then goes out on a hunting expedition. Its victims are invariably spiders of various kinds, but all are subject to the same mode of treatment. A scientific sting injects some poison which effectually paralyzes the luckless spider, who is then carried off to the nest and there fastened with a dab of moist clay. Another and another victim is brought to this chamber of horrors. Then the prescient mother ichneumon fly proceeds to deposit her eggs, one in the body of each spider, which can just move its legs in a vague, aimless manner, but can offer no resistance.

This done, the fly returns to her work as a mason. She prepares more clay and builds up the entrance to this ghastly cell. Then she commences a new cell, which she furnishes in like manner, and closes; then she adds yet another cell, and so proceeds till her store of eggs are all provided for, and, her task in life being accomplished, she dies, leaving her evil brood to hatch at leisure.

In due time these horrid little maggots come to life and find themselves cradled in a larder of fresh meat. Each poor spider is still alive, and his juices afford nutriment for the ichneumon grub, till it is ready to pass into its chrysalis stage, thence to emerge as a winged fly, fully prepared to carry out the traditions of its ancestors with regard to spiders, and to fulfill the purpose for which they have been created, according to ichneumon belief.

In California the spiders live in dread of a certain yellow-winged dragon fly, which darts upon them, stabs them, and devours them. One wary spider, which is there called tarantula, or, more properly, the trap-door spider, constructs for itself a house of refuge, where it retreats in the hour of danger. It is a wonderfully ingenious architect, and displays amazing skill and patience in contriving and constructing its home, which in truth is a fortress, with a strong door to keep out all besiegers.

The nest is a little well of clay sunk in some earthy bank, just large enough to admit an average-sized human thumb. The interior is smoothly polished, but this so-called tarantula is not content with bare plastered walls. She is a diligent worker, ever weaving dainty fabrics; so she lines her home with a double curtain-a hanging of coarse spider cloth next the wall, and over that a rich white satin material, smooth and glossy.

At the upper end of the well-like nest there is a circular door, fastened with a sort of hinge. It opens outward, so that when the spider goes out, it falls and closes of its own accord, and no foe would ever notice the little disk in the earthen bank, which is the only trace of the tarantula's home. But to make assurance doubly sure, the wary spider provides means to secure it on the inside. At the side furthest from the hinge it leaves several small holes in the disk, and by clinging to these with its claws it keeps the door tightly closed from the inside, so that no enemy can enter.

The door is in itself a marvelous contrivance, and a monument of patient ingenuity. Though barely the eighth of an inch in thickness, it is composed of thirty triple layers, each consisting of a coating of clay, lined with two ply of spider cloth similar to the tapestry within the nest. These ninety layers are all fastened together, making a solid door, which is largest on the outside, and fits into a groove, so that it closes quite tight. I suppose sufficient air for breathing purposes comes in at the keyholes. The yellow-winged dragon fly, against which the spider defends itself so securely, even endeavors to scratch open the closed door behind which its prey has taken refuge. But once within that portal, the fugitive is safe from winged foes. His chief danger then lies from the keen-eyed Indians, who know what a ready sale these curious silk-lined clay nets command among the pale-faced travelers from far countries, many of whom have already obtained very similar spider nests from the shores of the Riviera, and are anxious to compare the spider architecture of the Old World and the New .- C. F. Gordon-Cumming in

The Latest Form of Trolley.

According to the Baltimore Sun, the novel sight of a man taking the place of the trolley rod on an electric car was recently seen on the Lake Roland Elevated Railroad. The trolley on one of the large electric cars was caught in a wire, and the entire trolley apparatus was torn off, falling to the street. The accident happened at a time when the traffic was heavy, and it was the Pole. By adopting this latter route the sudden connected one end through the car roof and, standing Leisure Hour.

Algonquin Park.

