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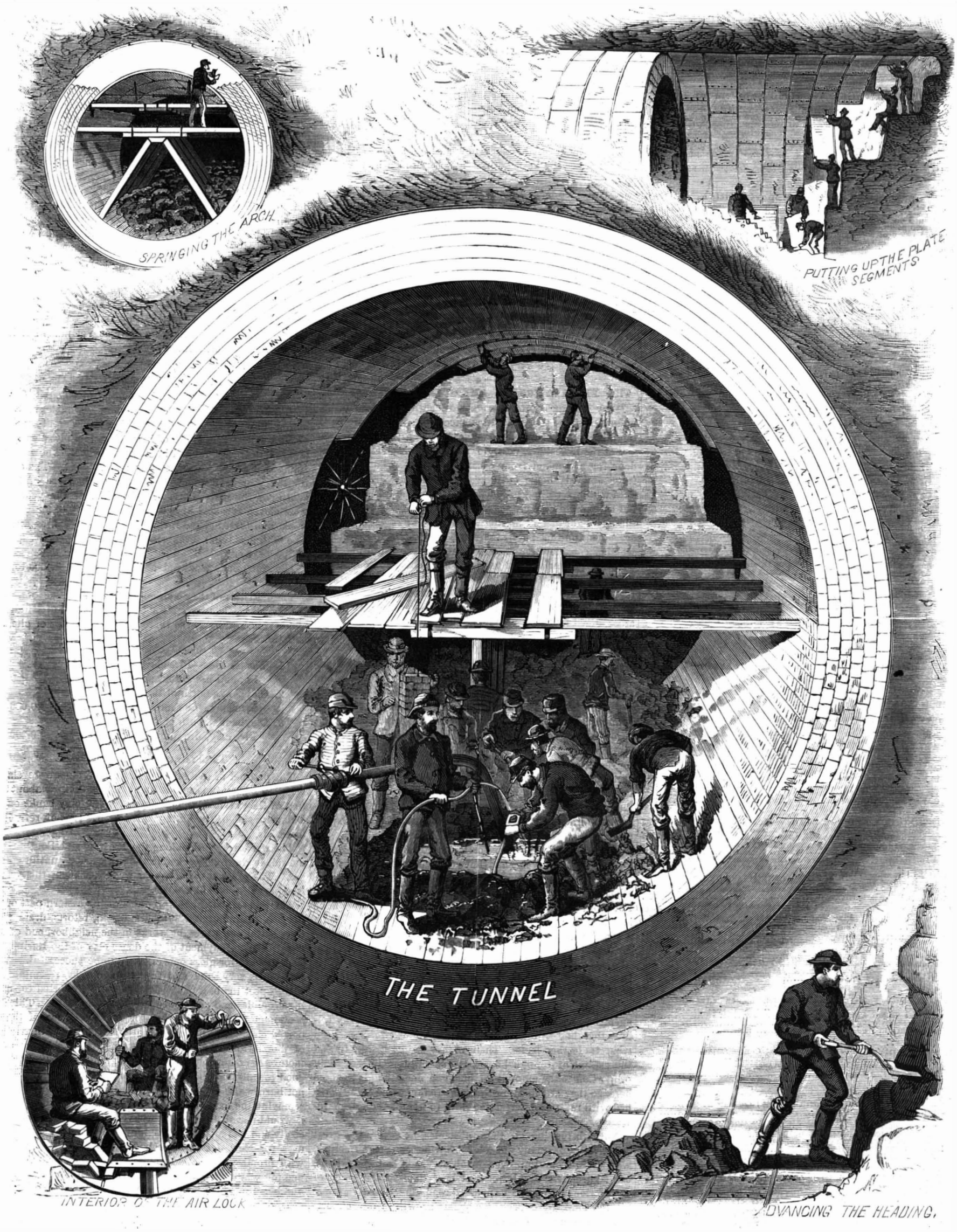

THE GREAT TUNNEL UNDER THE HUDSON RIVER BETWEEN NEW YORK AND NEW JERSEY.—[See page 290.]

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NEW YORK, SATURDAY, MAY 8, 1880.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 227,

For the Week ending May 8, 1880.

Price 10 cents. For sale by all newsdealers.

WHITE NICKEL BRONZE.

Pending the legal decision of the questions at issue with regard to processes of nickel-plating, manufacturers of nickelized wares are likely to be specially interested in a plan which is being developed in France looking to the substitution of nickel bronze for nickel plated iron or brass.

An ore of nickel, garnierite, is found in extensive deposits in New Caledonia, the French penal colony east of Australia, and are there worked by Messrs. John Higginson & Co., of Nouméa. On preliminary roasting the garnierite yields a regulus containing from 60 to 70 per cent of nickel, which is shipped to the works of the French company, at Septèmes, near Marseilles, where it is smelted into ingots and granules containing 99½ per cent of pure nickel and ¼ per cent of utilizable metallic substances. The extent of the mineral deposits in New Caledonia, the reduction in the cost of freight owing to the concentration of metal through the preliminary fusion, and the economy effected by the new methods of reduction devised by M. Jules Garnier, enable the company to sell the pure metal at about one-half the price it obtained three years ago.

After many experiments the company have succeeded in rolling and forging the pure metal; but greater success is attained by mixing the pure metal with various proportions of copper, zinc, and tin, forming nickel bronze. Twenty per cent of nickel suffices to give the desired tint and to secure inoxidizability. All articles now made of brass or copper, nickel plated, can be produced in solid bronze by the same processes and with the same plant, and at practically the same cost. So made they are 20 per cent stronger, and may generally be much lighter. Its great strength and the property of non-oxidization make this alloy eminently suitable for mathematical and musical instruments.

A small quantity of nickel added to steel increases its hardness and renders it inoxidizable, while edge tools made of the alloy stand better than those of ordinary steel. A nickel bell metal is also found to give good results. The Paris Exhibition of 1878, says the *Journal of the Society of Arts*, proved the action of a totally new system of metallurgy in connection with this beautiful metal; and that of 1879 showed its practical introduction into most branches of manufacturing industry.

THE EXPORTATION OF AMERICAN MANUFACTURES.

Many of our manufacturers have suffered grave disappointment from the difficulties encountered in obtaining a lucrative foreign trade. To make the best article of its class, and at the lowest first cost, do not of themselves open the door for a demand from other countries. The manufacturer and his home customers may, indeed, be the only ones who are willing to concede that his product is the best, but supposing that proper means have been taken to inform the buyers of distant markets, and that there may be tacit agreement on this point, there are still other and quite as weighty considerations which enter into the problem. Our exports of manufactured goods in any considerable quantities commenced but yesterday, as it were. The agricultural interests have so largely predominated here that the growth of any one manufacturing industry has been generally gauged by the approximation we were making to the supply of the home demand, and in almost every department, except in articles of food, we have always heretofore been large importers. In 1873 there commenced a steady diminution in our imports, with a corresponding growth in our manufactures. In this way we at once cut down the largest and most valuable trade of the manufacturers of England, France, and Germany. They have had hard times there, and reduced the prices of many kinds of goods to so low a figure that, with wages much below ours, it has been impossible for their manufacturers to make the 2½ or 3 per cent interest on their capital which is the most that many of them expect, It is, therefore, with foreign competitors in this condition that our manufacturing industries have become so flourishing as to lead to large expectations of a profitable export trade.

More than this, also, the foreign manufacturers who used to supply us so largely, and have labored so strenuously to maintain their hold, have likewise been the caterers for the other foreign countries to whom we now desire to sell goods. For more than half a century English manufacturers have had branch agencies in nearly every quarter of the globe where it was possible to find a market for the productions of English workshops, and, to a less extent, this has also been true relative to French and German productions. They have well established business relations, and know the wants of customers, thus holding a great advantage, even as against better goods at lower prices. And with these agencies, as with their principals at home, it necessarily follows that they will make the most strenuous efforts to keep what trade they have. Their money is invested in it, and the capital of foreign houses is generally much larger in proportion to the amount of business done than is the case here, so they are able to give long credits, while being satisfied with rates of interest too low to tempt American investors.

Notwithstanding all these obstacles, however, the great superiority of many articles of American manufacture, which, from our improved machinery and better methods, can be produced at a lower cost here than similar goods of an inferior quality can be made abroad, undoubtedly affords solid grounds for expecting a steady growth in our exports of manufactures. Comparing the imports for the year ended June 30, 1879, with our receipts of foreign manufactured goods in 1873, the great falling off which has been shown in six years ought to be as encouraging to us as it has been discouraging to foreign manufacturers. In watches and watch movements this decrease amounted to $2,354,226; in manufactures of cotton, $14,821,141; in flax goods $5,734,549; in iron and steel and their manufacturers, $49,861,304; in copper and its manufactures, $3,392,389, and in lead and its manufactures, $3,183,813. In nearly all of these articles, however although we still continue to be liberal importers, we have a steadily growing export trade—nothing to be compared to the great increase we have had in the exports of farm produce, it is true, but amply sufficient to prove that our manufacturers, while rapidly covering the field at home, are successfully competing for foreign custom. The results have thus far, in many cases, seemed small, in proportion to the efforts put forth, but this is just where the characteristic impatience of American manufacturers and the nervous impetuosity of American business men are most apparent. They do not fully appreciate the character and extent of the competition they have had, and are far from attaching such importance to the progress they have already made as is given to it by their foreign competitors themselves. It has been a life or-death struggle with the latter, and, with every advantage they have had, they now see that American competition, which was scarcely known ten years ago, will have to be met hereafter in all the leading markets of the world, in every prominent description of manufactured goods. In cotton and woolen manufactures, in machinery, railway supplies, and general hardware, as well as in hundreds of minor articles of which we formerly imported a large part of what we consumed, they see that the manufacture is now established here on such a basis that they will have more to fear from us hereafter than they have heretofore had from competition among themselves. The recent advance in tariff rates by Germany, the efforts to impose higher duties by France, the talk about "protection" even in England, all have their origin in the fear of American goods, and such considerations should encourage our manufacturers to put forth still further efforts in many branches of business where we have as yet made but little more than a commencement.

NEW JERSEY MINES AND MINERALS.

The annual report for 1879 of the State Geologist, George H. Cook, gives, in addition to other valuable matter, a large amount of information touching the mineral resources of New Jersey. The list of iron mines includes nearly 300 separate openings, ranged in four parallel belts known as the Ramapo, Passaic, Musconetcong, and Pequest. The output for the year 1879 was 488,028 tons, an increase of 19 per cent upon the year before. At the close of the year there were eleven furnaces in blast with a capacity of 3,210 tons a week, and three spiegel furnaces making 132 tons a week. The State has in all seventeen stacks, with a yearly capacity of 200,000 tons.

The zinc mines produced a little short of 22,000 tons of ore.

The statistics of the clay deposits give evidence of a prosperous year. The figures for the clay district of Middlesex County, according to the three principal groups of pits, are as follows:

	Tons.
1. Woodbridge—Fire clay, fire sand, kaolin, and fire brick, shipped	115,060
2. Claybanks north of the Raritan River—Fire clay, fire sand, and kaolin	90,000
3. Claybanks south of the Raritan River—Fire clay, fire sand, and kaolin	60,000
Total refractory materials	265,060

The product of the mines and pits of stoneware clay in Middlesex County is set down as 10,000 tons, or about half that of the previous annual output. The clay banks on the Delaware side of the State yielded 31,847 tons of refractory materials.

The red brick works along the Raritan and South rivers did not begin to be worked to the full capacity until September. The product for the year was 87,000,000; this year it is expected to be 110.000,000.

The greater part of the products of the eastern part of the State is manufactured into fire brick, retorts, drain pipe, terra cotta, and wares, at works in the neighborhood of the pits. The employment of the dense clay of the Raritan fire clay stratum for glass pots is likely to be successful. This clay burns very solid and free from checks, resembling in this respect the best of the foreign clays imported for making crucibles and glass pots and strong fire brick. This clay is abundant, and can be sold for half the price of the imported clay. The finer grades of white clay from the vicinity of Woodbridge and Amboy are extensively used in the manufacture of cream-colored and white granite wares. They are good for mixing with the less plastic Delaware clays, but do not burn white like kaolin clays. A practical method of removing the oxide of iron would be a valuable discovery, as it would permit the use of these clays in place of the more costly and less plastic clays now employed. Several new uses for New Jersey clays have been recently developed, with promise of great advantage to the State. The potteries making white ware at Trenton, Elizabeth, and Jersey City number 101 kilns, producing $2,500,000 worth of wares a year, or more than half the whole product of the country. They employ 3,000 hands, and pay out $1,250,000 a year in wages.

In the course of the year there were 38 glass factories in operation in the State, each employing from 50 to 75 hands. In addition to supplying these works the glass sand pits along the Maurice River sell from 10,000 to 15,000 tons of sand for consumption in adjoining States.

The yield of greensand marls in the marl belt crossing the southern half of the State is large, and the supply is practically inexhaustible. No attempt was made to collect the statistics of lime burned in the State.

A large and valuable map accompanies the report, showing the leading features of the economic geology of the State.

THE COMMISSIONERSHIP OF PATENTS.

The President has nominated and sent to the Senate for confirmation the name of the Hon. Edgar M. Marble, of Michigan, to be Commissioner of Patents, in place of Gen. Paine resigned. It is understood that the new Commissioner takes his seat May 1.

This appointment will, we feel confident, give very general satisfaction. Mr. Marble is by profession a lawyer, and for a considerable time past has been Assistant Attorney-General of the United States in the Department of the Interior, where his labors have always been distinguished by marked ability. He is an enlightened and commanding man, in the prime of life—45 years—agreeable manners, sterling integrity, quick perceptions, and judicial mind. He believes in hearing both sides of a case carefully before deciding. We think that the interests of patentees and inventors will at his hands be promoted, and that the affairs of the Patent Office will flourish so long as he occupies the Commissioner's chair.

The retiring Commissioner, Gen. Paine, has been very successful in his management of the Patent Office, and his departure occasions general regret. During his term he thought it necessary to introduce a number of new rules of practice, some of which are regarded as mere additions to the length of official red tape. But it must be admitted that, as a whole, Gen. Paine's administration has been an able one. Some of his decisions in patent cases have a high value for their clear and original method of interpreting the law, and will always rank with the ablest documents among the official records.

THE EDISON LAMP TESTS.

To the Editor of the Scientific American :

Your correspondent, Mr. William C. Ramsdell, in his letter of April 9, in your issue of May 1, p. 281, shows that he is unacquainted with the very elements of the subject about which he writes, and criticizes the conclusions reached by myself and others only because he does not understand them.

In the first place he seems to think that electromotive force is the same thing as the energy involved or work done in a given circuit. If he had examined any of the text books on electricity he would have found that electromotive force expresses simply the specific power which any combination (battery or magneto-electric machine or the like) possesses for causing the transfer of electricity from one place to another. In a given couple, say a Smee battery, it is the same in a cell the size of a thimble and in one as large as a bath-tub.

It is very correctly measured by the product of the current into the resistance where these are known, but when its value is obtained we have *not* found that of the energy expended or work done in the same circuit. For the latter we must have the product of the current *squared*, into the time, into the resistance, into the constant .737335, if we would express the result in foot pounds.

Had Mr. Ramsdell been acquainted with these matters he would have been saved the absurdity of announcing that it would require the same expenditure of fuel to run twelve lamps as it would be needed to run one.

It is curious that this *reductio ad absurdum* of his own did not open his eyes. Why should he stop at twelve lamps? His own method of calculation would give him the same result with a thousand, or a million, and thus reduce the cost of lighting the country to that required for one lamp.

It is hardly necessary to point out that in the calculations made in our paper it was *not* assumed that the twelve lamps were in series.

Theoretically it would make no difference as to the total energy expended how they were arranged, but, of course, any one acquainted with the subject would know that to place them in series would introduce great practical difficulties. Our calculation as given is correct for an arrangement in parallel circuits; but Mr. Ramsdell's calculations are simply absurd.

Yours truly,

HENRY MORTON.

Stevens Institute of Technology, Hoboken, N. J., April 23.

THE NATIONAL ACADEMY OF SCIENCE.

The spring meeting of the National Academy of Science was held in Washington, April 20–23. The attendance was small. At a private session an amendment of the constitution was adopted limiting the number of members in the future to one hundred. Major J. W. Powell and Professor William H. Brewer were elected members, making the prescribed number complete. Professor Alexander Agassiz, of Cambridge, was chosen Foreign Secretary in place of Professor F. A. P. Barnard, whose term of office had expired. The Council elected for the ensuing year comprises S. F. Baird, Wolcott Gibbs, Asaph Hall, J. E. Hilgard, Clarence King, and Simon Newcomb.

Quite a number of scientific papers were read. The first was by Professor A. Agassiz, on "The Sea Urchins of the Challenger Expedition." A paper by Professor A. S. Packard, Jr, on "The Internal Structure of the Brain of Limulus Polyphemus," was read by Dr. Coues. Prof. O. C. Marsh discussed at considerable length "The Size of the Brain in Extinct Animals," reaffirming the law of brain growth enounced by him two or three years ago. Mr. D P. Todd, of the Nautical Almanac office, in a paper on "The Use of the Electric Telegraph during Total Eclipses Applied to the Search for Intramercurial Planets," gave a plan by which observers of the eclipse of 1882 might telegraph their discoveries from station to station, and so confirm and extend each other's work.

On the third day of the meeting papers were read by F. M. Green on "The Telegraphic Determinations of Longitude by the United States Hydrographic Office;" T. S. Hunt on "The Tatonic System of Geology;" S. P. Langley on "An Instrument for Measuring Radiant Heat, and on the Composition of Colors;" E. S. Holden on "The Nebula of Orion;" Theodore N. Gill on "The Distribution of Zeus Conchifera;" William Harkness on "The Solar Corona;" E. S. Morse on "An Early Race of Man in Japan." On account of the number of papers remaining for presentation, an extra session was held on the 23d.

It was decided to hold the Fall meeting in this city, beginning November 16.

NEW YORK ACADEMY OF SCIENCES.

At a meeting of the New York Academy of Sciences, held Monday, April 19, 1880, Prof. J. S. Newberry in the chair, Mr. I. C. Russell delivered an address on

RECENT OBSERVATIONS ON THE GEOLOGY OF HUDSON COUNTY, N. J.

From a study of the very large number of wells sunk in Hudson county, Mr. Russell had prepared a diagram showing the general stratification of rocks to be as follows: Shell heaps accumulated by the aborigines, sand dunes, glacial drift, red shales and sandstones, trap rock, sandstone and shales, serpentine, quartzite, and gneiss.

A large portion of the address was devoted to tracing the trap rock formation from the Kill-von-Kull, along the Bergen hills, the Palisades along the Hudson, and up to Haverstraw, where it reaches the height of a thousand feet. The general dip of the formation is 15° to the northwest. Both above and below it are found strata of triassic shales and sandstones. Specimens were exhibited showing the metamorphosis of these rocks where they came in contact with the trap. The whole configuration of the trap rock formation will be understood, as was shown by a diagram, if we imagine a stream of trap coming up from below and crowding out the sedimentary rock before it, chiefly following the direction of the strata, but now and then breaking through and forming branches from the main stream. These would then be partially exposed by subsequent erosion. There is every evidence that the surface erosion of this vicinity was a tremendous one. Upon following out the slope of the strata on both sides of the Bergen hills, and calculating the height, it will be found that they must have once formed mountains at least seven thousand feet high. This agrees perfectly with the theory proposed by Dr. Newberry, that the whole continent in the vicinity of New York City was once far more elevated above the sea level than it now is.

The denudation of the trap on the Bergen hills by erosion, and especially by glacial action, has given rise to peculiar conditions of drainage. Numerous basins without any outlet were hollowed out in the trap and filled with drift by the glaciers. It is evident that in such localities there can be no natural drainage, but that all impurities will accumulate and exhale poisonous gases. Yet wells have been known to be sunk in the drift and the water was used for drinking. On the western slope of the hills the retentive character of the drift does not interfere with the drainage.

The address was full of detailed information and illustrated by specimens and diagrams. In commenting upon it, Dr. Newberry expressed his gratification that it confirmed his views concerning the igneous nature of the trap, and also concerning the former great elevation of this portion of the country. He reiterated his belief that the margin of the continent once lay seventy or eighty miles further out from shore, and that the channels of the Hudson, the East River, Newark Bay, etc., were once very deep ravines. Further evidence of this is found in the soundings of the Coast Survey.

Dr. Newberry then spoke on the

VEGETATION OF THE VICINITY OF NEW YORK IN THE TRIASSIC AGE.

The mouth of the Hudson river during the triassic age must have presented very much the same conditions as the Bay of Fundy at the present time. Being, as it were, the tube of a funnel, it must have been the scene of tremendous tides, and consequently it must have been a very unfavorable locality for the preservation of delicate plants. A comparatively large number of the coarser parts of trees and plants had been found in sedimentary rocks of the vicinity, and of these several specimens were shown, along with some finer ones from the slates in the neighborhood of Boonton. Dr. Newberry expressed the hope that further search would be made.

The main object of the communication was, however, to correct an error that was liable to find its way into print concerning a specimen, photographs of which had been shown him by Professor Cook, and which had been pronounced a lepidodendron found in triassic rock. It has been a well settled belief that lepidodendra became extinct with the carboniferous age. To show the correctness of this belief, Professor Newberry exhibited the photographs of the specimen, and then proceeded to show that it was not a lepidodendron at all. He drew a diagram upon the blackboard showing the characteristic elongated rhomboids with smaller rhomboids inclosed of the lepidodendra, and called attention to the fact that they were absent in the specimen.

C. F. K.

TORNADO IN MISSOURI.

On the night of Sunday, April 18, a storm of wide range and unprecedented severity passed over Missouri and parts of the adjoining States, developing locally numerous whirlwinds which caused frightful havoc and great loss of life. The storm was most severe in Southwestern Missouri. The town of Marshfield, containing 200 dwellings, was almost entirely destroyed, only about a dozen houses escaping unharmed by wind and the fires which broke out in the demolished buildings. Fully 100 persons were killed in the town and around it, and twice as many more were seriously hurt. The northwestern part of Arkansas and the southeastern part of Kansas also suffered severely. The little town of El Paso, Ark., was leveled to the ground, with considerable loss of life. Great havoc was wrought at Oakbower, Ark., where twenty-six houses were destroyed and several lives were lost. At Fayetteville, Ark., a tornado cut a narrow swath through the town, destroying or badly damaging every building in its track. About twenty business houses and several dwellings were demolished, and quite a number of people are reported killed and wounded.

The severity of the storm was felt as far north as Davis County, Iowa, where two whirlwinds caused much loss of property. One of these left a path of destruction twenty miles long and from fifty to three hundred yards wide. Much damage was done also in Illinois, Indiana, and Wisconsin.

The storm was most severe, however, as already noted, in Southwestern Missouri. Between Marshfield and Jefferson City several villages were more or less completely destroyed, and a large number of country houses were wrecked or demolished, and numerous deaths are reported from every quarter of the afflicted region. Among the curious incidents reported of the storm one dispatch tells of a child two years old which was found on the afternoon of the 19th in a tree-top, where it had been nearly twenty-four hours. It was considerably bruised, but will recover. It was claimed by its parents, who lived two miles and a half from the southern portion of the town. The child's aerial flight must, therefore, have extended over three miles.

Professor John H. Tice, meteorologist, of St. Louis, went at once to the track of the storm to investigate its phenomena. In a telegram to the St. Louis *Republican* he says:

"Everywhere along the track of the tornado there is evidence of a wave of water flowing in the rear of the cloud spouts. At some places there are only faint traces of such a wave. At others the *debris* is carried up and over obstructions two or three feet high. These waves or currents flowed in the greatest volume up hills. There are places where the entire top soil is washed away by the currents. Fibrous roots and tufts of grass show their direction to have been up hill, and, what is more significant, from all points of the compass toward the top of the hill when the tornado was raging at the time and expending its force. No trace at any point can be found where they flowed down hill. Many level places are swept clean of soil. Leaves, grass, *debris* of wrecked buildings, and fragments of planks carried along by the current and left in its track arranged themselves longitudinally to the current.

"The following is vouched for by George Gilbert, of this place. He and his wife and four children were on a visit eight miles in the country, and the center of the tornado passed within five or six yards from where they were. A wave of water, apparently fifteen feet high, rolled in the rear of the point of contact of the cloud spout with the earth. It rolled over them in a second, and was icy cold, drenching them thoroughly. About two miles northeast of the town stones weighing from five to seven hundred pounds were lifted out of the earth and carried along some distance in the track of the tornado.

"J. H. Williams, presiding justice of the county court, and residing in Panther Creek Valley, tells me a stone fell in the center of a field belonging to H. Rose, the weight of which was estimated at two tons. It is not known whence it came."

The tornado, so far as is known, commenced in Arkansas, in Stone County.

Opening of the Canals.

The Erie and Champlain Canals were opened for navigation April 20, two weeks earlier than last year. A large fleet of boats were at Buffalo awaiting this event, something over 5,000,000 bushels of grain being stored there for early shipment to tide water. A considerable increase is expected in the number of steamers on the canal. From careful observations made during a trial trip from Buffalo to New York last summer, the State Engineer estimates that a steamer and consort can make nine trips while two horseboats are making seven, at a cost nearly $500 less. Counting this saving, with the profit on the two additional trips, the gain for the steamer and consort during the season would be $1,382, without considering return cargoes.

THE TUNNEL UNDER THE HUDSON RIVER.

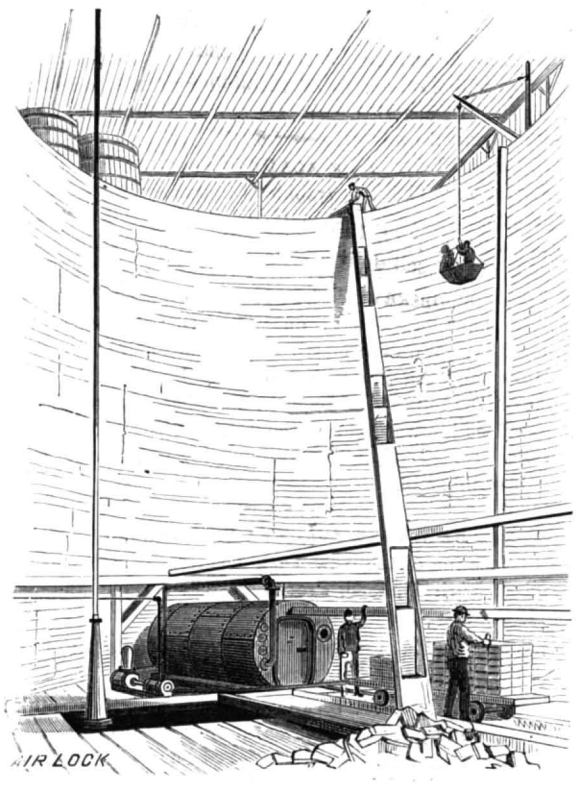
This great undertaking, which has been a conception of engineers and the talk of speculators for many years, is at last fairly under way, and our illustrations in this number give a good idea of the manner in which the work is being carried on. One would think that the great railroad lines terminating in Jersey City would give the project of a tunnel under the Hudson their hearty support, but some of them have opposed the plan from its inception, on account of the large amounts of capital they have invested there in the way of docks, storehouses, and depots, and in boats for the transportation of passengers and freight, and possibly, also, from jealousy of each other, lest one should obtain greater advantages than another. For this reason the work on the tunnel, which was commenced about 6 years ago under the laws of New York and New Jersey, has been greatly impeded by tedious litigation. It is supposed, however, that all obstacles of this nature are now removed, and substantial progress is at present being made. The work is carried on by the Hudson Tunnel Railroad Company; capital, $10,000,000; Dewitt C. Haskin, President and Active Manager; Secretary, L. C. Fowler; Engineers in Charge, Speilmann & Brush; Consulting Engineer, Col. Wm. H. Paine; Superintendent, J. F. Andersen. We are under obligations to all of these gentlemen, especially to President Haskin and Engineer Brush, for facilities in examining the works and for particulars.

The commencement of the work was made by sinking a perpendicular shaft or well, 30 feet in diameter by 60 feet deep, at a distance of 100 feet from the water, at the foot of Fifteenth street, Jersey City. This shaft is built in a solid manner, and lined with a 4-foot brick wall. The bottom of the shaft is the level of the roadway of the tunnel when the latter is completed, but the work toward the river was started at about half the depth of the shaft, the tunnel thence descending, by a series of steps, till it reaches the grade intended. This, of course, is only a temporary device, but it gives an easy grade at the commencement, which facilitates the furnishing of supplies or material for building the tunnel, and that portion of the shaft below the present entrance is now used as a great receiving cistern, into which is forced water and silt from the head of the tunnel.

The manner in which this tunnel is being built differs from anything heretofore attempted in this line, in that the principle is adopted of using compressed air to keep out the water, and partially to uphold the earth. At the commencement of the work, while the tunnel was being excavated through made ground, consisting largely of cinders, it was found impossible to maintain the required pressure, as the air escaped through the loose material. This difficulty was obviated by placing canvas several feet below the surface; but as the tunnel descended the earth was found sufficiently compact to render this unnecessary. The air pressure now used in the tunnel is from 17 to 20 pounds per square inch. The iron plates which form the exterior shell of the tunnel are rapidly put in, so that the workmen at the heading will always be protected by an iron ceiling, and thus the earth above the tunnel is furnished with a support almost as soon as an excavation is made.

The tunnel is nearly round, and its shell is an iron cylinder, about 22 feet high by 20 feet broad, made of boiler iron and worked forward in sections, as shown in our engravings. This iron is ¼ inch thick, and the plates are 2 feet 6 inches wide; some of them are 3 and some 6 feet long, and they have 2½ inch flanges on each side, through which each plate is bolted on all four sides to those around it. Additional strength is attained by the breaking of joints as the different sections are bolted together, the width of the plates, 2 feet 6 inches, forming the width of the several sections or ribs by which the cylinder, which constitutes the framework of the tunnel, is advanced. Inside this outer shell is a wall of hard-burnt brick, laid in cement; this wall, or lining, is 2 feet thick, and, extending completely around the interior, presents the form of an arch against any outside pressure, whether vertical or lateral.

In the prosecution of the work the men at the heading first dig and spade forward a thin semicircular opening, representing about the size and shape of the top of the tunnel, leaving the core or main portion of the earth untouched, only excavating sufficiently to allow the top plates to be placed in position, where they are bolted and braced before the earth beneath is taken out. In proceeding on this plan the work, as it progresses, shows four to eight sections, or widths of plates, in different stages of completion, the most advanced ones being extended out as a kind of hood, well braced up, until all of the earth in this core be removed, and the plates are put in position around all sides of the shell. After this is done the bricklayers follow, and, in making



THE AIR LOCK.

their two foot thick lining to this shell, are careful to lay the wall to fit close and solid to the plates, to which it is anchored by the 2½ inch flanges in the latter. This work and that being done at the heading is illuminated by an electric light, which enables the workmen to see what they are doing as well as if they were above ground.

The removal of the earth taken out has thus far been a very easy task. It is a tenacious mixture of blue clay and sand, the latter markedly from a gneiss formation of rock. As taken from the heading it is puddled with clear water pumped in from a stand pipe in the shaft at the mouth of the tunnel, and is then forced out through a 6-inch pipe by the air pressure in the tunnel. It is thought that this material will make excellent brick, and arrangements are now being made to use it for that purpose on ground adjacent to the tunnel opening for the supply of the immense amount of brick that will be needed in the work.

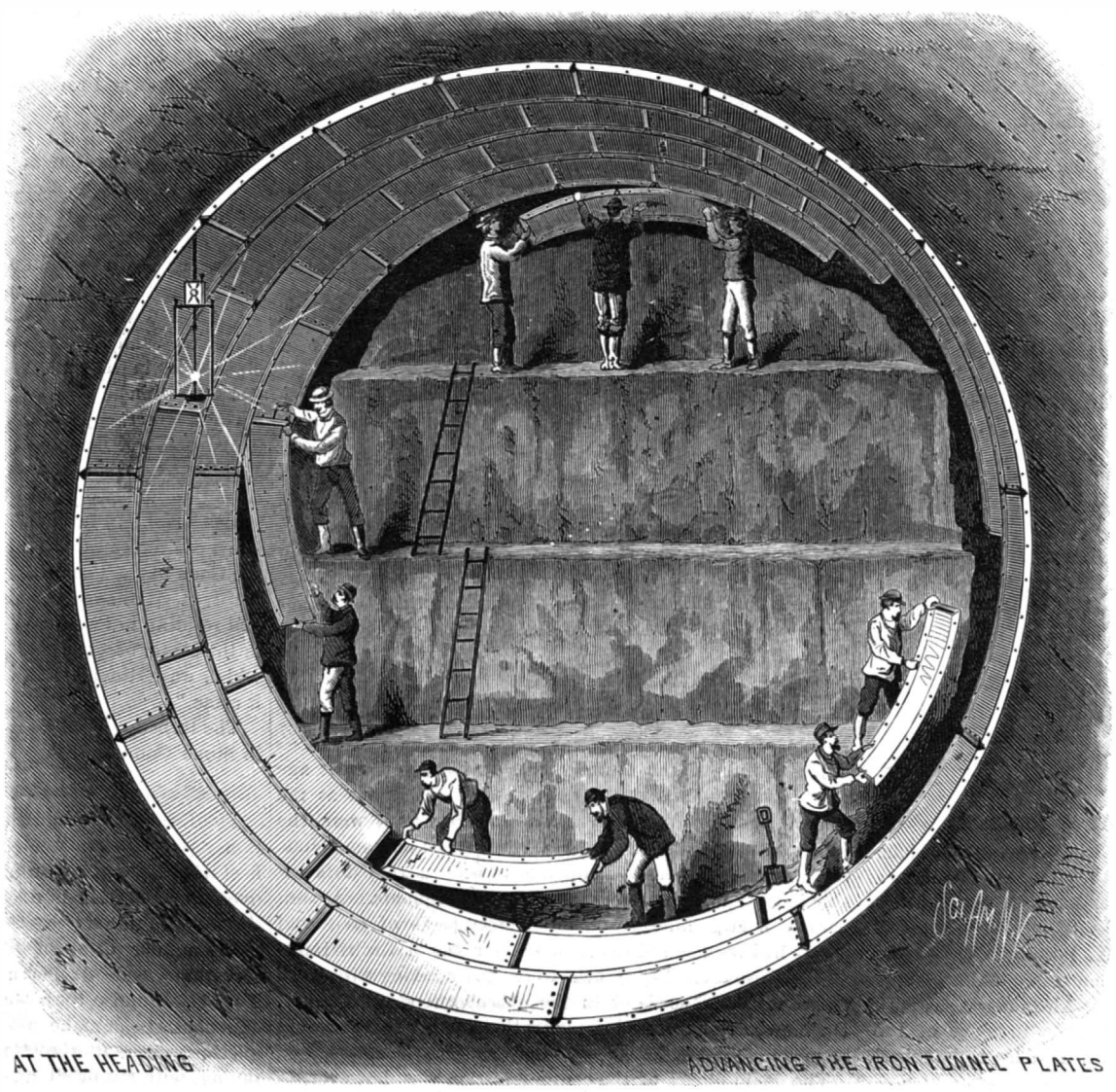
The air lock, at the mouth of the tunnel, is made of boiler iron, is 6 by 15 feet in size, and appears much like an ordinary steam boiler. Twenty men can easily be passed through at a time; and a narrow railway track runs through it, on which a car with brick and other materials for the work is run into the tunnel. When the lock is closed on the outside the inner door opening into the tunnel is open, and communication is now had with the workmen in the interior by placing written messages against a plate glass window in the outer end, when they can be read from the inside; this is to be superseded, however, by a telephone. In the interior of the air lock are what are called "equalizing" pipes, for regulating the air pressure in harmony with that in the tunnel, as may be desired. The operation of the air lock is extremely simple: on entering the tunnel one steps into it as in a sort of ante-chamber, where it would be dark were it not for such light as is given by a candle; the inner door, connecting with the tunnel, is, of course closed, and, when the outer door is closed the compressed air is gradually let into the lock, either from the tunnel itself or from the air reservoir. From five to ten minutes is generally taken for this purpose, so that the change will not be too sudden, and particular care is taken in this respect when those who have never been in before are entering the tunnel. One of the foremen, however, went through the lock in two minutes a few days ago, and the men employed in the work seem to suffer no inconvenience or disagreeable effects from the changes in pressure of the air, either in going in or coming out. The pressure used here is considerably less than was employed in the building of the foundations for the East River Bridge.