The great forests of Canada have for years been suffering as much from fires and from reckless cutting as have the wooded regions of our own country, and this fact the thoughtful people of the Dominion have, fortunately, begun to realize. The public desire to interpose some check to the pitiless attack upon the woods, and to save a portion of what remains in its primeval condition, took form a few years ago in a project for establishing in the province of Ontario a forest reservation and national park, and commissioners to make inquiry concerning the matter were appointed in the spring of 1892. This commission, of ing of land for agricultural use, the cutting away of which Mr. Alexander Kirkwood was the chairman, made a report last March, and the bill prepared at their suggestion has since then been enacted as a law under the title of "An Act to Establish the Algonquin ory of the beautiful woodland scenery which once National Park of Ontario." Under this act a tract of land in the northern part of the province, some forty miles long and thirty-six miles wide, has been set apart "as a public park, forest reservation, fish and somewhere a remnant of country in its original congame preserve, health resort and pleasure ground for dition, so that the native and untamed beauty of wants of coming generations in this respect will be too the benefit, advantage and enjoyment of the province forest, lake and river may be enjoyed forever. Some lavishly provided for.-Garden and Forest. of Ontario," and the lieutenant-governor in council is empowered to add to the park any adjoining townships or parts of townships in which no lands have fied the primeval forests, are now almost forgotten been heretofore granted. Our experience in the case of the Adirondack Forest and elsewhere shows the therefore, of a large district in its original sylvan difficulty in setting apart any considerable part of the public domain when it includes scattered areas which have become the property of private individuals. Fortunately, although some of the timber included in Ontario's new park had been disposed of, the crown once abundant throughout Ontario, are becoming yellows cannot be prevented or cured by fertilization continued to hold the title to the land itself, so that scarce. Not many years ago the moose, the monarch of the soil. He therefore recommends that further no vested interests stood in the way of securing of the Canadian woods, browsed in the proposed complete possession. It is fortunate, too, that under reservation, herds of red deer grazed in every meadow. the laws of Ontario the park could be placed directly the beaver built his dam on every stream, and the leaf fibers of the United States has just been published under the control of the Department of Crown Lands, and that the governor in council was authorized to great game has been pursued with the same ferocity that the United States annually imports \$8,000,000 make all needed regulations for the maintenance and which has practically exterminated the buffalo on our worth of leaf fibers, a large proportion of which should management of the park, so that it was not necessary in the beginning to formulate any elaborate code of the district now set apart as a park for the province industry in the United States is increasing each year. administration. The commission, too, seems to have the carcasses of no less that sixty moose, which had and it is believed that if the fiber contained in the been singularly fortunate in that they were able to been killed for their skins alone. Surely it is wise to secure so large a tract and one which is shown by the fence in one spot in Ontario where these innocent the fruit has been gathered, it will add largely to the report to be in so many ways suitable for the purpose: tenants of forest and stream can be saved from the profitableness of the pineapple industry. it was to serve

little soil fit for cultivation, with few high hills, but safety. many successive ridges of Laurentian rock alternating with valleys and marshes. It lies on the summit field for experiments in systematic forestry on a limited opened and closed at the will of the operator. An which divides the waters flowing toward the Georgian scale. Forest fires and the operations of lumbermen electric light incased in a lantern is lowered into the Bay from those which flow into the Ottawa River, have diminished the quantity of pine still standing, net, the electricity being furnished by a motor in the and rises to a height of 1,300 or 1,400 feet above the but extensive areas within the park limits are still well: bow of the boat. As the boat moves along the netsea level. There is probably not elsewhere in the stocked with this valuable wood, and hard wood trees work is thrown open, and the bright light of the lamp, province a tract which, within the same small space, grow in great abundance in groves or mixed with pine. which is seen at a great distance in the clear water, gives rise to so many important streams, and the Besides white and red pines, hemlock, tamarack, arouses the curiosity of the fish, which readily swim

Scientific American.

supply of these streams. The park itself contains for experiments in every department of forest culture. large volumes of water in lakes, rivers, brooks and square miles, while the area of the land is 1,300 square miles. Fortunately, the forest cover of this region is practically unimpaired, so that it will not be difficult to preserve in their original condition these elevated lakes and the streams which run under overarching woods.

The park is a place of singular beauty. The clearthe timber for lumber, with the added ravages of fire, have almost effaced throughout the older settled parts of Ontario, as well as of the United States, the memprevailed all over the land; and while the preservation of forests in their original state is advisable for econokinds of trees, once common in Ontario, are becoming scarce; wild flowers and undershrubs, which diversiwhere they once abounded, and the perpetuation, conditions will afford a keen pleasure to the visitor as well as a field of study to the student, while for all it will preserve pleasing memories of the past.

Game, fur-bearing animals and some kinds of birds, bear, mink, otter, and marten were common. The own plains. In the spring of 1887 there were found in cruelty and greed which pursues them to the point of The site itself is an elevated area, containing but extermination, and where they can rear their young in

commissioners do well, therefore, to note that one balsam and cedar, there is an abundance of black into the trap.

of the most important functions of the reservation will birch, with maple, beech, ironwood, ash and bassbe that of maintaining and regulating the water wood. This variety of trees will furnish opportunities Nor is it unreasonable to suppose that so large a ponds, the entire water surface covering about 166 reservation will have a growing importance as a sanitarium. Its height above the sea level, its succession of hill and valley, lake and river, its groves of balsam and cedar and pine, which are supposed to have some specific value in curing certain diseases, combine to offer great advantages to invalids who are likely to improve under the conditions of an outdoor life in the pure air and at a high altitude.

Altogether, the establishment of Algonquin Park, a name which perpetuates the memory of the powerful Indian nation who held sway over this territory centuries ago, seems to mark an important advance in the development of Ontario. A hundred years hence it will be cherished as one of the most precious possessions of the province. It is to be hoped that these mic reasons, it certainly is also worth while to preserve reservations will be multiplied both in this country and in Canada. There is small danger that the

Peach Yellows.

The Agricultural Department has just issued a bulletin on the subject of peach yellows, prepared by Special Agent Erwin F. Smith. It embodies the results of four years' experiments with fertilizers to determine their value as preventives and cures of the disease. The experiments were made in the Middle States, and Dr. Smith says he is satisfied that peach experiments be abandoned.

The report made by Special Agent Dodge on the by the Department of Agriculture. Mr. Dodge says and could be grown in this country. The pineapple leaves of the plant can be successfully extracted after

Fishing by Electricity.

An apparatus for fishing by electricity consists of a Here, too, as the commission well points out, is a fair large iron frame interlaced with netting, which can be

RECENTLY PATENTED INVENTIONS. Engineering.

ROTARY ENGINE. - Wentworth Rice, Rapid City, South Dakota. This engine has a main cyl inder and two auxiliary cylinders, the latter about half the size of and one on each side of the main cylinder, the three pistons turning in the cylinders being secured will be covered, and the joints rendered absolutely wind on one main shaft. A cut-off valve is arranged close to and water tight. The sheets may be rapidly applied to the piston to shorten the inlet port for cutting off the a vertical wall or a roof having any degree of pitch, steam at any time during the revolution of the piston, to use the steam expansively in the cylinder. The engine is perfectly balanced and arranged to utilize the steam very economically and to the fullest advantage.

Mechanical.

TOOL HOLDER.—John C. Hunter, San Francisco, Cal. This invention relates to tool holders for rated positively, and is but little likely to get out of order. lathes, planing, shaping, slotting, and other machines. It provides a head made in sections, between which the tool is clamped, one of the sections being adapted to be seated in the stock. To securely hold the tool in proper position the sections are provided with recesses or grooves corresponding to the cross section of the tool, the latter being clamped in place by the screwing up of nuts. The device is of very simple and strong con-

Agricultural.

CATTLE STALL.-Jakob Aeberly, St.

Miscellaneous.