The supply of pure air and the careful regulation of the pressure are, of course, most important essentials in a work of this kind. There is an engine especially to run the compressor, which is worked in connection with an outside air reservoir, 5 by 11 feet in size, and a ventilating pipe in the tunnel secures a constant circulation of fresh air from the surface. There are three sets of workmen, each set composed of about forty men, and working eight hours daily, so that the work proceeds day and night throughout the twenty-four hours. At present the work is progressing at the rate of three feet per day of finished tunnel; but the facilities for construction will soon be increased, and in three years the tunnel is expected to be complete.

At present, the work has been carried forward about 150 feet from the shaft, or a distance of some 60 feet under the river, beyond the dock. The water here is shallow, and the top of the tunnel where they are now working is about 25 feet below the bottom of the river. The width of the river on the line of the tunnel is 5,500 feet, and it gradually deepens all the way from the Jersey shore till within about 1,000 feet of the New York side, where the water is 60 feet deep, and the bottom changes from sand and clayey silt to one of rock. The grade of the tunnel will follow in a general way the gradual drop in the bottom of the river, and will ascend rather more abruptly on the New York side. The tunnel now building is only one-half of what is to make the completed work, as the design is to have two tunnels side by side, under the river, which will be carried into one larger tunnel at the shore ends; the second tunnel will be commenced in a few days, and work on both will then be vigorously carried on. The terminus on the Jersey shore will be about half a mile from the water, and that on the New York side has not yet been fully fixed upon.

It is as yet uncertain what means will be adopted for taking trains of cars through when the work is done, although it has been suggested that the pneumatic plan might be adopted, and compressed air used as a motor. The different railroad lines terminating in Jersey City will, it is supposed, make common use of the tunnel, on some such plan as the several roads now use the Grand Central depot, each paying pro rata, according to a scheme to be agreed upon with the tunnel company. It is thought that 400 trains a day can be passed through, using the tunnel throughout the twenty-four hours, and doing most of the freight business at night.

It seems to us that no one who has at heart the true interests of the country can hesitate to give encouragement to the progress of this work. It establishes a new line of unbroken communication between the East and West, greatly increases the



HUDSON RIVER TUNNEL—LAYING THE IRON PLATES.

business facilities of New York city, promotes rapid transit, and adds to the wealth and prosperity both of city and State. The legislature of New York should assist the work by promptly granting the most liberal facilities for establishing depots and necessary works on the New York side of the river. Congress has just passed the bill to facilitate the organization of a great International Exhibition, to be held in New York city in 1883. If the State legislature will now act promptly in granting the modest requirements of the tunnel company this great work of tunneling the Hudson will be completed before the exhibition opens and in time to bring millions of passengers from the North, South, and West directly into the limits of the city. The great railway tunnel under the Thames river, at London, 1,600 feet long, is justly regarded as one of the most remarkable engineering works ever undertaken. But this Hudson river tunnel, which will be over 5,000 feet long, puts the Thames work far into the shade. Mr. D. C. Haskin, the originator and manager of the Hudson tunnel, is entitled to every aid which the citizens of New York can give him in the prosecution of this great undertaking. He deserves the highest honors for his sagacity and perseverance in pressing forward the enterprise, in the face of the most inveterate prejudices, carpings, adverse opinions, and criticisms of engineers, and even active opposition of most powerful opponents. It is plain that we have in Mr. Haskin the right man at the head of the work.

Our various illustrations require but little explanation. On the front page we give views of the interior of the tunnel, showing the manner in which the iron shell is put in, the earth heading being cut in the form of stairs to facilitate the workmen in putting in and bolting the iron shell, no staying being required. The brick lining, and the mode of mixing the excavated silt with water and its discharge from the tunnel through the air pipe, are also shown. In addition to the engravings here given we publish in our SUPPLEMENT this week a number of additional engravings, showing the sectional view of the river, with tunnel built as proposed, with depths of water and distances; also a side sectional elevation of the tunnel works as far as they have advanced, showing the location of the air machinery, and all parts and appliances of the work; also plans and diagrams of the approaches; and a detailed description of the whole. We shall watch the progress of this great work with pleasure, and keep our readers supplied with all facts of interest thereto relating,

The Franco-Lorillard Expedition.

M. Charnay, in charge of the Franco-Lorillard Explorations in Mexico and Yucatan, sailed from this port for Mexico, April 21. On his arrival at the Mexican capital, M. Charnay will engage excavators and proceed at once to the places marked on the plateau of Anahuac during a previous visit, as likely to yield evidences of the extinct civilization he proposes to study. M. Charnay has already sent from France to Vera Cruz over four tons of implements and machines for use in his work of exploration, including two tons of elastic hemp paper, for moulding purposes, dredges for the sacred lakes of Yucatan, where he intends to search for the jewels cast into the water in idolatrous worship as offerings to the gods, ladders in sections with iron clamps, and photograph materials.

In stating his plans to a *Herald* reporter M. Charnay said: "I do not suppose that I shall reach Central Mexico for five or six months. From my own observations on the spot and from the statements of other writers, I take it that traces have already been discovered in the province of Yucatan of about forty ancient cities. Further, there are unmistakable indications that this district and these cities were more densely populated than is any known portion of the globe at the present moment. It is a puzzle as to how these people subsisted, as the district is rocky and barren in the extreme save for a prodigious growth of underwood or scrub, which presents a formidable obstacle to the rapid prosecution of excavations. During my recent explorations on behalf of the French Government in Java, I was much struck with the general resemblance existing between the traces of the ancient inhabitants of that country and those I found in Mexico. But a much higher degree of civilization is indicated as having existed in Java. We have at present in view a two years' sojourn in Mexico and Central America, but if necessary our stay may be protracted even another year."

Demand for Immigrant Labor.

The Secretary of the Board of Emigration reports that the labor bureau of Castle Garden is besieged with applicants for newly arrived help. The most of the applications for domestics are for German and Swedish girls. There is also a large number of applications from silk mills in Paterson, N. J., and in Connecticut, for factory girls and families. One firm wants thirty families with children old enough to work, and promises them good homes, steady work, and fair wages. The Russell Manufacturing Company, of Middletown, Conn., recently sent for thirteen families. Neither of these orders could be filled at once. There are many inquiries from firms in this city for girls to work at china decorating.

The demand for men is much greater than for women, principally for experienced iron workers, miners, brickmakers, and weavers, and the supply is inadequate. In one day 152 men and boys were sent to different parts of the country, and the day before 178 more were sent from the Castle Garden labor bureau. Of these some were engaged to work in coal and iron mines in this State and Pennsylvania; several Germans were sent to Frary's cutlery works in East Bridgeport, Conn.; 40 Hungarians were sent to brickyards in New Jersey; 20 Hungarians were forwarded to the brickyard at Northport, L. I., and a few farm laborers were sent to Connecticut. Applications are on file with Mr. Jackson from fifty different places for silk weavers, wrappers, and winders, cotton and woolen weavers, spinners, and cardroom hands. One application was received for 200 carpenters to work on the new hotel at Rockaway Beach, the wages offered being $2.25 a day, with an average of two days' overtime each week in good weather. Applications were received from the Columbia Stone Company, North Amherst, Ohio, for 20 or 30 Germans to work in the stone quarries; 100 stonecutters in other places; 10 moulders; machinists, pattern-makers, rollers, heaters, puddlers, and skilled hands of all kinds employed in iron manufactures. Not more than 300 silk weavers have arrived here since January 1, and most of them were engaged before they left home.

The total number of immigrants landed at Castle Garden from January 1 to April 20 was 56,404, a number surpassing any previous record in the history of emigration to this country.

Of the new arrivals there came from Germany 9,884; Ireland, 7,143; England, 4,537; Sweden, 3,003; Norway, 307; Denmark, 481; Netherlands, 565; Belgium, 304; Switzerland, 1,479; France, 508; Italy, 1,770; Greece, 138; Russia, 718; Luxemburg, 161; Bohemia, 300; various other countries, 193.

CRIME IN BENGAL.

The area of Bengal under British control is about that of Great Britain and Ireland, with about the same number of inhabitants. The population is made up principally of native Hindoos and the Mohammedan descendants of the ancient Mogul invaders.

In a lecture on what the English have done for the Indian people, delivered to the members of the Philosophical Institution, Edinburgh, Dr. W. W. Hunter, Director General of Statistics to the Government of India, said, according to the London *Times* report: "There was now only about one-third of the crime in Bengal that there was in England. While for each million persons in England and Wales there were 870 criminals always in jail, in Bengal, where the police was very completely organized, there were not 300 convicts in jail for each million; and while in England and Wales there were 340 women in jail for each million of the female population, in Bengal there were less than 20 women in jail for each million of the female population."

A well paid and highly disciplined police, the doctor said, now deals efficiently with the small amount of crime in Bengal; a happy state of things attributable to British rule, if the British view of the case is to be accepted.

It would be interesting to know how many of the Bengal criminals are of European parentage; and why it is that British rule at home shows results so poor in comparison with India. Of course it would not do to suspect that those benighted pagans and Mohammedans are naturally inclined to lead more wholesome and honest lives than the masses of Great Britain. Christian civilization would stand aghast at such a thought. Perhaps the missionaries, who tell us so much about the land where every prospect pleases and only man is vile, may be able to make clear the puzzle.

The Milling Roller Suits.

On February 2, Judge Treat, in the United States Circuit Court, rendered a decision in the case of R. L. Downton *vs.* The Yaeger Milling Company, of St. Louis, for the alleged infringement of Mr. Downton's process patent No. 162,157. The case came up for hearing on January 10, and on the date given above the court dismissed the bill and gave judgment for the defendant. The points at issue in this case are too well known to need extended expatiation in this connection. Mr. Downton's patent claimed the process of removing the germ from middlings by passing the latter through rolls. An erroneous impression prevails that the claims put forward by Mr. Downton were broader than this, but such is not the case. The patent did not cover the use of rolls on wheat, bran, or purified middlings, but simply the extraction of the germ by means of rolls. The Yaeger Milling Company purchased a number of Wegmann's Porcelain Rolls of E. P. Allis & Co., of Milwaukee, and it was for the use of these that Mr. Downton brought suit, which has ended in the courts declaring that Mr. Downton's patent lacked novelty. Mr. Downton has appealed the case to the Supreme Court of the United States, and has given notice that he will bring suits in other circuits.

The *American Miller* says that this decision frees the Millers' National Association from paying the royalty agreed upon in the compromise made last spring by that body in its annual convention. By the terms of that agreement the members of the association were to pay the Downton Purifier Manufacturing Company a royalty for the rolls then used in members' mills of $25 per set for the first three sets of rolls, $15 per set for the second three, $10 per set for the next four, and all over that number (ten sets), $5 per set, the payment to be made when the validity of the patent should be sustained by a decision of a Circuit Court of the United States. For the time being, therefore, the roller litigation may be regarded as over, and millers using rolls can breathe easy for awhile.

NEW INVENTIONS.

A means for determining the action and effect of steam in the retorts when manufacturing water gas has been patented by Mr. Henry C. Bowen, of New York city. In the manufacture of water gas the method heretofore in general use is to charge a retort or generator with coal, then bring it to a state of incandescence by driving air through it, then to shut off the air and force steam through the incandescent mass of coal. At this high temperature the incandescent carbon decomposes the steam, forming carbonic acid and hydrogen, and the carbonic acid, as it passes farther through the mass, is itself decomposed or robbed of one equivalent of oxygen by the carbon to form carbonic oxide. The commingled carbonic oxide and hydrogen then constitute the base of the water gas, and pass out of the gens erator, to be subsequently carbureted by passage through a hydrocarbon, and then fixed to form a stable gas by being heated in a separate set of retorts. The object of this invention is to provide means for enabling the operator to detect at any time the passage of undecomposed steam along with the carbonic oxide and hydrogen.

A device for operating elevators, so constructed as to raise the cages of the elevators by the movement of a train of cars, and which is especially designed for operating passenger elevators at stations upon elevated and underground railways, has been patented by Mr. Nicholas Nolan, of New York City.

A simple and efficient apparatus for cooling liquids and freezing ice cream by means of chemicals, has been patented by Mr. William F. Clapp, of Allemance, N. C. The invention consists of an oscillating or rotary vessel provided with compartments for the cooling mixture and the liquids to be cooled, and a central chamber for the reception of the ice or other refrigerant and the vessel containing the cream.

Mr. John De Frain, of Philadelphia, Pa., has patented an improved vegetable cutter, which is so constructed that it may be adjusted to cut the vegetables into slices or strips of any desired thickness.

An improved sash supporter, which is simple in construction and operation, and which holds the sash in any desired position, has been patented by Mr. William W. Sweetland, of Edwardsburg, Mich. The invention consists of an articulated spring latch, through which a rod fastened to the upper part of the window frame passes, and against which the latch is pressed to hold the sash in position. The latch is operated by means of a lever worked by a cord.

The First Rolling Mill in America.

To the Editor of the Scientific American:

I wish to correct a statement in your issue (No. 7) regarding the first rolling mill in America.

Your correspondent is mistaken in stating that his father built the first rolling mill in this country. My great-grandfather, Isaac Pennock, established one in 1798. I have the ledger bearing that date now in my possession.

The mill was called the "Federal Slitting Mill," and was located in East Fallowfield Township, Chester county, on the Buck run. It was used for rolling sheet iron and strips, principally the latter, which were slit up into rods for nails, etc. All nails then were forged out of rods by hand on the anvil. There were no boiler plates made or needed in those days.

My grandfather, Dr. Charles Lukens, was the first maker of boiler plates in Pennsylvania, and it is to be presumed in America. He was for a time at the Federal Slitting Mill, but in 1816 moved to Coatesville, and operated another mill called "Brandywine Iron Works." There boiler iron was first rolled.

At the death of Dr. Lukens, in 1825, the business was carried on by his wife, Rebecca W. Lukens, who greatly increased it and conducted it successfully for a number of years. As a tribute to her memory the name of the works was, after her death, changed to "Lukens Rolling Mill."

This was the first of the several mills now in this town, and has been operated continuously in the family from 1816 to the present day. It is now used merely as a feeder to a large steam mill erected alongside.

There were no railroads in this country then, and all iron and fuel had to be teamed, most of it to and from Wilmington and Philadelphia, the former 26, the latter 39 miles distant; some, however, was teamed to Pittsburg (315 miles) and beyond.

The old Federal Slitting Mill has long since been abandoned for manufacturing iron. A paper mill is now erected on its site. A. F. HUSTON.

Lukens Rolling Mill, 2d mo. 14th, 1880.

Wild Dogs in the West.

For several years a pack of wild dogs have been known in the Yellowstone Valley. They are described as resembling a cross between a wolf and a spaniel. A more savage pack of wolf dogs are now reported in the wilds of Northwestern Nebraska. It is said that about two years ago two bull-dogs joined a band of wolves near the head of the Birdwood, and have remained with them ever since. Within the past year a species of dog-wolf, supposed to be the offspring of the escaped bull-dogs, have been committing depredations in that section. They are said to possess the cunning of the wolf combined with the ferociousness and pluck of the bull-dog, and are consequently much more to be dreaded than the common prairie wolf, and are far more bold and savage. The Deadwood *Times* says that they are becoming numerous and quite troublesome.

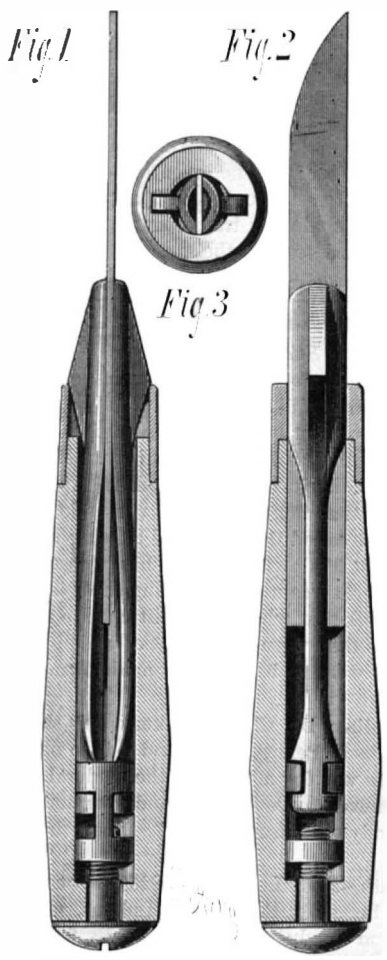
The Opium Traffic of Asia.

In a review of the British opium trade in India and China, Professor Christlieb, of Bonn, gives the following statistics showing the magnitude of the trade and its effects upon Indian agriculture:

Since the conclusion of the treaty of Tientsin, in 1860, the quantity of opium annually imported into China from the East Indies has increased to 80,000 chests. In 1875 as many as 85,454 chests, worth £10,000,000, were brought into the Chinese market, 8,943 of which were sent to Malacca, while the consumption of the drug for medicinal purposes in Great Britain in the same year reached only 165 chests. The progressive growth of the trade during the past eighty years is thus shown: In the year 1800, about 5,000 chests; in 1825, 12,000; in 1850, 50,000; and in 1875, 90,000. Among the most striking effects caused by the extension of poppy plantations in India are the diminution of the quantity of land available for other crops and the consequent curtailment of food products. In Benares and Behar, immense tracts of the finest and most fertile land in Northern and Central India have been gradually covered with poppy plantations. Quite recently 100,000 acres of the richest plains in Central India, and 55,000 acres in the Valley of the Ganges, which formerly used to produce corn, sugar, and indigo, have, to the impoverishment of the soil, been devoted to opium culture. The acreage devoted to that purpose to-day is estimated at 1,033,000 acres.

IMPROVED KNIFE HANDLE.

The annexed engraving shows an improved extension cutting blade handle, recently patented by Mr. Wilbur Webster, of East Jaffrey, N. H., Figs. 1 and 2 being longitudinal sections taken at right angles to each other, and Fig. 3 is an end view showing the shape of the jaws.



WEBSTER'S KNIFE HANDLE.

The invention consists of a handle containing two semi-tubular clamps, having their inner ends fitted to recesses in a movable block held by a screw in the end of the handle. The connection of clamps with the movable block is very simple and effective. The free ends of the clamps are provided with tapering projections that bear against the ferrule at the end of the handle as the clamps are drawn in by the action of the screw. The clamps are prevented from turning by slots cut in diametrically opposite sides of the ferrule for receiving the projections on the clamps.

This handle is adapted to a variety of tools, but it is more especially designed for flat cutting tools.

Further information may be obtained by addressing the inventor as above.

Statistics of Cotton.