METAL ROOFING.-Benoit B. Detombay, Chenee, Belgium. Metal roofing sheets are, according to this invention, formed with parallel hollow ribs, with interlocking tongues on the edges of the sheets, the construction being such that the fastening rivets or nails making a very ornamental and extremely strong roofing. CASH REGISTER.-Charles J. Passick, eward, Neb. This is a register adapted to be secured beneath a counter, and to display to a purchaser when operated the amount of a purchase, which is also regis tered. The cash drawer can only be opened when one of the registering buttons is pressed. The device is ope-A gong is rung every time the drawer is opened

VENDING MACHINE.-Owensby H. Woodfill, Nevada, Mo. This is a machine especially adapted to deliver packages containing stamps, car tickets, etc., or small packages or books. A sight opening in the casing shows the coin deposited to work the me chanism of the machine, any smaller coin falling into the coin compartment without causing a delivery of the goods. The machine is designed to be of very simple. compact, and durable construction, and the invention covers various novel features of construction and combinations of parts.

floor. PAPER BOX.-Joseph T. Craw, Jersey City. N. J. This invention provides a blank in one piece, which may be quickly and conveniently folded to assume the shape of Noah's ark, thus affording a novel receptacle for fancy crackers, candies, etc. In a box thus made the articles may be packed without danger of the box coming open unless it is to reach the contents.

floors of varying height relatively to the warehouse

SOFA, TABLE AND BED.—Dennis W. Palmer, Gloucester, Mass. This is a combination piece of household furniture which may be quickly changed to fit it for one or another use. It consists of a frame having heads, each formed with a hinged section, a table hinged to the heads being adapted to form a back for the frame, and also to be supported on the heads, grinding wheel with knives on its periphery, and the while there is also a bottom head in sections hinged ogether, one of the sections being hinged to the frame.

BLIND STOP.-William W. Hoskins. Houston, Texas. A short metal rod attached to the lower end of the slat strip of the window blind is pivoted at its other end to a pivoted toothed segment swinging in a semicircular case fastened to the bottom rail of the shutter, the notches of the toothed segment being engaged by the tooth of a spring-pressed detent. Upon pressing upon the detent, the slats of the blind may be moved up or down and adjusted in any desired position, for the regulation of the light and air, the when released, locking the segment and slat strip

This table has a hingedleaf, supported when extended by legs adapted to fold at its side, the top surface of the table and leaf being padded, and the padded surfaces folding together when used simply as a kitchen table. A sliding board in front forms an ironing board for shirt bosoms, etc., and a sliding board at one end forms a bracket on which the irons may be placed. Α box is supported under the table by means of chains, the box being adapted to receive and store the sad irons, etc., and being arranged to be drawn up and locked in place on the under side of the table top. The table normally occupies only the space of the usual kitchen table, but may be readily opened out to constitute a large and very convenient ironing table.

CIDER MILL.—Clemment W. and Enoch G. Gest, Brazier, Ohio. The hopper of this mill has a hopper discharges into a chute at the bottom of which is a chamber with a horizontal slowly working plunger which is hollow and has a head covered with canvas to form a strainer. The press box is cone-shaped and its interior is lined with canvas, and by using the canvas lining in the press box and the strainer over the plunger the pulp may be ground very fine, none of it escaping through the fabric forming the strainer and lining.

WRITING TABLET AND COPY HOLDER. -George H. Munson and George B. Haines, New York City. This is a combination device more especially designed for the use of stenographers, to hold the book or tion for taking or ın prop tablet is provided with a holder pivoted to swing either to the front or back, while a support is pivoted on the sides of the tablet and keepers at the pivot ends of the support, the keepers having angular offsets to limit the outward movement of the support. The device is of very simple and inexpensive construction, but is designed to be a great convenience to stenographers and typewriters.