According to the latest reports the great cotton spinning industry embraces throughout the world 71,250,000 spindles, of which 39,500,000 are in Great Britain. The United States have 10,050,000 spindles; France has 5,000,000; Germany, 4,800,000; Russia, 2,860,000; Switzerland, 1,870,000; Austria, 1,800,000; Spain, 1,775,000; Italy, 900,000; Belgium, 800,000; India, 1,275,000; Sweden and Norway, 310,000; Holland, 230,000; Greece, 36,000; and other countries (including Denmark and Portugal), 44,000 spindles. Britain has to every 1,000 of its inhabitants, 1,180 spindles; Switzerland, 675; United States, 218; France, 135; Germany, 108; Spain, 103; Holland, 57; Sweden and Norway, 48; Austria, 42; Russia, 30; Italy, 29.

SIMPLE TELEPHONE TRANSMITTER.

BY GEO. M. HOPKINS.

There are telephones and telephones, but in the host of instruments so named the successful ones may be counted

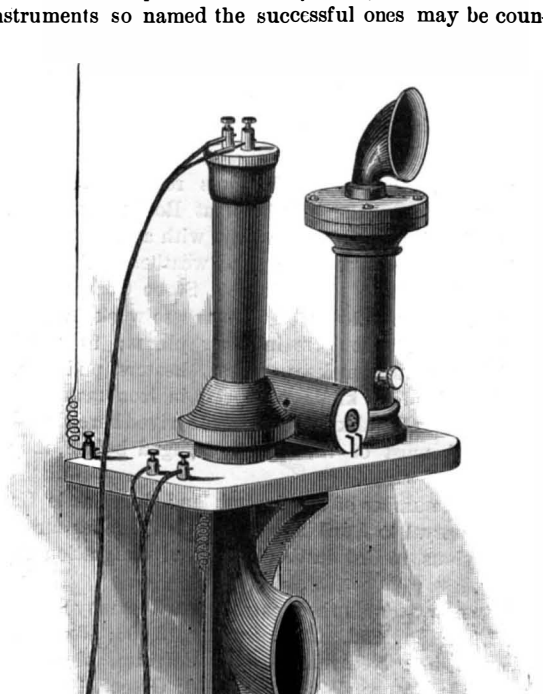


Fig. 1.—SIMPLE TELEPHONE.

upon the fingers of one hand. Of telephonic receivers it may as well be said there are but two, for there are only two principles involved in their construction. Of transmitters there are but two that have gained any notoriety and retained their foothold as useful instruments.

Having a chronic liking for telephonic research I have made it a point to try the various telephones as they have been made known to the public, and have found that with but few exceptions they are defective and useless as practical instruments, and interesting only at exceptional times when the conditions for experiment are favorable, and the adjustments delicately made.

In the course of these experiments the transmitter shown in the annexed engravings was devised, and it was subsequently developed into a usable instrument possessing all of the qualities requisite in a telephone. In the first place, it is so simple as to be capable of construction by the merest tyro, and never needs adjustment. It requires neither call bell, keys, nor switches when used in an ordinarily quiet place, with a closed local circuit.

Fig 1 is a perspective view, showing the relative arrangement of the transmitter and receiver; Fig. 2 represents the arrangement of the local circuit and line; and Fig, 3 is a vertical section of the transmitter.

The transmitter is fixed to the bracket and stands vertically, with its sound-collecting mouthpiece pointed in the direction whence the sound proceeds. The receiver, which is an ordinary Bell instrument, stands when not in use over a curved pendent resonator, the smaller end of which projects through the shelf of the bracket and just enters the hole in the center of the receiver mouthpiece.

Between the transmitter and the receiver there is a small induction coil, whose primary wire is connected with the local battery and the transmitter. One terminal of the secondary wire of the coil is connected with the receiving instrument and line, the other terminal is grounded. These connections will be understood by reference to Fig. 2. *a* and

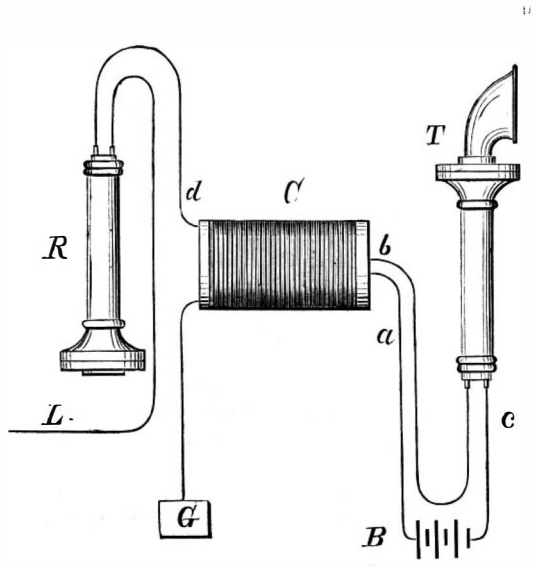


Fig. 2.—ARRANGEMENT OF TELEPHONE CIRCUIT.

b are the terminals of the primary wire of the induction coil, C. The terminal, *a*, connects with the battery, B; the terminal, *b*, runs to the transmitter, T, connected with the battery by the wire, *c*. One terminal of the secondary wire of the coil, C, is grounded; the other terminal, *d*, connects with one binding post of the receiver, R, the other binding post being in communication with the line wire, L. This arrangement is adapted to a closed circuit, one or two cells of gravity battery being connected with the transmitter. If an open circuit battery is used a switch is placed in one of the wires, *a*, *b*, *c*, so that the local circuit may be left open when the talking is done.

The construction of the transmitter will be seen in the vertical section, Fig. 3. The diaphragm, A, has attached to its center a small brass cup, B, containing a button of ordinary battery carbon three sixteenths of an inch in diameter and about the same thickness. This carbon projects beyond the brass cup, and is surrounded by a short paper tube, which projects beyond the face of the carbon one eighth inch. A piece of copper foil placed between the brass cup, B, and the diaphragm extends to the edge of the diaphragm, where it is pressed by a spring in the cell, C, which is in metallic contact with a wire extending downward through the lower end of the instrument.

The standard supporting the diaphragm cell is hollow, about five eighths inch internal diameter, and the height of the diaphragm above the bracket is four inches.

In the standard there is a bottle, D, of special form, supported by a ring, E, having a threaded stud extending through a slot in the standard, and provided with a milled thumb nut, by which it may be clamped at any desired height. The bottle, D, has a long narrow neck, about three sixteenths inch internal diameter, and a platinum wire blown in the lower end connects with the local circuit wire, which is coiled to admit of moving the bottle up or down. This wire extends through the base of the instrument, and is connected as shown in Fig. 2. The bottle, D, is partly filled with mercury, in which floats a pencil, F, of carbon of the kind used for electric lighting by incandescence. This pencil is one eighth inch in diameter, two and one eighth inches long, and is made slightly convex and very smooth at the

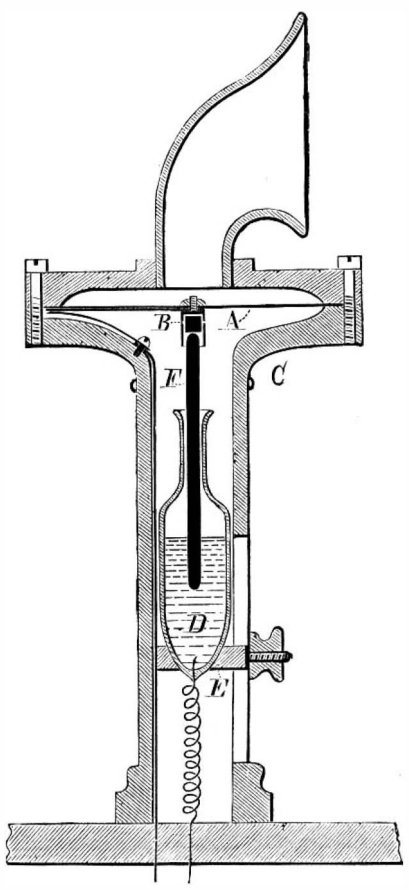


Fig. 3.—TELEPHONE TRANSMITTER.

ends. The mercury buoys the carbon up so that it is always kept in light and uniform contact with the carbon button, while it also forms part of the conductor in the local circuit. The carbon attached to the diaphragm is perfectly plane on its contact surface, and as smooth as it can be made by means of a fine file.

The diaphragm, which is of mica, has one and three-fourths inches free to vibrate. It is rather stiff, and is clamped firmly in its cell. The surfaces between which the diaphragm is clamped are perfectly true, and made of material not liable to warp. Wood well soaked in paraffine answers a good purpose, but vulcanite is far better.

The induction coil used with the instrument is of the ordinary form, two inches long, one inch in diameter, with a three-eighths inch core of No. 18 soft iron wires. The primary coil consists of three layers of No. 18 silk covered copper wire, and the secondary of No. 36 in sufficient quantity to fill the spool. One cell of Leclanche or Fuller battery will work the transmitter, but two will augment the volume of sound.

As to the efficiency of this instrument it will bear comparison with other transmitters, and in one or two points it seems to have an advantage. It will transmit speech clearly whether the speaker is within ten inches or as many feet of the instrument. Although a call bell may be used in connection with it, generally none will be required, as by saying o-o-o-o loudly in the mouthpiece a trumpet-like sound is heard in the receiver at the other end of the line, which, although not very loud, is sufficient to attract attention in a measurably quiet room.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

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

POSITIONS OF PLANETS FOR MAY, 1880.

Mercury.

On May 1 Mercury rises at 4h. 10m. A.M. On the 31st Mercury rises at 4h. 23m. A.M.

Mercury, Venus, and Saturn rise nearly at the same time on May 1, in the hour preceding sunrise, Venus being farthest north.

Mercury and Neptune will be in close proximity on the 18th, but they rise so nearly with the sun that Mercury is not likely to be seen.

Venus.

On May 1 Venus rises at 4h. 18m. A.M. On May 31 Venus rises at 3h. 57m. A.M.

Although Venus rises so nearly with the sun during May its brightness will make it conspicuous.

Saturn and Venus rise nearly at the same time on May 1. Saturn is south of Venus.

Mars.

Mars is the only planet to be seen in the evening sky of May.

On May 1 Mars rises at 8h. 35m. A.M., and sets at 11h. 47m. P.M.

On May 31 Mars rises at 8h. 6m. A.M., and sets at 10h. 52m. P.M.

On May 1 Mars is west of the star Delta Geminorum, at a declination 2° farther north; it passes this star on May 9 at a distance of 1½° north. On the 15th Mars has the right ascension of Castor, but is nearly 9° south of that star. The crescent moon may be seen to move toward Mars on the evening of the 13th.

Jupiter.

Jupiter will be brilliant in the early mornings of May.

On the 1st Jupiter rises at 3h. 41m. A.M.; on the 31st at 1h. 57m. A.M.

Jupiter may be seen south of the waning moon on the morning of May 5.

Saturn.

Saturn, Venus, and Mercury rise nearly at the same time on May 1, Saturn being about 1° south of Venus.

On May 31 Saturn rises at 2h. 31m. A.M., following Jupiter after about half an hour, and making its diurnal path 3½° north of Jupiter. The waning moon and Saturn have nearly the same right ascension on the morning of the 7th. Saturn is nearly 8° south of the moon.

Uranus.

Uranus rises on May 1 at 1h. 9m. P.M., and sets at 2h. 25m. A.M. of the next day.

On the 31st Uranus rises at 11h. 12m. A.M., and sets 27m. after midnight.

Uranus is still very near the star Rho Leonis. On May 31 it is half a degree east and half a degree north of this star, when on the meridian.

Sun Spots.

A large group of spots, inclosing three of more than ordinary size and some ten or twelve small ones surrounded by faculæ, was seen on the sun's disk on April 12. These spots passed out of sight by the motion of the sun on its axis between the 14th and 15th of April.

If this group reappears, as is probable, it will be well advanced upon the sun's disk early in May. A telescope of low power (with a colored glass) will enable an ordinary observer to watch the changes of these spots, as caused by the sun's turning, and also those variations which belong to the violent action on the sun's surface.

A Dangerous Amusement.

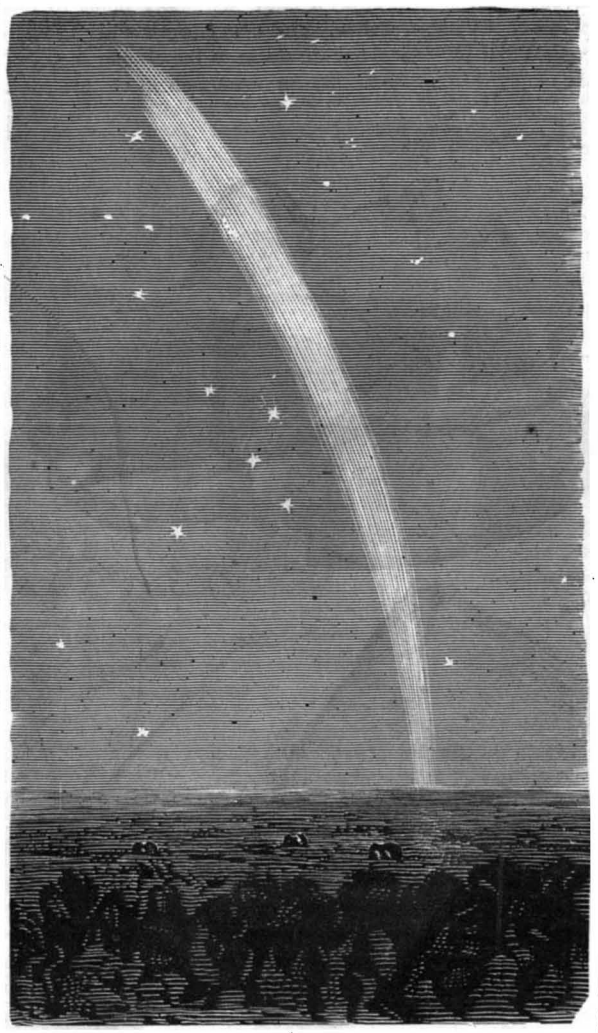
As out-door sports begin the girls are sure, this spring, to take their usual turn at rope jumping. Scarcely a season passes without several reports of girls dropping dead after some long continued effort, as in trying to skip the rope a thousand times; and even when not so carried to excess the practice is decidedly hazardous. Dr. Peck, of the Surgical Institute at Indianapolis, pronounces it a prime cause of cripples among girls. Speaking of a recent operation in which the bones of both legs of a little girl had been removed owing to necrosis caused by rope jumping, Dr. Peck says that similar cases are of frequent occurrence, though the mischief more commonly shows itself in necrosis of the spine. Not a month passes but cases are brought to the institute to be treated for injuries brought on by the continuous concussions upon the bones in this amusement. He advises parents and teachers to prohibit the "pernicious pastime" at all times and under all circumstances.

The New York International Exhibition of 1883.

The Senate bill (No. 1160) to provide for an International Exhibition in this city in 1883 was passed by the House of Representatives April 19. It had already been passed by the Senate, but having been slightly amended by the House it was returned to the Senate for the concurrence of that body. The chief amendment consisted in the addition of the names of the members of what is known as the Hilton committee to the original list of incorporators. The changes were concurred in by the Senate April 20. It is to be hoped that the differences between the rival committees will be promptly and amicably settled, and that nothing will occur to hinder the prosecution of the enterprise.

THE GREAT SOUTHERN COMET.

The event which is creating a considerable sensation in the southern hemisphere is the nightly appearance in the southwestern heavens, shortly after sunset, of a large and luminous body, supposed by those conversant with the aspects of such celestial visitants to be a comet of no ordinary kind. It is remarkable that astronomers throughout the British colonies and in England have not given the least intimation or prediction as to its coming.

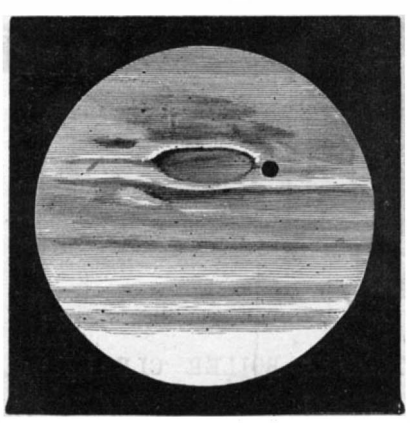


The appearance of the present comet is what astronomers designate "a beam." Its continuance is uncertain, though it may remain visible for some time, especially as it has not yet attained its perihelion and the nucleus has not been seen, though, doubtless, it will be at the Cape, France, England, and other countries. In brilliancy and grandeur it is vastly inferior to the comet which appeared in the early days of the colony.

Our illustration represents the comet as it appears nightly; that it is wonderful and awe-inspiring, we admit, but the absence of superstition from our minds, and a belief in the opinions of scientific men as to the cause of such phenomena, has banished all dread as to the baneful results which are expected to follow its appearing. The most notable comets of modern times are those of 1843, 1847, 1853, 1858, and 1861. That of 1843 is still regarded as the most marvelous of the present age, having been observed in the day-time before being visible at night—passing very near the sun—exhibiting an enormous length of tail of a fiery character, and arousing interest in the public mind as deep as it was unprecedented. Whether the comet now visible to us has anything to do with the heat of the atmosphere we cannot say, but it is a fact that for days prior to its coming the temperature was higher than usual.—*Frearson's Weekly, Adelaide, Australia.*

WHAT IS THE TIME OF JUPITER'S ROTATION?

The great red, elliptical spot on the visible surface of Jupiter is so long that could the earth be placed at one



Jupiter seen through a 9 in. telescope.—Power 350.—7h. 49m., Oct. 20, 1879.

end of it and rolled it would make nearly a complete revolution before arriving at the opposite end; and so wide at the widest part that the earth would overreach it on either side by but little more than half the diameter of our moon, and stands in such contrast to the surrounding disk as to be visible with large telescopes when the planet is but three hours from the sun in right ascension, and the sun on the meridian.

The authorities, Sir William Herschel, Beer, Mädler, and others, give for the time of Jupiter's rotation 9h. 55m. 26′. The red spot was estimated central on the disk, October 3, 8h. 55′, 1879; on January 10, 5h. 40m., 1880, it was again estimated central, having in 98d. 20h. 45m. made 239 apparent revolutions about the axis of Jupiter—approximate real time of rotation, 9h. 55m. 37″+.

It has been suggested that this spot affords an excellent opportunity for determining the time of Jupiter's rotation; and the attention of amateurs has been called to this work by a note from abroad.

It is generally believed by scientists that no considerable portion of a planet's atmosphere is likely to move much faster in the direction of the planet's rotation than the planet beneath travels; that any considerable motion must be in a direction opposite to the planet's rotation.