Paul. Minn. This is an improvement in stalls for milk cattle, providing therefor a feed crib protected by a pendent gate, to the lower end of which is hinged a cover, a shaft being attached to the gate and a flexible device on power, which may be held at any desired angle, and has the cover, whereby the latter may be adjusted toward or $\dot{}$ an automatic feed, has been provided by this inventor. from the feed crib. The arrangement is such that when Wihe drill-holding frame is supported by a strap from the the gates and covers are closed the animals will naturally body of the workman, who will ordinarily turn an opestep rearwardly, and maylie down upon clean platforms, rating crank by hand, pulling back a hammer against thus enhancing their comfort and conducing to their the tension of springs, the hammer upon its release regular feeding.

THRASHING MACHINE ATTACHMENT. Alfred Gilmore, Stillwater, Minn. This is a device to be substituted for the usual cylinder and concave in machinesforthrashing flax. Adjacent to the feed rollers is a group of thrashing rollers comprising lower supporting rollers upon which rests an upper pressing roller, composed of independent disks, guides bearing against the located in advance of the thrashing group of rollers. As the flax straw fed to the machine varies in thickness the disks of the pressing roll rise and fall, while pressing equally upon the straw throughout the length of the thrashing rolls, preventing the escape of unbroken heads without breaking or injuring the straw.

ROCK DRILL.-Harvey P. Jones, Den- in position. ver, Col. A drill adapted to be operated by hand or

striking upon the shank of the drill. The rebound of

the drill is taken up by a special mechanism, and the drill $% \left[{\left[{{{\mathbf{x}}_{i}} \right]} \right]$ is turned at each blow, the mechanism being such that by a moderate turning of the crank a rapid succession of powerful blows will be struck and the drill will be held up to its work all the time.

Kuckartz, Portland, Oregon. A framed structure having ends of the pressing roller, while a flexible armed beater is at one end a hinged, wedge-shaped apron and flap plate is hereby provided, to forman improved removable gangway from a warehouse to a car or the reverse. The device is of simple construction, and adapted for easy stowage below the floor of the warehouse, while convenientfor extension therefrom and adjustment forservice.

DOOR HANGER.-Theodore C. Prouty, St. Joseph, Mich. This invention relates to an im provement in trackless door hangers, two hangers being used with each door, and the construction admitting of such connection that when the door is closed or en tirely open it rests upon the floor, while in its movement from a closed to an open position, or vice versa, the door is raised above the floor or carpet. The device is

designed to be simple and durable, and not liable to get out of order when fitted to a door.

WAREHOUSE GANG PLANK.-Lonard spraying nozzle, by means of which the plants may be manipulated to simultaneously drop the predetermined easily and thoroughly sprinkled in every direction, without danger of breaking or injuring them in passing the nozzle between the branches. The outer end of the hose section, to be placed in a pail or other vessel containing water, is provided with a filter to prevent the

assage of impurities or obstructions

KITCHEN AND IRONING TABLE.-Mrs. being also adjustable in its parts to suit cars having Johanna Voos, 76 East 86th Street, New York City. of this paper.

MEASURING PROPORTIONAL PARTS FOR MIXTURES.-Alexander K. Suddoth, Memphis, Tenn. This invention provides a conveniently manipulated

WINDOW GARDEN SPRAY .- Benjamin gauge for determining the amount of any two or more F. Sill, Long Island City, N. Y. In a short section of articles to be combined to make a mixture, the articles hose is a compressible bulb formed integral with a being placed in separate compartments, and the gauge quantities. The gauge is especially adapted for dental use. for regulating the proportionate amount of mercury and amalgam, or other articles constituting a filling or for use in making a plate.

> NOTE .-- Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date

NEW BOOKS AND PUBLICATIONS.

QUALITATIVE ANALYSIS TABLES, AND THE REACTIONS OF CERTAIN OR-ANIC SUBSTANCES. By E. A. Letts. Belfast: Bayne & Boyd. 1892. All rights reserved. Pp. 91.

This is one of those books with elaborate tables de signed to lie upon the working table of the chemist or on his desk, to be referred to constantly. Its excellent and clear printing, its selection of subjects and its full index make it of particular value for this purpose.

THE PERFECT CALENDAR EOR EVERY YEAR OF THE CHRISTIAN ERA. By Henry Fitch. 1891. New York: Funk & Wagnalls Co. 8vo. Pp. 37. Price 50 cents.

Perpetual calendars are by no means new, but the pre ent work appears to have solved the difficulty of farnishing a perfect perpetual calendar which is simple and intended for everyday use. With this little book all the difficulties of old style and new style are brushed away. A brief history of the calendar is annexed.

ANNUAL REPORT OF THE MINISTER OF PUBLIC WORKS FOR THE FISCAL YEAR 1890-91. Parts I and II. Ottawa. 1893. 8vo. Pp. 231, 419. Price 50 cents.

Canadian annual reports, Part II, contains the water levels of the river St. Lawrence between Quebec and Montreal. Illustrations to accompany Part II come in a separate volume, price 90 cents

CYCLOPEDIC REVIEW OF CURRENT HIS-TORY. First quarter 1898, A. S. Johnson, A.M., Ph.D., editor. Buf-falo: Garretson Cox & Co. 8vo. Pp. 214. Illustrated. Price 40 cents.

This is not a new publication, as it is numbered vol. 3, No. 1, but it has changed hands. The Review is intended to give a clear and dispassionate view of the events of contemporary history. Some of the headings are as follows : The Behring Sea dispute, the Hawaiian question, the reciprocity policy, U.S. politics, the merchant marine, cholera, necrology, disasters, silver ques tion, etc.

Any of the above books may be purchased through this office. Send for new book catalogue just pub lished. MUNN & Co., 361 Broadway, New York.

SCIENTIFIC AMERICAN BUILDING EDITION

AUGUST, 1893.-(No. 94.)

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- 2. Plate in colors showing the colonial residence of L. Allyn Wight, at Montclair, N. J., erected at a cost of \$15,400 complete. Perspective view and floor plans. Messrs. McKim, Mead & White, archi tects, New York. An attractive design.
- 3. A cottage erected at Portland, Me. Perspective view Me.
- 4. A Queen Anne cottage, erected at Wayne, Pa., at a cost of \$6,000 complete. Floor plans, perspective view, etc. Messrs. F. L. & W. L. Price, architects, Philadelphia, Pa. An excellent design.
- 5. Engraving and floor plans of a dwelling recently erected for A. B. Root, Esq., at Springfield, Mass., at a cost of \$2,500 complete.
- 6. Engraving and ground plan of Grace Episcopal Church, at Plainfield, N. J., erected at a cost of \$40,000, complete. Mr. R. W. Gibson, New York City, architect.
- 7. A dwelling recently completed at Brookline Hills, Mass., at a cost of \$5,120, complete. Perspective elevation and floor plans.
- 8. A cottage at Elm Station, Pa., erected at a cost of \$3,900, complete. Floor plans and perspective.
- 9. Wood and stone dwelling at Narberth, Pa. A unique design. Perspective elevation and floor plans. Estimated cost \$5,000, complete.
- 10. Design for a village library.
- 11. The Fifth Avenue Theater, New York. View of the family circle and of the handsome drop curtain. Mr. Francis H. Kimball, architect, New York.
- 12. A suggestion in corner decoration. Bay window

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication. References to former articles or answers should

References to former articles or answers should give date of paper and page or number of question.
 Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
 Special Writien Loformation on matters of personal rather than general interest cannot be expected without remuneration.
 Scientific American Supplements referred to may be had at the office. Proc 10 cents each.

Books referred to promptly supplied on receipt of

Minerals sentfor examination should be distinctly marked or labeled.