If this red spot represents the time of Jupiter's diurnal rotation that planet presents to us the remarkable phenomenon of the whole equatorial atmosphere moving in the direction of the planet's rotation 6,500 miles farther in 24 hours than the surface of Jupiter beneath it travels in the same time.

Most of the cloud forms in the equatorial belt are far from permanent, either in location or outline; some of them change so much in a few days as to be unrecognizable; but a well defined light spot was observed about central on the disk of Jupiter, September 27, 1879, at 8h. 5m., which, after making nearly 356 revolutions about the planet's axis, was last seen, unchanged to any great extent, just coming on the disk, February 20, 1880, at 4h. 55m.—approximate real mean rate, 9h. 50m. +.

On September 28, 1879, it was noticed that the red spot and the markings on the equatorial belt were separating at a rate which would bring them again together in about 43 days. Since then it has been observed that when the red spot has made 105 to 109 revolutions about Jupiter's axis the equatorial belt will have made one more.

When Jupiter rises on the morning of May 22, 1880, the red spot will probably be on the disk, and that portion of the equatorial belt above mentioned north of the spot. At 4h. 10m., Washington mean time, it is estimated that the red spot will have passed the center of the disk, and the planet will be high enough for observation in the eastern part of the United States.

Accepting 9h. 50m. as the time of Jupiter's rotation, the spot is traveling rapidly westward. Suppose it to have an independent rotary movement, in the direction taken by the hands of a watch, which on the circumference is not less than 250 miles an hour, sometimes much more, and it will account for about all the observable phenomena in the region of the spot. H. G. FITZ.

Peconic, N. Y., April 7, 1880.

The Geodetic Union of Europe and Africa.

The important work of connecting the systems of triangulation covering Western Europe and Northern Africa was consummated in the latter part of October last. Preparations for it had been going on for several years under the direction of General Ibañez and M. Perrier, acting respectively for the governments of Spain and France.

Four mountain heights were selected for signaling operations, namely, Mulhacen and Tetica, in Spain (the former being the highest in that country), and Filhaoussen and M'Sabiha, between Oran and the frontier of Morocco. It was decided not to trust alone to solar signals, but also to employ the electric light at night, and the event fully justified this resolve, for the solar signals totally failed, being seen neither in Spain nor Algeria. The difficulties of the enterprise, then, will be obvious on consideration, for to produce the electric light with sufficient intensity it was necessary to have recourse to electro-magnetic apparatus driven by steam engines, and the problem was that of hauling up Gramme machines, engines of six horse power, and various instruments, to summits of 1,000 to 3,550 meters height, making roads on these desert mountains, organizing supplies of water and fuel, and finally providing accommodation and sustenance at each station for twenty to one hundred men and fifteen or twenty beasts. There was a military guard attached to each station (in Algeria especially this was necessary), and the soldiers worked in roadmaking, etc. The time open for operations was short between the intense heat and the early snows. On August 20 all were at their posts—Colonel Barraquer on Mulhacen, Major Lopez on Tetica, Captain Bassot on Filhaoussen, and M. Perrier on M'Sabiha. But in vain were solar signals sent by day and electric by night; the vapors from the Mediterranean proved impervious to the beams. At length, however, on September 9, after twenty days' feverish expectation, M. Perrier perceived the electric light of Tetica, visible sometimes to the naked eye, like a round reddish disk, as bright as Alpha in Arcturus, which appeared near the horizon. On the 10th he perceived the electric light of Mulhacen. The Spaniards also perceived the French signals, and a period of definite observation was entered upon, extending from September 9 to October 18. The geodetic junction of the two continents was at length realized. The numerical results arrived at with regard to those four immense triangles of some seventy leagues length of side are given in a communication by M. Perrier to the French Academy, and are shown to have satisfactory accuracy.

By this work the geodetic operations in the British

Islands, France, Spain, and Algeria, were united into one grand system of triangles, reaching from the Sahara (34° N. L.) to the northernmost of the Shetland Islands (61° N. L.), giving a meridian arc of 27°, the greatest hitherto measured on the earth.

NEW LIFE PRESERVER.

The engraving shows a novel life preserver recently patented by Mr. Rufus E. Rose, of Gretna, La., which may be combined with different garments worn upon the person, or it may be made as a separate article and worn independently of the clothing.

The invention consists in several air chambers, A, provided with inwardly opening valves, C, which may be operated independently, and an air supply tube, B, communicating with the several chambers through separate valves.

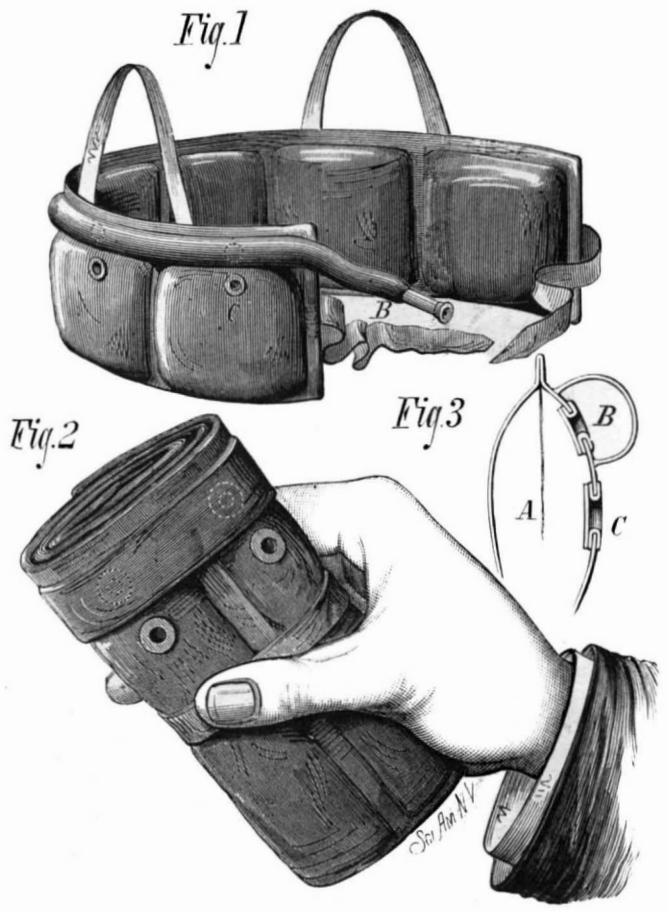
Fig. 1 shows the life preserver inflated and ready for use; Fig. 2 gives a good idea of the size of the life preserver when rolled up and out of use, and Fig. 3 is a transverse section showing the arrangement of the valves.

The chambers are inflated by blowing through the supply tube, which is provided with a suitable mouthpiece. The great advantage of this form of life preserver lies in the separate chambers. One or more of the chambers may be punctured without destroying the efficiency of the device, as the remaining chambers will retain their charge of air.

This life preserver when uninflated is so light and compact that it may with convenience be combined with some of the garments worn by the user, when it will always be in position for use. The form shown in the engraving is fitly called a "pocket life preserver," as it may be rolled into so small a package as to be conveniently carried in the pocket, occupying no more space and weighing less than an ordinary diary or memorandum, and when it is inflated it is sufficiently buoyant to sustain two persons.

The inventor informs us that this invention was suggested by an article in the SCIENTIFIC AMERICAN some time since which pointed out the necessity for such an invention.

Further information in regard to this life preserver may be obtained by addressing the inventor as above.



ROSE'S LIFE PRESERVER.

Endurance of Boilers.

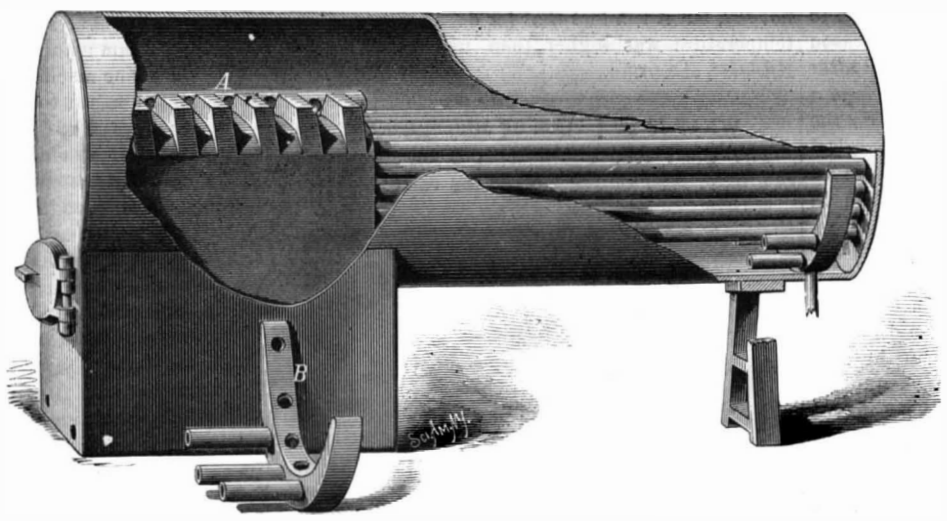
Some idea of the difficulties encountered, in the use of the impure water in locomotives in some of the Western States, may be formed from the following extract from a letter from a master mechanic in that region to the *Railroad Gazette:*

"At this end of the road, where we have so much alkali water to contend with, we are obliged to change the flues every six months to get the scale out of the boiler and from around the fire box. Along with this we wash our engines thoroughly the best we can for every four hundred miles run, with a force pump and seventy pounds pressure, taking out the blind flues, mud drum head, and all the washout plugs in the sides and in the legs of the boilers, and even with this constant work our flues will not last longer than six months without giving us a great deal of trouble from leaking on account of the mud and scale."

NEW BOILER CLEANER.

The operation of removing the sediment and loose scale from beneath the tubes of locomotive boilers, when conducted in the usual way, is laborious, expensive, and damaging to the boiler, as no means of access to this part of the boiler is provided, and the steam pipes and exhaust nozzles have to be removed and the ends of the tubes cut off before the bottom of the boiler can be reached. This being the case the examination of the boiler is often deferred, so that a great mass of scale and sediment accumulates and hardens so that it can be removed only by means of the hammer and chisel.

The invention shown in the annexed engraving is intended to overcome these difficulties, and to furnish a convenient and effectual means of loosening and moving the scale so that it may be easily removed. The invention is applicable to all kinds of tube boilers, but is more especially useful on boilers of the locomotive type.



TITCOMB'S BOILER CLEANER.

It consists of two tubes, A B, provided with jet openings or tubes, and having external connections leading to a boiler for supplying steam or to a supply of water under pressure. The inventor prefers to make these jet tubes of brass, and to place them in the positions indicated in the engraving. The jets of the tube, A, are directed across the crown sheet, and the jets of the curved tube, B, point toward the water leg of the boiler, and in the upper surface of the curved tube, B, there are jets pointing upward. When jets of steam are admitted to the boiler through the tubes, A B, the scale is loosened and moved to the water leg, from which it may be easily removed through the hand holes. The inventor states that steam removes the scale from the tubes with surprising rapidity, so that they are left in good condition for generating steam. When two or more stationary boilers are used in one locality the steam from one may be used to clean the other. Where there is only one boiler a well jacketed steam drum may be used to store up a sufficient quantity of steam to clean the boiler. In the case of large round houses the inventor proposes to apply a large stationary boiler to this purpose, placing it centrally and providing it with suitable connections for conveying the steam to the cleaner in any of the empty locomotives. By an arrangement of this kind two locomotives could be cleaned and washed at once. The inventor does not confine himself to any special form or arrangement of this cleaner, as it can be adapted to any style of boiler. The application of this device to a boiler economizes fuel, improves its steaming qualities, prevents pitting, and saves a great deal in the way of repairs.

This invention is protected by United States patents issued to Mr. Winslow Titcomb, of Waterville, Me.

ENGINEERING INVENTION.

An electric car brake, patented by Mr. Philip V. Conover, of Uvalde, Texas, consists of a pinion attached to the car axle, the pinion taking in a ratchet wheel provided with a projecting pin that enters into the slots of a wheel provided with a sleeve, upon which the brake chain is wound, which sleeve can be moved on the axle by means of a lever that is actuated by a rod passing into a helix connected with a battery on the locomotive. A pawl tooth that is held in place by a slide prevents the unwinding of the brake sleeve until the slide is removed by a lever actuated by a rod passing into a helix likewise connected with the battery on the locomotive.

Practical and Useful Inventors.

In almost every community is to be found at least one man who professes to have given the first hint toward the perfection of some invention that has brought its introducer fame and fortune, neither of which the suggester shares. It may be that in some instances this claim is correct, but usually the sympathies of the people are with the man who does rather than with the visionary who dreams; for there is generally a hard road to travel between the conception of an improvement and its practical adaptation and final success.

There was a time when the inventor was essentially a dreamer; when he environed himself with mystery and was content with the homage of the ignorant. No paternal and wise government extended over him the protection of letters patent; the people did not want his improvement; the world was not ready for him. Chemistry was used to discover the transmutation of metals or the elixir of life, and mechanical knowledge to construct a toy with which to amuse and astonish the ignorant. These men, who thought and wrought in the twilight of science and the dawn of the arts, undoubtedly contributed something to us of the after ages, although in many cases they left their records in ambiguous puzzles. The shadows of the great minds who walked in the slant rays of the rising sun are projected across the plane on which our inventors travel.

But such men as Watt and Arkwright and others diverged from the secluded paths of these impractical thinkers and essayed the broad road of utility. Under their hands the scientific toys of the philosophers became the useful adjuncts to man's needs. This is the true secret of the inventor's success. Utility should be his guide and aim. It is not enough either that he conjectures and speculates: he must demonstrate by actual experiment, on a scale sufficiently large to prove the value of his invention, before he is legally or even properly entitled to the distinction or the reward of the inventor. One may sit and dream day after day of a conjectured improvement, and even feel assured of its value, but it will avail him nothing unless by experiment he builds a foundation better than "the baseless fabric of a vision." While he dreams it may be another is working out a similar dream. It cannot be doubted that many valuable improvements, now in general use and yielding handsome incomes, would have borne another's name and enriched another's pocket if the original inventor had wrought out his discovery to a practical result.

The work of the inventor is not, then, as the Boston *Journal of Commerce* further adds, merely to devise and calculate—to dream and imagine—but to demonstrate and prove by experiment. The true inventor is not a mere visionary, seeing the road and pointing to it, but is a moving, animated man, clearing obstructions from his path and leading the way. If he is independent enough to strike out a new path to a result, he must not be content merely to survey it, but must lay out the road, grade it, and propel himself and his improvement over it, before he can expect to levy toll on those who travel after him.

Testing Railway Employes for Color Blindness.

The work of examining the 5,000 employes of the Pennsylvania Railroad Company to discover their capacity to distinguish colors and forms, was begun in Jersey City, April 1. Acuteness of vision was tested by means of printed cards placed at a distance of about twenty feet; also by means of small openings in a screen illuminated on the further side. Many who successfully passed these ordeals failed signally on the color tests. Three skeins of woolen yarn were used, one being light green, the second rose, and the third red, and were marked respectively 1, 2, 3. Each of these was placed on a table in front of the person examined at a distance of three feet, and, with the vision of either eye obstructed by a spectacle frame, the man under examination was requested to name the color. He was also directed to pick out a similar shade to the one in question from different skeins of woolen yarn, numbered from 1 to 36. One young man correctly designated the test skein as red, but on being told to select a similar shade from the skeins before him he picked three shades of blue, two of yellow, and one of red. He could distinguish no difference, and the same thing happened to half a dozen others who followed him. The skeins on the row were then divided into three sets, with twelve numbers in each, and the men were then examined as to color blindness. Some were able to distinguish all the shades of green, but failed lamentably in picking out the different shades of red.

It is said that the officers of the road were greatly impressed

by the results obtained, and that the directors of the other railways terminating at Jersey City are likely to adopt the same system of examination for their employes.

RAILWAY CREMATION.

It is a pretty universally recognized fact at the present day that burying such animals as have succumbed to a pes-

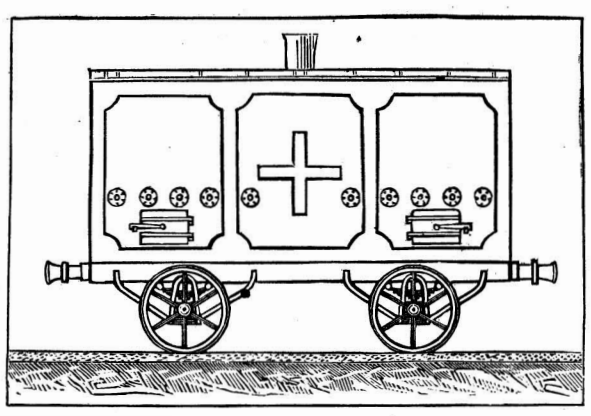


FIG. 1.

tilential disease is not sufficient to destroy the contagious germs which remain in their bodies. This has been shown especially by the researches of Messrs. Pasteur, Chamberland, and Roux. These gentlemen have ascertained that when infected blood is consigned to the earth the bacteria are preserved therein in the germ state, multiply, and, in a short time become transformed into corpuscles which can be detected after remaining in the soil for several months. We ought to welcome, then, a new method of cremation which has been invented by Messrs. Kuborn and Jacques, and which satisfies every sanitary necessity by furnishing an easy means of totally destroying the infected animals. The two accompanying engravings give an exact representation of the apparatus. As shown in Fig. 1, it looks externally like a railway car; but it differs in the fact that rails are dis pensed with, the car being drawn on the surface of the ground by horses or mules. Fig. 2 shows the arrangement of the interior of the apparatus. The closed space, A, is designed to receive the cadavers. It is a chamber having walls, R R, impermeable to heat. The bottom is composed of two dead plates, S, both of refractory material, the lower extremities of which terminate in a well, B, so as to form a hydraulic joint. Beneath these dead plates are located two fire places, F F, provided with movable working holes, which, by regulating the introduction of the air, allow of perfect combustion being obtained. The products of com bustion reach the chimney through the flues, C, C″, and C‴.

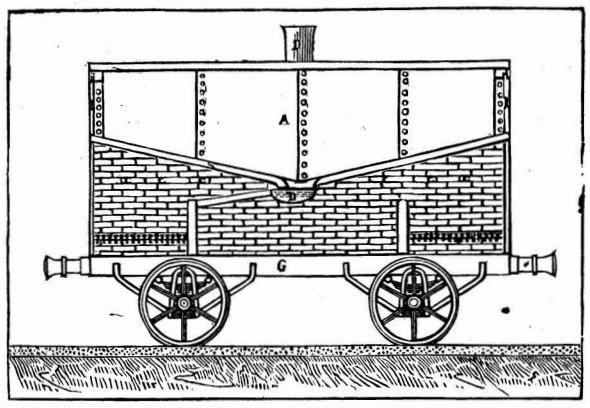


FIG. 2.