(5286) L. R. B. asks: Could unused arc lightcarbons be used with advantage as positive poles of batteries ? If so, how are they best arranged in cell and and floor plans. A model design. Cost \$3,400 what solutions should be used? What would be the E. M. complete. Mr. J. C. Stevens, architect, Portland, F. and resistance of such battery? A. The electric light F. and resistance of such battery ? A. The electric light carbons can be used as you suggest. If they are copper coated, the copper must be removed by means of mtric acid. The solution used in zinc carbon batteries is made by dissolving bichromate of soda in water, making a saturated solution, and slowly adding to this solution one-fifth of its bulk of commercial sulphuric acid. The zinc should be amalgamated.

> (5287) J. B. T. asks: Will you kindly nform me through your paper where I can get some information about oxidizing silver or if you know of a good formula to be used for that purpose ? A. Dip the elean silver article in a solution of sulphide of pota (liver of sulphur), 2 drm. to a pint of water. Heat this solution to a temperature of 175° F. Immerse for a few seconds only, when the article becomes blue black. For a velvet black, dip the article, previous to oxidizing, in a solution of mercurous nitrate and water and rinse. Then dip in the sulphide solution as above. For a brown shade, oxidize in the potassium sulphide as above, then dip in a liquid composed of 10 parts blue vitriol and 5 parts sal ammoniac to 100 parts vinegar. After oxidation brush with a scratch brush very lightly, to brighten and variegate the surface.

(5288) B. L. Association writes: An electric lighting company contracts to light the streets of our city with arc lights of 2,000 standard candle power each. What is the standard candle of comparison, and how may we know, with reasonable accuracy, what power lights we are furnished with ? Is any book published which gives full information in regard to the strength of lamps and lights as furnished by electric lighting companies, and method of measuring same ? A The candle power is nominal; 2,000 candle power really equals the light of about 800 sperm candles, each burning 120 grains per hour. Your contract should specify current and potential. We cannot recommend a book cov ering the precise ground which you specify. (5289) J. C. C. writes: I have come cross a number of open circuit batteries with the binding posts so corroded by the action of the solution as to make them useless. After the batteries have been charged, would it not be advantageous to put on top a tablespoonful of heavy oil, to stop the salt from keeping; or would this be injurious to the life of battery ? A. Oil can be used as you describe. It has the objection of being dirty. It is a good plan to give a coating of paraffin to theupper half inch of the jar.

not advisable. With a proper mixture they can be made serviceable. It is doubtful if plain black pitch would answer. 2. What shall I use to seal the above cells ? Also rubber and glass cells ? A. The cells should not be sealed, as, in charging, gas is often evolved. They may be partly closed by any form of stopper; best of ubber.

(5291) H. J. S. asks for a formula of a omposition or name of a substance which when placed in water will assume larger proportions, and when removed from same will not resume its original size, but remain compact and hard? A. Compre soft wood, such as holly, answers your requirements

(5292) P. S. asks: Will the motor decribed on page 497 in "Experimental Science" run the dynamo described on page 487? Will there be any gain in strength of current? A. With sufficient current the motor referred to will drive the dynamo, but there will be no gain in strength; on the contrary, there will be a loss of from 25 to 50 per cent.

(5293) J. J. S. writes: I run a small desk fan attached to a No. 1 Porter motor on the regu ar incandescent light wires. To prevent fuse melting it is necessary to put a lamp in the circuit , but the fan will only run with a 32 c. p. lamp, 1 or 2 16 c. p. lamps having no effect whatever. Can you give the reason for this, and also if I can run the fan without any lamp in the circuit? A. Without introducing some resistance in the circuit along with your motor, the motor takes an amount of current which is sufficient to heat and melt the fuse. Probably your motor is running very uneconomically. If it were wound with fine so as to have a suitable resistance, it would take the requisite amount of current and run with much greater economy. It is important, in connecting up a motor in an electric circuit, to have the motor adapted to the current and electromotive force

(5294) P.J.L. asks whether illuminaing or fuel gas can be made from the action of sulphuric acid upon zinc, and its gas forced through a carburetor for a commercial value, and, if so, at about what cost? And further, does this make a better ga for illuminating purposes than air carbureted which contains no acid gas? A. The gas you describe cannot be made commercially, as it is very expensive. It makes a better gas than carbureted air.