Any kind of fuel, no matter what, may be used. The apparatus is simple, and is easily operated at but trifling expense.

Packing Apples with Salicylic Acid.

There are few greater treats during the winter and early spring seasons, says the London *Magazine of Pharmacy*, than the magnificent apples which are imported from America to find their places on the dessert table in England. Considerable numbers, however, arrive here in a bruised condition from the effects of careless packing; a certain amount of fermentation is set up, and unless they are consumed without delay, they are lost to the dessert table. This is more frequently the case when barrels full of the so-called "Newtown pippins," and others, have been exported by private individuals to their friends in England, than when they are packed by the regular tradesmen. There is no reason why this splendid fruit should not be imported here almost as fresh and blooming as when it is gathered from the tree. A common but soft kind of tissue paper should envelop each apple before it is placed in the cask, and this tissue paper should have been soaked in a solution of salicylic acid and dried before it is used. The best preparation of salicylic acid for this purpose is the alcoholic solution, made with the strongest spirit, and then diluted with as much water as it will bear without precipitating the acid, so as to make the solution go as far as possible. Each apple should be enveloped in at least three or four folds of the salicylated paper, and every possible precaution should be taken to prevent bruising when loading into the casks or cases. Well packed apples should not move at all during the voyage, and the shaking of a railway train should have little effect upon them. Nevertheless, a certain amount of contusion is inevitable, and to avoid the ulterior results of this, the salicylated paper is indispensable. As to the cost it would be a mere trifle when we consider the result gained, and the splendid condition of the fruit when it enters the London market. Besides, it is very probable that the salicylic acid paper used for packing the apples in America, might be used over again, or applied here in England to some similar antiseptic purpose, and an allowance made for it accordingly.

SEA BEANS.

BY A. W. ROBERTS.

So much confusion of ideas exists about these so-called sea beans in the minds of most people that I have taken the trouble to obtain all the information obtainable about them.

Fig. 1—Seed of *Entada Scandens.*

Fig 1 is the seed of a vine, the *Entada scandens*, which grows in the tropical portions of both hemispheres. The vine is chiefly remarkable for the large pods and seeds, the pods often being from six to eight feet long, divided into numerous joints, each one of which contains a bean. In some parts of India these beans are used as weights. In London the seeds are sold under the name of "West Indian filberts" These sea beans are found in large quantities on the coast of Florida, particularly after northeast storms. These beans are worked into various trinkets, such as perfume bottles and snuff boxes. One of our leading jewelers has had some of these sea beans to polish and mount in gold for watchseals and lockets. For polishing the best materials are fine pumice stone powder, putty powder, and rotten stone. After the roughness of the outside of the bean is taken down with the pumice stone powder to a uniform surface, then put on the second polish with putty powder and oil. After which finish with rotten stone and oil on a lap wheel.

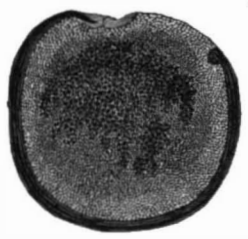


FIG. 2.

Any one handy with the graver can embellish these beans with every style of device desired. The beans should be first boiled in water for a half to one hour to soften the outer coating. After the outer coating is softened give it a coating of Winsor & Newton's Chinese white, on which the drawing is made for the engraver to follow. One of the prettiest styles of ornamentation of these beans is that of monograms inlaid with gold bronze. These beans are believed by most persons to be a product of the ocean from the fact of their being found on different parts of our seashore, particularly of the Southern States. I have found them on both the Massachusetts and Long Island shores. They have also been found on the coast of Scotland and as far north as the Loffoden Islands, off the coast of Norway.

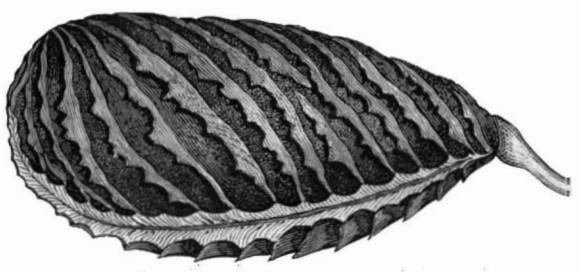


FIG. 3.

Figs. 2 and 3 represent the bean and pod of the "asses-eye," the scientific name of which is *Mucuna urens.* This bean is also a native of the West Indies, and is borne to the Florida coast by ocean currents. These beans have of late years been sent north from Florida in large quantities for the use of jewelers and tortoise shell workers, who convert them into charms for watch chains. They are capable of receiving a very high polish, the same materials being used as directed for polishing the *Entada scandens.* Miniature compasses and portraits are often introduced as a setting in these beans. They grow in short stout pods, covered with brownish bristly hairs, which easily separate, and when handled stick in the fingers, producing an intense itching sensation. The pods of this bean are used to adulterate the pods of the *Mucuna pruriens*, of which the hairs are the officinal portion. These hairs are the cowhage sold by druggists and commonly known as "cow-itch." *Mucuna urens* is a perennial climbing plant, which twines round the trees and rises to a considerable height. The flowers are yellow and large, and resemble the pea blossom in form; usually placed in twos and threes in short peduncles.

The hairs of the *Mucuna urens* and *Mucuna pruriens* are possessed of powerful vermifuge properties, and act mechanically by penetrating the worms.

Legal Responsibility for Machinery Accidents.

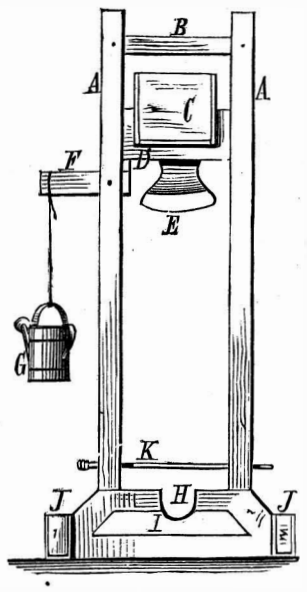
The Supreme Court of the United States has laid down the law as to the responsibility of employers for the lives and limbs of their workmen. They must not expose them to perils which can be guarded against, and if the servant reports defective or unsafe machinery, the master becomes responsible if the repair or restoration is not promptly made. The doctrine, familiar to English courts but never hitherto adopted here, that the acts of a superior officer or workman under a corporation are as those of the employer, and the latter is responsible for negligence involving disastrous results, was affirmed. The case was that of a railroad engineer who lost his life while saving his passengers from an accident, the result of a defect in his engine to which he had called the attention of the master mechanic. His widow sued the railroad, the Texas and Pacific, for $80,000, but was ruled out of court in Texas. *Leffel's News* thinks the lady will probably be more successful on the retrial which has been ordered.

Operating Elevated Railroads by Electricity.

We learn from our foreign exchanges that the Council of Magistrates of the city of Berlin have appointed a special committee of engineers and architects to examine into and report upon the proposal submitted by Siemens and Halske for the construction of an electric railway across a portion of the capital. It is intended to begin the line at Belle Alliance place and run it through Friedrich and Chaussee streets on to Wedding place. The tracks—one for the up and the other for the down trains—will be supported by iron columns, 14 feet 9 inches high and 33 feet apart. The carriages are to be narrow and short, having only ten sitting and four standing places. The electro-dynamic machine to move the train will be placed under the floor of the carriage between the wheels, and a steam engine of 60 horse power to produce the electricity will be placed at the terminus. There will not be many stoppages, and the rate of speed is estimated at about twenty miles an hour.

INSANE INGENUITY.

Stephen M. Pillsbury, Jr., of Chelsea, Mass., an unmarried man of thirty, with a hereditary taint of insanity, guillotined himself April 20. He is described as a temperate, retiring sort of fellow, in prosperous circumstances, and on good terms with his family and friends. His special weakness was a morbid taste for reports of criminal matters and suicides. Evidently his desire was to do something notable, but owing to feeble health and probable lack of physical courage, he could see no way to distinguish himself except by suicide. Accordingly he constructed an apparatus like that figured herewith (copying a contrivance used for a like purpose in a Western State five or six years ago), and deliberately cut off his own head. He set up his apparatus in the barn, using therefor such materials as were handy. The standards were joists, A A, extending from the floor to the loft, to the under side of which they were securely spiked, a brace, B, adding to their stability. The lower ends of the joist were mortised in a block of hard wood, the top of which was rudely hollowed out at H to support his neck. Boxes of stone, J J, on either side kept the apparatus steady. Fitted between the uprights, so as to slide easily, was a piece of two-inch plank, to which was fastened the blade of a broadax, E. On the top of the slider was a box, C, loaded with stone. A lever, F, pinned to the left upright supported at one end the slider, balanced by a watering pot, G, at the other end. A broom handle, K, thrust through the supports near the base served to hold the suicide's head in place, and a leak in the watering pot let off the guillotine when he had stupefied himself with ether placed under his nose in the trough, I. The apparatus answered its purpose reasonably well, and probably could not have been put to any better use. We are not sure, however, that it would not be well to re-enact the old custom of midnight burial at the crossroads, stake and all, for such as make an end of themselves in such untidy and, to their friends, shocking ways. With so many means at command for decently slipping off the mortal coil bodily mutilations are not to be tolerated.



PILLSBURY'S GUILLOTINE.

MISCELLANEOUS INVENTIONS.

Mr. Goldsborough Robinson, of Louisville, Ky., has patented a process of treating leaf tobacco for improving its color and quality, which consists in immersing the tobacco in alcohol and then drying it.

Mr. Charles Coon, of Saugerties, New York, has patented a process of repulping paper, which consists in causing the beater engine to operate upon the same while suspended in a hot bath.

Messrs. John S. Headen and John I. Spainhower, of Pleasant Hill, Mo., have patented an improvement in that class of boiler washing machines in which an oscillating lever or analogous device is employed to press or squeeze the clothes, said lever working in a clothes receptacle having a perforated semicircular bottom and placed in a sheet of galvanized iron boiler that is intended to be set over a fire.

Mr. Andrew J. Clark, of Little Falls, Minn., has invented an improved book for holding blank forms, the object of which is to preserve the blanks in good condition, and to enable the different kinds to be readily and quickly referred to and taken from the book.

Mr. Merrill R. Skinner, of Foster Brook, Pa., has patented a swivel hook for connecting and tightening ropes and cables without removing them from the pulleys or shafting, and which is simple in construction and effective and convenient in use.

An improved ice pitcher of simple construction, with a removable lining of porcelain, has been patented by Mr. Herman Vasseur, of Wallingford, Conn. The invention consists in an ice pitcher containing a removable lining of porcelain, glass, or similar material resting upon the detachable bottom of the pitcher.

Mr. Jasper T. Cronk, of Hoboken, N. J., has patented a simple and convenient means of adjusting a clothes line and hanging the clothes from a window. The invention is an improvement on the line fastener for which Letters Patent No. 186,991 were granted to the same inventor February 6, 1877.

An improvement in pianoforte agraffes, patented by Mr. Edward T. Bowlby, of Dixon, Ill., relates particularly to improvements in the agraffe which clasps the strings to the bridge on the sounding board; and the object of the improvement is to prevent the disagreeable jarring of the strings caused by the springing of the frame of the instrument and the setting of the bridge and sounding board.

Mr. William Harkins, of Dunkirk, N. Y., has patented a car coupler formed of a drawhead having an extended arm and a coupling bar at one side with a recess between. A horizontal key is propelled by a pinion gearing into a rack on the key or by a spring. The pinion has a lever arm attached to it which, when the key is set, extends across the recess, so as to be struck by an entering bar of the opposite coupler. When this lever is struck the key is thrown forward by the combined action of the revolving pinion and spring or by the pinion without the spring, and passing through a slot of the coupling bar, holds the cars coupled.

IMPROVED WINDMILL.

The windmill represented in the annexed engraving has its wheel mounted on a vertical shaft, in a strong, well-braced, octagonal timber tower, provided with shutters which may be opened or closed to control the motion of the wind wheel, or to stop it altogether, as circumstances may require. The shutters are hung loosely so that they will open by the force of the wind.

The wheel consists of upper and lower radial, arms extending from hubs placed on the vertical shaft. Between these arms are secured vanes or paddles, which are set at a suitable angle to receive the wind; the outer vane inclining inward from the end of the arm at an acute angle, and the others placed behind and parallel with it. By this arrangement the air passing through the wheel is utilized to the greatest extent: striking the first vane on the outer row, it is guided to the second vane on the second row, and from this to the third vane on the inner set, and so on.

In a mill of this construction the wind from any direction may be utilized to the fullest extent. The wheel and tower are simple and inexpensive, and the mill is adapted to general use.

Wind power is certainly cheaper and more universal than any other, and the machine shown in the engraving seems well adapted for utilizing it.

Further particulars may be obtained by addressing the inventor, Mr. Thomas Dwees, San Antonio, Texas.

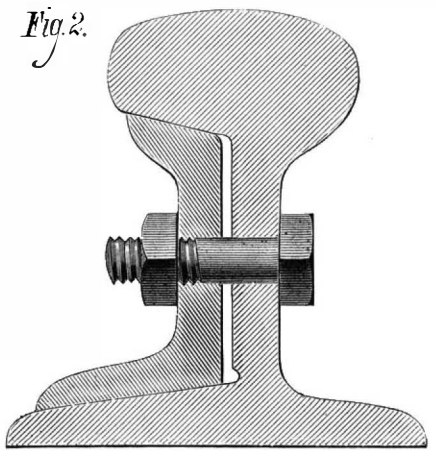
A Night Light.

A simple way to produce an illuminating composition is thus described in *Industry:* Cleanse oyster shells by well washing, expose them to a red heat for half an hour, separate the cleanest parts, and put into a crucible in alternate layers with sulphur; now expose the vessel to a red heat for an hour at least. When cold break the mass, and separate the whitest parts for use. If inclosed in a bottle the figures of a watch may be distinguished by its aid. To renew the luminosity of the mass place the bottle each day in the sun, or in strong daylight; or burn a strip of magnesium wire close to the bottle. The sulphide of lime will thus absorb light, which will again be available at night time.

IMPROVED RAIL.

The annexed engravings represent an improved rail recently patented in this country, also in England, France, Germany, and Belgium. It is intended to avoid the noise and

Fig. 2.

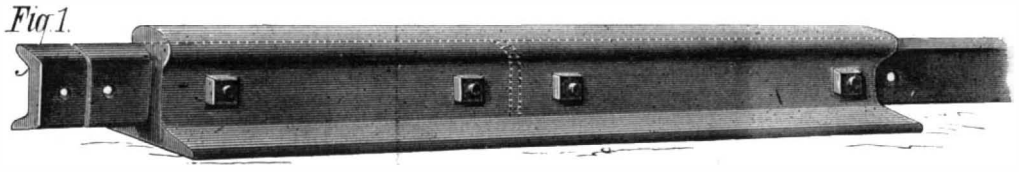


VAUGHAN'S IMPROVED RAIL.

jarring common to the ordinary forms of rail by preventing the depression of the ends of the rails at the joints. This construction, besides conducing to the speed, safety, and comfort of travelers, and increasing the durability of the track, adds to the durability of the rolling stock and machinery run upon it.

The mechanical construction will be understood from the engravings, Fig. 1 being a perspective view, and Fig. 2 a transverse section.

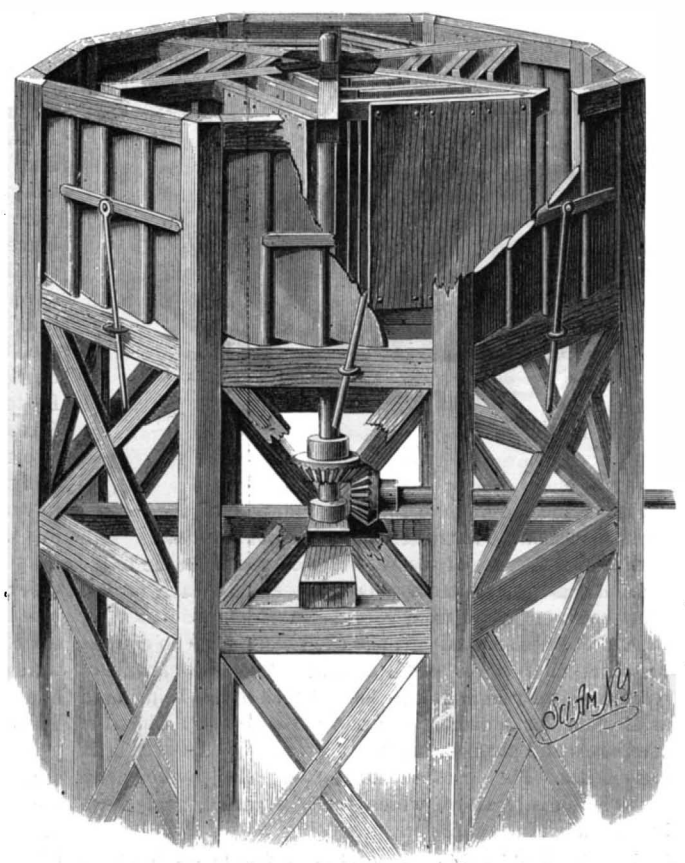
Fig. 1.



VAUGHAN'S IMPROVED RAIL.

The rail is made in two parts, one of which is similar in form to the ordinary rail, the difference being that one side is channeled deeper than the other, and the channel is beveled to receive a re-enforcing bar, which is also channeled and breaks joints with the rail proper so that the whole is as rigid at the joints as elsewhere. A little space is left between the vertical adjoining faces of the two parts of the rail to admit of a perfect bearing at the upper and lower edges of the inserted piece, and there is a small semicircular groove at the juncture of the base and web to relieve the sharpness of the angle.

This improvement is the invention of Dr. A. C. Vaughan, of Shane's Crossing, Ohio. The foreign patents are to be issued jointly to the inventor and Mr. Francis Jordan, of Harrisburg, Pa., who is general agent for the introduction of the invention.



DWEES' WINDMILL.

The Kuro-Si-wo not like the Gulf Stream.

According to the recent report of W. H. Dall, Acting Assistant of the U. S. Coast Survey on the Pacific coast, the Kuro-Si-wo, or Japanese warm current, is not marked in its approach to the American coast by sharply defined walls of water temperature such as characterize the Gulf Stream of the Atlantic. It is not at all like a river flowing in its bed. There is a general drift which is reversible and intermittent when opposed by storms, and which shades off from a temperature of 65°. That part of the Kuro-Si-wo having a temperature of 55° approaches the northwest coast in the vicinity of Vancouver Island. There is a deflected arm of this current known as the Alaska current, which has a temperature varying from 50° to 55°. The shoal waters of the Behring Straits on the eastern side appear to be warmer than on the western side. But Captain Dall says that there is no proof that there is a warm current flowing up through the straits. The whole Pacific coast, however, from Unmak in Alaska, to Vancouver is bathed by a sea with a summer temperature varying from 48° to 55°.

The winter along a coast of this temperature never can be severe. There is a great precipitation of moisture, but only a moderate degree of cold until the interior of the country is reached. Southeastern Alaska has been described by recent explorers as having more than a tolerable climate. For a considerable part of the year it is pleasant and altogether agreeable. It is essentially that of Vancouver. The exhalations of moist air are drifted inland. Vegetation is rank, and a great deal of the land can be made very productive. It is not to be supposed that the influence of the Kuro-Si-wo is lost after passing Vancouver in a southerly direction. It no doubt has some influence all along the Oregon coast, and greatly aids in the precipitation of moisture in Washington Territory and Northern Oregon, and in producing the fogs of the California coast.

MECHANICAL INVENTIONS.

An improved nut lock, patented by Messrs. Amandes Hackman and George W. Tinsley, of Blakesburg, Iowa, consists of a bolt having a longitudinal groove cut across its screw threads, in combination with a nut having a thin raised annular collar or flange, that fits about the bolt and may be pressed into the groove of the bolt for the purpose of locking.

A baling press so constructed that the head block can be moved to one side to uncover the top of the baling box, and that the direction of motion of the follower can be changed while the driving shaft moves continuously in the same direction, has been patented by Mr. Alexander McN. Paxton, of Vicksburg, Miss.

Mr. Henri Burin, of New York city, has invented a tool for cutting off metal rods, bars, or shafts, and also for cutting screw threads, and especially intended for heavy work. The inventor makes use of a cutter head fitted for being revolved by a hand crank and gearing on a base or support that is to be clamped around the bar or shaft. The cutting tool travels around the shaft or rod, and is set up by a screw as the work progresses.

A novel and efficient rock drill, wherein the drill is fed and turned automatically, and is operated in delivering a blow by the full force of the propelling power, has been patented by Mr Arthur W White, of Buffalo, N. Y.

Mr. Kimp Hill Higginbotham, of Waterford, Miss., has patented a water wheel, so constructed that it can be run with a very low head of water, and can be stopped and started automatically.

Mr. Joseph V. Morton, of Winchester, Ky., has patented a sewing machine motor, so constructed that sewing machines may be driven by hand power or by foot power, or by both hand power and foot power, as desired.

Signaling by Illuminated Steam.

A new method of signaling at sea has lately been tested in England by the Trinity Board, with great promise of beneficial results. The system was devised by Carl Otto Ramstedt, late of the Russian navy. The apparatus consists of a dished chamber, in which the inventor burns strontium or other substances so as to produce a variety of colors if desired. At the back of the chamber is a reflector, by means of which the light is thrown on the steam either steadily or in flashes at will. The steam thus becomes a luminous mass, varying in color with the substances used in combustion. In practice the light is thrown upon the steam issuing from the funnel of a steamer, and optical signals are made according to any known code of signaling, such as by combinations of flashes of longer or shorter duration. This is effected by the light apparatus being closed in at the front with a hinged cover, which is manipulated by the signaler according to arrangement. The result of the experiments showed the system to be very effective and applicable to its intended purpose, and there appears to be little doubt that it will prove of value as a means of signaling at sea.

The advantages of the invention are not limited to steamers, as it is equally applicable to sailing vessels, in which the light might be thrown upon the sails.

Useful Shams.

Under the above heading, which we think an inappropriate one, as most of the articles named are not only useful substitutes, but in some cases superior to the genuine article for use in the arts, Mr. P. L. Simmonds, in the *British Trade Journal*, remarks as follows:

One of the most noticeable features of modern times is the immense progress which has been made, and the manufacturing ingenuity and scientific skill displayed, in finding substitutes for expensive or scarce raw materials and articles in general demand. The fact is apparent beyond question that art is fast invading the domain of nature. Chemistry is enabling us to replace animal and vegetable dyes, and to form artificial gems, or creditable imitations; mineral oils replace animal and vegetable ones for illuminating purposes, and the electric light is treading upon the heels of gas.

The expensive outfits for the whale fisheries are comparatively abandoned, whalebone and blubber from the huge marine mammals being less in request; coral insects may proceed with their submarine constructions unmolested; the sea tortoise will be pursued less eagerly for its carapace; the ostriches of the desert be less sought after; and even the great pachyderms of India and Central Africa can be spared to be more usefully employed in extending the march of commerce. Under our enlightened civilization we can now manufacture our own whalebone, coral, tortoise shell, ivory, and feathers, without the need of penetrating into wild jungles and arctic or tropical seas for our supplies. The extinction of whalebone in commerce will not deprive us of our umbrellas, or the female sex of their parasols and corset busks. Rattans have been converted into wallosin, and horn shaped into pliable bones, while steel ribs also do duty effectually for baleen.

Ivory, being an expensive material and in continual demand, has formed the subject of many patents for good substitutes, but those tried have generally had more the appearance of an opaque cement than the natural dentine. The best and most effectual imitation, which takes a good polish, is the American substance passing under the name of "celluloid."

Celluloid is one of those inventions of recent origin which has become a substitute for many natural raw materials. It is a species of solidified collodion produced by dissolving gun cotton in camphor with the aid of heat and pressure. The applications of celluloid are now legion. As a substi tute for ivory it is best known, and so perfect is the resemblance that a close inspection is required to distinguish the counterfeit from the genuine; the absence of the grain, or decussation, is the chief distinction. Celluloid possesses not only all the strength and elasticity of ivory, but it does not warp nor discolor with age.

It is much used in making combs, backs of brushes and hand mirrors, frames for looking glasses and portraits, handles for knives and forks, piano and organ keys, and billiard balls, which are said to be equal in elasticity to those of ivory. One advantage it has over ivory is that it may be moulded, so that the most delicate and elaborate articles can be made with it at a fraction of the cost of true ivory. An endless variety of colors can also be given to celluloid by the admixture of proper pigments.

In imitation of tortoise shell it is made into such articles as combs, card cases, cigar cases, napkin rings, etc. The pink coral so popular for jewelry is admirably imitated with it, and so are malachite and amber mouthpieces for pipes, cigar holders, and musical instruments.

Beautiful fancy ornaments are made of artificial tortoise shell, which is formed by melting gelatine at a moderate temperature with a small amount of metallic salts, running the whole into moulds, and staining the mass with hydrosulphate of ammonia, so as to produce an imitation of the grain of natural tortoise shell. The appearance of tortoise shell may also be given to horn by brushing it over with a paste made of two parts of lime and a little soda lye, which is allowed to dry. This forms sulphuret of lead with the sulphur contained in the albumen of the horn, and produces dark spots, which contrast with the lighter colors of the horn.

Among minor products which have been successfully imitated are meerschaum, horn, and coral, by the pulp of potatoes, turnips, or carrots, treated with sulphuric acid.

Ostrich feathers, which, as the coveted court plumes of fashion have always been in demand at high prices, are not only getting more plentiful by the domestication of the bird, instead of hunting it down in its wild haunts, but imitations of all kinds have sprung up—those of spun glass sold at from 2*s.* to 8*s.* each instead of 10*s.* to 20*s.*; those made of silk, etc. It has heretofore been the custom to work up all the odds and ends of ostrich feathers into plumes, and even to make use of the feathers of other birds. But it was left for Yankee ingenuity to get up an imitation, the component parts of which are silk on a rattan or celluloid quill. This "sham" could be easily passed off on ladies as genuine, and almost defies detection by others than experts.

Cloth, in imitation of furs and skins, is now made from mohair or goat's wool, and the resemblance is so good that at a few yards' distance it is difficult to tell whether it is real or imitation. It is colored to resemble seal, beaver, otter, and chinchilla, and lately there has been quite a quantity made in imitation of ostrich feathers, and used very largely for trimmings on dresses and mantles. At the last Paris Exhibition there was an imitation white squirrel shown, shaded to a light fawn.

The manufacture of imitations of precious stones has long been an important industry in France, but it has increased enormously of late years, on account of the perfection attained in the art; and at present the supply cannot keep pace with the demand for fictitious gems. A revolution has been brought about lately in the manufacture of artificial diamonds by substituting a preparation of gold for the oxide of lead in making the strass, and further, the stones when cut are subjected to a chemical process by which the refractive power is made equal to that of diamonds of the purest water. These perfect stones attracted great attention in the last Paris Exhibition, where they were exposed side by side, and in the same cases, with real diamonds of great price. Whether the latter can ever be artificially made on an extensive scale is still a matter of dispute, although its possibility is claimed. Any man can convert a diamond into charcoal, but it is not so easy to turn charcoal into diamonds. The recent claim of Mr. MacTear, of Glasgow, to have crystallized carbon is acknowledged, but the diamonds produced are as yet too minute to affect the value of natural ones.

Artificial pearls have long been manufactured with the greatest skill and ingenuity, and so close is the imitation that alternate strings of false and genuine shown by jewelers can scarcely be distinguished. Mourning jewelry of black glass has replaced the more expensive jet ornaments among the lower classes.

Numerous patents have been issued from time to time for making imitation marble, which in practice have been more or less successful; by some of these an almost perfect imitation of the various shades and colors of marble is obtained, and slate is made to imitate marble. Artificial stone is now made to any extent.

Within the last six or seven years a complete revolution has taken place in the substitution of artificial alizarine for the natural alizarine of madder. The culture of this dye root has almost been abandoned now in the producing countries where it was formerly grown. The product from an agricultural industry which yielded yearly over £2,000,000 in value has been entirely replaced by a chemical.

As a dye, alizarin is now, at most, not more than one-third of the average price of madder in former years. The "green grease," one of the last portions of the distillation of coal tar, was formerly an impurity, and valueless; instead of being thrown into the gutter, this by-product has become a valuable commodity which has largely benefited our gas works, England being the great tar producing country. The new color obtained from it does away, too, with the necessity of separately mordanting the fabric to be dyed.

From the light coal tar oils a whole series of aniline colors, of formerly unknown shades, have sprung up, exceeding in value £2,000,000 sterling annually. The estimated value of the production of coal tar colors, here and on the Continent, is about £3,250,000, and this industry has placed at the disposal of commerce products which, but for chemical research, could never have been obtained.

Ultramarine is another color which has made remarkable progress, although it is not a recent substitute, its manufacture dating from 1828, when it was discovered by Guimet. In 1820 the blue prepared from lapis lazuli cost £80 the pound; now the yearly production of ultramarine in Europe (chiefly in Germany and France) is over 22,000,000 lb., sold at less than 1*s.* the pound.

A cheap substitute for silver has been found in aluminum made from bauxite, at a cost of 20*s.* the lb.

When the war with Russia rendered bristles scarce and dear, commerce soon supplied our brushmakers with vegetable substitutes in the shape of kittool fiber and coir fiber from palms, Mexican fiber from the leaves of *Agave sisilana*. Piassava fibre from the leaf stalks of a South American palm came in to supply bass brooms, chimney sweepers' brushes, and street sweeping-machines. Even split quills have been brought into requisition for brushes, and for white and dyed bristles we are not alone dependent upon the stiff hair of the hog.

Another cheap substitute brought into use is that of vegetable down, to replace the costly animal product, eider down. These silky downs, clothing the seeds of several plants, such as *Bombax*, *Ceiba*, *Calotropis*, etc., are now largely used for filling coverlets, ladies' quilted petticoats, muffs, and other articles. This vegetable down is 50 per cent cheaper than the feather down. The qualities which recommend it for use are immunity from attacks of moth and vermin, lightness, elasticity and softness, medium warmth, and cheapness.

The manufacture of oleomargarine, or artificial butter, has already reached the status of an important industry, both in America and on the Continent. The production of oleomargarine is carried on on an extensive scale in large establishments, where great quantities of fat can, by special machinery, be treated cheaply and with uniform results, while the churning of the oil with the milk, and the subsequent processes necessary for its conversion into butter, are the work of numerous small factories.

Besides the use of oleomargarine for the manufacture of artificial butter, it finds another extensive channel in the manufacture of cheese, being added to skim milk and rennet. The cheese produced is said to be palatable, and to make a heathful article of food.

Gas bids fair to be replaced ere long by the electric light, judging by the progress Mr. Edison has made with his electric lamp.

Careful thought and ingenuity are always on the search to utilize waste products, and to find substitutes. For instance, there is a large demand for eggs for various manufacturing purposes—for glace leather in glove making, book binding, photographing, calico printing, clarifying liquors, etc., in the form of albumen, and the yolk of the egg, etc.

Large premiums have been offered for a good substitute for egg albumen, but no really efficient substance has yet been discovered. In glove making a mucilage obtained from the root of the marsh mallow has been tried. Some manufacturing processes require the white of the egg, some the yolk. At least four eggs are required to clarify every barrel of wine; and when the production of wine in France and other continental states is considered, the demand becomes extensive, reaching hundreds of millions of eggs. Some of the seaweed isinglass might certainly be used for this purpose.

There is no end to artificial productions, and the list might be extended indefinitely, including artificial ice, which renders us independent of King Frost; artificial sugar, which we can make from starch or rags; artificial fruit essences, artificial horn from seaweed, artificial wood from compressed sawdust or straw, artificial leather from old scraps or the leather cloth, artificial parchment from paper chemically treated with sulphuric acid, and as hides for leather become more in demand, we have come to utilize the formerly neglected skins of the alligators, the snakes, the kangaroos, the porpoise and other sea mammals, and fishes.

Use of the Blowpipe with Closed and Open Glass Tubes.

BY C. J. MULLER.

Very important results are obtained by heating substances under examination in closed or open glass tubes. They should be of hard German glass, as this does not readily soften under heat, nor become discolored, like ordinary flint glass, by a deposit of reduced lead. The most convenient size for the closed tube is 3 inches by 3 or 4 10ths; of the open tube, 4½ inches by 2-10ths.

The Closed Tube.—The phenomena to be observed in using the closed tube are: 1, Decrepitation; 2, change of color; 3, phosphorescence; 4, deposit of condensed aqueous vapor; 5, deposit of a solid sublimate; 6, fusion; 7, evolution of gas or vapor, which may be colored, alkaline, acid, or odorous. Sometimes it is advantageous to have the tube bulbous at the bottom. It should be rendered dry before use by warming it over the spirit-lamp, and also be quite clean. The assay may sometimes be in powder, sometimes in the shape of a small fragment, according to circumstances. If in powder, the powder should be introduced so as not to soil the sides of the tube. The charged tube should be first heated in the flame of a spirit-lamp, and in most cases the heat be subsequently increased by exposure to the blowpipe flame. To test the acidity or alkalinity of any condensed moisture or uncondensed vapor, small strips of moistened turmeric or litmus paper should be inserted in the mouth of the tube.

EXPERIMENTS.

Witherite, simply heated by means of spirit-lamp, decrepitates, yielding watery vapor, which condenses in the upper part of the tube.

Nothing but the existence of water in the mineral is proved by this experiment.

Gypsum, heated by spirit-lamp, afterward by blowpipe flame, becomes white, and is converted into plaster of Paris. Water condenses in the upper portion of the tube.

The behavior and result are characteristic of gypsum.

Fluorspar, heated by spirit-lamp, phosphoresces in the dark, and decrepitates, yielding a little water sometimes.

Behavior is characteristic.

Nat. Alum, heated by blowpipe flame, gently at first, strongly afterward, intumesces and yields much water. When strongly heated sulphuric acid is evolved, which reddens litmus paper.

Turquoise, heated by spirit-lamp, yields water, turns black, and sometimes decrepitates.

Wavellite, heated by blowpipe flame, yields water and hydrofluoric acid, which corrodes the glass.

The presence of fluorine is proved.

Iron Pyrites, heated by blowpipe flame, yields much sulphur and some sulphureted hydrogen; detected by its odor and its action on acetate of lead paper.

Mispickel, heated by blowpipe flame, yields a red sublimate of bisulphuret of arsenic, and also metallic arsenic.

Pyrolusite, by blowpipe flame, when strongly heated, gives off oxygen, which may be recognized by its action on a splinter of ignited wood inserted in the mouth of the tube.

It increases the glow of the splinter, or causes it to burst into flame.

Nickel glance, heated by blowpipe flame, decrepitates, and yields an orange-colored sublimate or tersulphide of arsenic.

Ullmannite, heated by blowpipe flame, yields a white sublimate of antimonous acid, and some tersulphide of arsenic.

Calamine, by blowpipe flame, strongly heated, evolves carbonic acid gas, which may be recognized by its action on an ignited splinter of wood inserted into the tube. It extinguishes it immediately.

Jamesonite, by the blowpipe flame, fuses, and yields sublimates of sulphur, sulphide of antimony, and metallic antimony.

ACCORDING to Professor Church, withered leaves of the usual autumnal colors—yellow, red, or brown—can be rendered green again by steeping in water along with a little zinc powder.

A Poisoning Case with Lessons.

An interesting poisoning case came before the Coshocton County (Ohio) Court, at the February term, in which a woman was charged with administering arsenic to her husband, who died the 13th of August, 1870, with all the symptoms of arsenical poisoning. The body was exhumed on the 26th of August, the abdominal viscera removed and submitted to Professor C. Howard, of Columbus, for analysis, who reported traces of arsenic in the stomach, intestines, and kidney, and four-fifths of a grain in the liver.