(5295) E. J. M. asks at what time the ancient classification of four elements was made and by whom ? A. Earth, air, fire, and water were elements enumerated by Empedocles. Ether was added to these as a fifth element. The division undoubtedly preceded Empedocles' time.

(5296) A. B. C. asks: 1. I inclose a sample of some mineral which is found near this town; it is found from four to six feet below the surface of the ground among gravel, and it is also found embedded in state stone. I tried to melt some of it, but when it reached a dull red heat it took fire and burned with a blue flame and smelled very strong of sulphur. The figme does not last long, but it stays hot a long time. I also inclose a sample of stone resembling slate, which when broken smells like petroleum, and when heated gives off a gas which burns. Please tell me what they are. A. The mineral sent is iron pyrites in shale, of no value. 2. How much weight will a straight electro-magnet lift, the core of which is made of 1/4 inch iron, 3 inches long, and wound with 4 layers of No. 18 doublewound wire, if a current of one volt E. M. F. is sent through it, the distance of the weight from the pole of the magnet being 1/8 of an inch? A. Your magnetmight lift 2 ounces. A magnet of this form is not well adapted to lifting or sustaining weights; better use a magnet of horseshoe form. 3. Should the air be kept out of a sal-ammoniac battery ? A. Sealing the battery prevents evaporation. If your battery has a porous cell, the sealing should be perforated to allow the escape of air on the entrance of the solution into the porous cell. 4. In making an electro-magnet what rule is there for finding the amount of wire required for a given size of iron ? A. The common rule is to make the depth of the winding equal to the diameter of the core. 5. What is meant by ampere turns? A. An ampere turn is the equivalent of one ampere carried once around a magnet core; thus the passage once around the core of one ampere is an ampere turn, or 10 turns of a wire carrying one-tenth ampereis an ampere turn 6. How many ohms are required to destroy the effects of one volt on a delicate galvanometer? A. It is doubtful if any amount of resistance would entirely destroy an E. M. F. of one volt. Much depends upon the sensitiveness of the galvanometer

(5297) F. L. A. asks: 1. How to putthe black finish on brass. A. The fine black finish on brass is made by dipping in a solution made of 5 drachms perchloride of iron dissolved in one pint of water. Also by rubbing the surface with chloride of platinum salt moistened. 2. What causes the alternate circles of light and dark under the electric light? A. The band shadows under the electric light are probably the effect of diffraction, possibly intensified by reflection from the inside of the globe. 3. Where can I buy Clerk

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August 15, 1893,

AND EACH BEARING THAT DATE.

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(5290) F. R. C. asks: 1. Will wooden | the moderately rounded hand with forward stroke; it is cells, well lined with black pitch, about 1/2 in. thick, be | natural for the action of the muscles and admits of great durable for storage cells ? A. The use of wooden cells is 'speed.

Maxwell's work and what is the price? A. We mail J. Clerk Maxwell's "Theory of Heat" for \$1.25; "Elementary Treatiseon Electricity," \$2.25; his larger work in two volumes on "Electricity and Magnetism," \$8. (5298) F. W. P. asks: 1. How cap I re-

duce stick phosphorus to a powder, or to a form I can handle in making an alloy ? A. Use red phosphorus. Stick phosphorus cannot be powdered and is very unsafe to work with. 2. Can mercury be deposited on brass so that it will not scratch off ? If so, how? I have a bell metal gong I wish to make a reflector of. A. This is an impossibility as far as a practical reflector is concerned. Silver-plate it.

(5299) R. A. G. writes: Will you please tell me which is the best system of penmanship for a telegraph operator's use-whether back or forward hand, which can be written the faster, also where can I get the system you recommend ? A. The best system of penmanship for telegraphic, i. e., receiving, is that which is simplest and quickest to execute. This appears to be

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