The professor was of course an important witness in the trial, and his examination elicited some facts which are not without interest to chemical students. The tests he used were Reinsch's and Marsh's. He described the manner of distinguishing the metallic spot of arsenic on porcelain from that of antimony, relying on the hypochlorite of sodium solution and the nitrate of silver tests, together with the production of the octahedral crystals which have always been considered so highly characteristic of the arsenical sublimate. The defense created a doubt in the minds of the jury as to the reliability of Professor Howard's analysis, by showing on cross examination that a work on jurisprudence considered the hypochlorite of sodium test of the arsenical spot as wholly unreliable, *as it would also dissolve the antimonial spot*, though slowly. The production of octahedral crystals was proven to be unreliable as a test for arsenic by a recent statement from Professor Wormley, that antimony sometimes will produce crystals *which cannot be distinguished in appearance from those of arsenic.* We are here taught the important lesson that some of the so-called reliable distinguishing tests for arsenic are not reliable, and the careful toxicologist should make use of more confirmatory tests. The attending physician testified that he had prescribed subnitrate of bismuth to the patient, and we have not the least doubt that the arsenic found in the viscera came from this medicine. What an important lesson to the pharmacist! Here was a woman on trial for murder; arsenic was found in her dead husband's remains, and circumstantial evidence pointed to her guilt, and yet we believe the cause of the whole proceedings was this treacherous subnitrate of bismuth. Every druggist should carefully test his preparations of bismuth and ascertain whether or not they are contaminated with arsenic. We are happy to state that the woman was acquitted.—*Phil. Hoglan in Pharmacist.*

The Action of Platinum on the Animal Organism.

The action of most of the metals on the animal organism is well known, but that of platinum has been but little studied, almost the only observations that we know being those of Höfer and Gmelin, made respectively forty and fifty years ago. This gap in our pharmacological knowledge has been, to a certain extent, filled by some researches of Dr. Fredk. Kebler, of Cincinnati, in the laboratory of Strassburg, and which have, says the *Lancet*, been recently published in the *Archiv fur Experim. Pathologie u. Pharmakologie* The observations relate to the action of platinum both on frogs and warm-blooded animals. The mode of administration was the subcutaneous injection of a solution of chloride of platinum neutralized by carbonate of soda. The chief effects on frogs were found to be—augmentation of the general sensibility; heaviness of voluntary movements; curving of the back when this or the head was stroked, sometimes with painful extension of the hind legs on cutaneous irritation; increasing paralysis of the voluntary movements; spontaneous convulsive spasms of the extremities, or individual groups of muscles; weakened muscular irritability; loss of consciousness; and death. From these effects it would seem that platinum paralyzes the voluntary muscles, but paralyzes their movements before it affects the muscles themselves, apparently in consequence of a specific action on the central nervous system. The heart appears much less affected than the voluntary muscles, being scarcely interfered with, when death occurs. In mammals, however, the action is somewhat different. The direct effect on the muscles is not perceptible. Death rapidly occurs from a paralysis of the abdominal vessels when a dose is administered such as might affect the muscles. In rabbits a copious diarrhea is produced, and in dogs there are vomiting and hemorrhagic stools. In the former, after death, the mucous membrane of the stomach and intestine is congested, and in the latter the congestion extends also to all the abdominal organs. The muscular irritability was in all cases preserved up to death. In both kinds of animals indications of general paralysis were perceptible soon after the administration of the poison. The results of the experiments seem to indicate that the action of the poison takes place upon the muscular fibers or the peripheral nerve endings of the vessels, most probably upon the latter. But the phenomena presented by frogs, and some of the characters of the weakness in mammals, suggest that probably platinum has also a specific action on the central nervous system, and the nervous symptoms are due partly to this, and partly to the local anæmia. The fatal dose of platinum appears to be, for dogs 5 to 6 milligrammes, and for rabbits about 10 milligrammes of the body-weight of the animals experimented upon.

An Extra Mule.

Dr. Yandell, in a letter to the *Louisville Medical News*, speaks of a fertile female mule, now to be seen at the Jardin d'Acclimatation, Paris. She has brought forth no fewer than six foals—some by zebras, some by an ass, and some by a stallion.

Extraction of Perfumes with Chloride of Methyl.

BY PROFESSOR CAMILLE VINCENT, ECOLE DES ARTS ET METIERS.

Some months ago a manufacturing perfumer, M. Massignon, came to consult me respecting the employment of chloride of methyl (which has the property of dissolving fats, resins, and essential oils) in the extraction of the odorous principles of scent-producing plants. I expressed my belief that it might be so employed, but told him that I had no *data* in point at my command.

An experiment subsequently made with scent-woods succeeded, but the product possessed a very unpleasant odor, the commercial chloride of methyl used for industrial purposes retaining a pyrogenous product with a very persistent odor. I therefore turned my attention to the purification of the methyl, which in itself has a sweet ether-like smell; and in this I succeeded perfectly by treating ordinary methyl chloride with concentrated sulphuric acid, which completely absorbed the unpleasant odor. Chloride of methyl liquefied after the above treatment was found to leave no odorous residue on evaporation; it is perfectly suited for the extraction of perfumes, and when subsequently evaporated, leaves them with their limpidity and delicacy wholly unimpaired. My first experiment was made with orange flowers in a glass vessel; and the product thus obtained was pronounced by several experts to be superior to neroli obtained in the ordinary way by distillation with water. Encouraged by the success which had thus far attended my efforts, I had an apparatus constructed of sufficient size to test the practical value of the discovery by operating upon several kilogs. at once of different kinds of flowers. It consisted of the following parts: 1. A digester, in which the flowers to be extracted were placed; 2. A receiver for the liquefied methyl chloride previously purified with sulphuric acid; 3. An air-tight vessel to receive the methyl chloride after passing through the flowers, in which a vacuum could be produced with the aid of an air pump; 4. An air pump to exhaust the last-named vessel, and to drive the methylic vapor into a cold coil, whence it returns, in a liquefied state, into receiver 2. The air pump and coil formed part of an ice-making machine.

The extraction of the perfume, as, for example, of roses, is thus performed. The digester 1 is filled with flowers. Upon these is turned, with the aid of a conical stop cock attached to receiver 2, a portion of the liquid chloride of methyl contained in the latter vessel. A couple of minutes are allowed for digestion, and then the liquid is run off into receiver 3. Another charge of methyl is given, which is filtered through the flowers into vessel 3, like the preceding, and so on until the flowers are supposed to be exhausted. The air-tight receiver 3 is now partly filled with the liquid methyl charged with the odorous principles of the flowers washed by it. Any portions of chloride remaining in the digester can be removed with the air pump and by passing steam through the residue of the flowers, receiving the watery vapor in a gasometer, the chloride in each case being returned to receiver 2 through the cold coil. The chloride of methyl charged with odorous principles in vessel 3 must now be evaporated *in vacuo*. For this purpose a current of water at 86° Fah. is passed round the vessel, while the air pump is at work. When the manometer attached indicates an internal pressure of half an atmosphere, the operation may be considered as completed. The air-tight receiver is opened, and the odorous principles are found in the residum of fatty matter and wax left by the evaporated methyl. Treated with alcohol cold, this residuum yields up the perfume of the flowers in its full potency and delicacy.

In this way may be obtained, not only the perfumes of flowers generally extracted by distillation, but also of others, as the jasmine and violet, which, on account of their easy destructibility, are prepared chiefly by *enfleurage* or maceration in fat. Specimens of the perfumes extracted with deodorized methyl chloride have been sent to the Société d'Encouragement. The results with all kinds of scent-producing plants, flowers, seeds, barks, and roots alike, show that the yield by the methylic process averages 25 per cent more than by ordinary distillation with water.

M. Massignon is erecting an apparatus on the above principle at Cannes, which will be capable of extracting 1,000 kilogs. (20 cwt.) of flowers daily, and which he hopes will be in work in the course of the present month. The refrigerator attached to the apparatus manufactures 60 kilogs. of ice per hour.—*La Nature.*

Brilliant Metallic Deposits on Glass.

The deposit of a silver mirror on the interior of glass balls and hollow vessels, by filling them with suitable silvering solutions, is an exceedingly simple operation, yielding most beautiful results. The film of silver, although very thin, is not without expense. Metals which form with sulphur precipitates having a brilliant metallic luster, may be employed in the same manner as silver, yielding varied and beautiful effects at little cost. Carl Mann, assayer in Pribram, describes the use of antimony and lead as follows:

When nitric acid is added to a concentrated aqueous solution of tartar emetic solution as long as a precipitate is produced, then filtered and the precipitate stirred into fresh water, the liquid formed is essentially a basic nitrate of antimony in suspension. On diluting a portion of this milky liquid and boiling, the precipitate dissolves in the hot and acid liquid. A little of this hot solution poured into a hollow glass vessel and cooled as rapidly as possible, by shaking or holding it under running water, the liquid becomes milky and deposits a very thin but perfectly homologous film of the antimony salt on the sides of the glass. On washing it out with cold water and passing sulphureted hydrogen gas into it, or pouring in a solution of the gas, the glass appears of a uniform faint yellow color; the sulphide of antimony formed adheres very firmly to the sides of the glass after washing and drying.

By repeating this procedure several times the film can be increased very considerably within certain limits. Such glasses appear of a beautiful golden color with a green reflection. The effect is very fine and pleasing.

If sulphureted hydrogen gas be passed into an aqueous solution of oxide of lead in excess of metaphosphoric acid, a portion of the sulphide of lead will, under the proper conditions, adhere firmly to the sides of the vessel in which it is precipitated. The vessel will then have different metallic colors by reflected light according to the thickness of the film, darker when thicker. By transmitted light such a glass has a yellowish brown color.

The lead solution may be prepared by dissolving 1 part phosphoric acid in 4 parts water, also a second solution of 1 part sugar of lead in 20 parts water, and a third of a strong decoction of saponaria or an aqueous emulsion of an ethereal oil such as turpentine or *oleum serpylli.* To cover a glass ball with this lead film, three volumes of the phosphoric acid solution is poured into the ball, then four or five of the lead solution, and as much of the saponine solution. The total quantity of the liquid must be sufficient to easily cover the interior on tipping it slightly. If a thin film of the antimony be deposited first the lead film adheres better. The sulphureted hydrogen gas is passed in and the vessel kept moving to bring it in contact with every part of the glass. It is afterwards washed and dried. P. N.

AGRICULTURAL INVENTIONS.

Mr. Raphael T. Semmes, of Atlanta, Ga., has patented certain improvements in plows, and more particularly in that class of plows in which the standard is made reversible and adapted to receive mould boards and turning plows or scrapers on one side, and bull-tongues, sweeps, or shovel plows on the other.

Mr. Ferdinando Poole, of Emporia, Kan., has patented an improved hedge fence layer, which is so constructed as to lay the plants at any desired compactness and at any desired closeness to the ground.

An improved grain thrasher and separator has been patented by Mr. Martin Williams, of St. Johnsville, N. Y. The object of this invention is to furnish combined grain thrashers and separators so constructed as to separate the thrashed grain from the straw more thoroughly than machines constructed in the ordinary manner.

A Ship Canal through Denmark.

A concession has been granted to Herr Dahlström for a ship canal from the Baltic to the North Sea, between the Bay of Kiel and Brunsbuttel, in the estuary of the Elb. Its depth throughout is to be 20 feet 9 inches, its width at the surface of the water 160 feet, and at the bottom, 64 feet, the banks consequently having a very gentle slope. Provision will, moreover, be made, by the adoption of a peculiar system of locks and reservoirs, for increasing the depth of the water to 25 or 26 feet whenever it may be desirable to do so, and this depth will allow of the passage through the canal of the heaviest German ironclad afloat—the König Wilhelm, a vessel of 9,603 tons displacement and the largest ship in the German Navy, drawing only 26 feet. The canal can, it is calculated, be completed in six years, and will, it is estimated, cost $3,750,000, or about $2,250,000 less than the estimates made a few years ago of the cost of constructing a canal 31 feet deep and 224 feet wide at the surface of the water. In size, it may be added, the proposed Baltic and North Sea Canal does not compare unfavorably with the Suez Canal, the width of this at the surface of the water being 172½ feet, the width at the bottom 70 feet, and the depth about 26 feet 3 inches.

A New Gatling Gun.

An improved Gatling gun has lately been exhibited by the inventor in England. It is capable of firing 1,000 shots per minute, and killing a man or a horse at a mile range. The gun has a compact appearance, can be taken to pieces, and easily carried about, can be applied to military or naval use, and the mechanism of it is simplicity itself. The revolving barrel has ten compartments, into which, as they whirl round, metal cartridges drop from a tall oblong case fixed over the center of the barrel. At each turn of the handle ten shots are fired, and their dispersion is accomplished by a sliding apparatus. The size of shot in different caliber guns of this class ranges from musket-balls to half-pounders. By the use of this implement three men can do the work of 300 riflemen.

A Fast Locomotive.

A passenger engine built chiefly for speed has just been finished at the Baldwin Locomotive Works, for use on the Bound Brook route between New York and Philadelphia. It is intended to make the distance, 90 miles, in 90 minutes. Its driving wheels are 6½ feet in diameter, and there is but one pair. The weight of the engine is 84,000; and its water tank holds 4,000 gallons. The dimensions of ordinary passenger engines are: driving wheels 5 to 5½ feet; weighs 70,000 to 75,000 lb.; capacity of water tank 2,000 to 2,500 gallons.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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

Experimental Machinery, prices fair, at Anderson Bros., Peekskill, N. Y.

Wanted—A Second-hand Air Compressor that will supply 60 to 75 feet of cubic air per minute at 300 lb. pressure. Address L. S. C., 268 West St., New York.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Steel Name Stamps, 15 cts. per letter; Steel Figures, $1 per set. C. L. Alderson, Cleveland, Ohio.

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

H. W. Johns' Asbestos Liquid Paints are strictly first-class pure linseed oil paints, and contain no water. They are the best and most economical paints in the world for structural purposes. H. W. Johns M'f'g Co., 87 Maiden Lane, sole manufacturers.

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

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

That conspicuous structure located at the southwest corner of Smith and Fulton streets, Brooklyn, one of the finest buildings in that city, has been bought by Baldwin the Clothier, and is now known as the "Baldwin Building."

Safety Linen Hose for hotels, factories. and stores, with or without couplings. Greene, Tweed & Co., 118 Chambers St., New York.

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

G. W. Baker, Wil., Del., makes the Post Band Saw for hand, foot, and steam. Will cut 7 inches thick of hard wood.

Power, Foot, and Hand Presses for Metal Workers. Moderate prices. Peerless Punch and Shear Co., 52 Dey St., New York.

For Sale.—U. S. and Canadian Patent for a Blind Stitch Sewing Machine; a valuable invention. Address P. Hoffman, 197 East Genessee St., Buffalo, N. Y.

Penfield (Pulley) Block Works. See illus. adv. p. 285.

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

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

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

Spokes and Rims, white oak and hickory, best quality, to any pattern, and Hammer Handles of best hickory. John Fitz, Martinsburg, West Va.

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

For Middlings, Mill and Mill Furnishing, see adv. p. 285.

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

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

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

For Wood-Working Machinery, see illus. adv. p. 286.

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

Removal.—Greene, Tweed & Co. have removed from 18 Park Place to 118 Chambers St., New York.

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

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

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

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

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

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

Bradley's cushioned helve hammers. See illus. ad. p. 269.

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

For Standard Turbine, see last or next number.

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

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

Portable Forges, $12. Roberts, 107 Liberty St., N. Y.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 252.

For Separators, Farm & Vertical Engines, see adv. p. 251.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 253.

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

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

For Patent Shapers and Planers, see ills. adv. p. 251.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Company, Buffalo, N. Y. For Power Paper, Lard, Cider Presses, see adv. p. 252.

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

For Alcott's Improved Turbine, see adv. p. 270.

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

Eagle Anvils, 10cents per pound. Fully warranted.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 284.

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

Eclipse Portable Engine. See illustrated adv., p. 284.

The Horton Lathe Chucks; prices reduced 25 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn.

$275 Horizontal Engine, 20 H. P. See page 284.

Emery Wheels of all kinds, and Machines at reduced prices. Lehigh Valley Emery Wheel Co., Weissport, Pa.

The 1880 Pennsylvania Lawn Mower.—Light draught and easily adjusted. Machines warranted. See illus. adv. last week. Lloyd, Supplee & Walton, Philadelphia, Pa.

Pat. Steam Hoisting Mach'y. See illus. adv., p. 284.

Nellis' Cast Tool Steel, Castings from which our specialty is Plow Shares. Also all kinds agricultural steels and ornamental fencings. Nellis, Shriver & Co., Pittsburg, Pa.

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

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

Rue's New "Little Giant" Injector is much praised for its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

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

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

Elevators.—Stokes & Parrish, Phila., Pa. See p. 285.

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

4 to 40 H. P. Steam Engines. See adv. p. 285.

Combined Universal Concentric or Eccentric and Independent Jaw Chucks. Pratt & Whitney Co., H'tf'd, Ct.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

(1) E. D. writes: 1. I have a lot of screws which by accident got rusty. I would like to know if there is any liquid bath I can give them which will give them a better appearance. A. Dip them for a few seconds in a mixture of sulphuric acid 1 part, water 10 parts. 2. Will you please give me directions for making a cheap electric machine for medical purposes? A. See p. 203 (14), Vol. 39, SCIENTIFIC AMERICAN.

(2) G. A. C. asks: Do telegraph wires attached to a house, or passing over one, have the tendency to attract the lightning to the house? A. No.

[OFFICIAL.]

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April 6, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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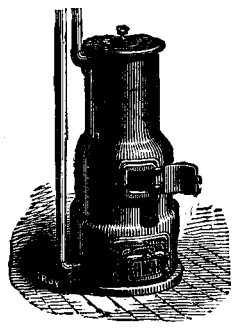

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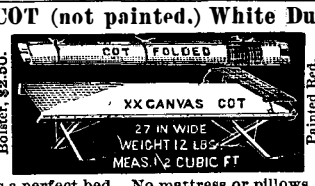

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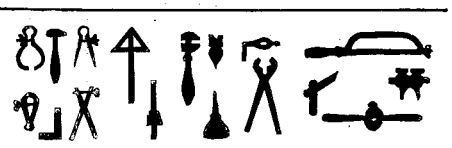

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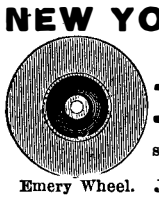

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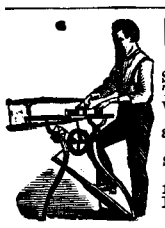

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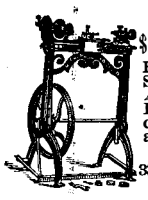

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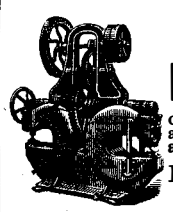

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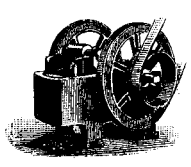

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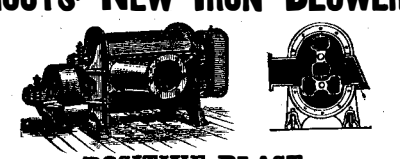

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