
a Weekly journal of practical information, art, science, mechanics, chemistry, and manufactures.

NEW YORK, MAY 6, 1893.


## THE NAVAL PARADE AND REVIEW,

The combined fleet of American and foreign war vessels which had been gathering at Hampton Roads for some two weeks previous, to participate in the inauguration of our Columbian festivities, sailed from that port on April 24 for New York, under command of Admiral Gherardi. The interchange of courtesies most cordial, and interesting in the highest degree, the time which the vessels were at Fort Monroe being oc cupied by an almost uninterrupted round of entertainments, including boat races among the different crews and sea maneuvering by the vessels. The ships went to sea in double column, the American, German, and Dutch forming the port column, and the British, Russian, French, Italian, and Brazilian the starboard column, and in pretty nearly this order they reached the Lower Bay of New York on the following day. The three Spanish vessels, the Infanta Isabel, Reina Regenta, and Nueva Espana, having in tow the three Columbus caravels, did not remain at Hampton Roads, to come from there with the fleet; but fearing that the weather might not be favorable for the towing of the caravels, they made the voyage a day earlier, safely anchoring their small craft at the assigned places in the North River.
At 9 o'clock in the morning of April 26, the signal $\left\lvert\, \begin{gathered}\text { Port } \\ \text { Gherardi, commander-in-chief : 1, Philadelphia (flag). }\end{gathered}\right.$
to "Prepare to get under way" was flung out from the
Philadelphia, Admiral Gherardi's flagship, and answer-
ing pennants responded from all the warships, where
everything had been put in most complete readiness for
making a grand entrance to the harbor and port of
New York. The day was bright and beautiful, and
a stately panorama was then presented to the many
thousands who covered the high grounds of Staten
Island and the Long Island shore from the Narrows
up, and crowded the tops of buildings and the lines of
the wharves of three cities as the combined fleet came
forward up the magnificent bay and the noble river
at slow speed, and the vessels maintaining measured
distances, until the anchorage ground was reached,
opposite the beautiful Riverside Park.
Forts Hamilton and Wadsworth saluted the vessels
as they passed up, but on this occasion the salutes
were only answered by the flags of the fleet. There
was constant signaling between the vessels to main-
tain the proper distances and order, the formation and
sailing order calling for 900 feet of water between col-
umns and a similar distance between ships. The order
of the, parade, and in which the vessels came to anchor
for the review on the following day, was as fol-
lows:
Port Colums.- United States. - Rear Admiral

2, Newark (flag). 3, Atlanta. 4, San Francisco. 5, Ban roft. 6, Bennington. 7, Baltimore. 8, Chicago (flag). Yorktown. 10, Charleston. 11, Vesuvius. 13, Con cord, Argentina.-Rear Admiral Howard. 13, 9 de Julio. Holland.-Capt. Arriens. 14, Van Speyk. Ger-many.-Capt. Buchsel. 15, Kaiserin Augusta. 16, See adler. United States.-17, Miantonomoh. Starboard Column.-Great Britain.--Vice Admiral Sir John Hopkins, commander-in-chief. 1, Blake (flag). 2, Aus tralia. 3, Magicienne. 4, Tartar. Russia.-Vice Admi ral Koznokoff, commander-in-chief. 5, Dimitri Donskoi (flag). 6, General Admiral. 7, Rynda. France.Rear Admiral de Libran, commander-in-chief. 8, Arethuse (flag). 9, Hussard. 10, Jean Bart. Italy.-Rear Admiral Magnaghi, commander-in-chief. 11, Etna (flag). 12, Giovanni Bausan. Spain.-Rear Admiral Gomez y Lono, commander-in-chief. 13, Infanta Isa bel (flag). 14, Reina Regenta. 15, Nueve Espana. Bra il.-Rear Admiral de Noronha, commander-in-chief. 16, Aquidaban (flag). 17, Tiradentes. 18, Republica.
During the passage up, the U. S. monitor Miantonomoh did not take her position until the other vessels of the fleet had passed up the river, as she was sta tioned opposite the Battery to fire a salute from her great ten inch guns on the unveiling of a statue of John Ericsson at that place, the exercises in connec (Continued on page 280.)


## Sixutific Gemmerian. <br> ESTABLISHED 1845.

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OPERATIONS OF THE CANADIAN PATENT OFFICE. We are indebted to the Minister of Agriculture of Canada for a copy of his report for the year 1892, which contains the proceedings of the Canadian Patent Office.
In Canada patents are granted very much on the same system as in this country, but the life of the patent is eighteen years, divided into three periods of six each, according to the amount paid by the applicant. Payments on the great majority of patents are not continued beyond the period of six years. An American patent that is not more than one year old can be patented in Canada, but it is necessary, in order to maintain the validity of the patent
hall be worked in Canada within two years.
In 1892 there were granted a total of 3,417 Canadian patents, of which 2,227 were taken by American citizens, 671 by Canadians, 298 by Englishmen, 106 by Germans, 26 by Frenchmen, and 89 by persons of other nationalities. It will thus be seen that nearly twothirds of all the patents granted in Canada are to American inventors, and but for them the Canadian Patent Office would make a very poor showing. The entire receipts of the Canadian Patent Office were $\$ 84,720$, and the expenditures were $\$ 39,643$, leaving a profit of $\$ 45,000$ over expenses. It may be said that American inventors chiefly support the Canadian Patent Office as well as the Patent Bureau at Wash ington.

## reatment of potatoes to prevent potato

 SCAB.A recent number of the Rural New Yorker con tains an article by H. L. Bolley, illustrated by photographs, showing the advantage of soaking the seed tubers in corrosive sublimate solution. The author says it has been demonstrated that the black-
ened, pock-marked condition of potatoes, commonly poken of as potato scab, is due to the direct action of a parasitic cause which not only originates disease on the tubers, but also affects. the roots and bases of the vines. The disease is propagated in the new crop from that on the seed tubers, and the author claims that, if the tubers are treated with the substance mentioned, the plants will be free from the disease.
Photographs are given of potatoes grown without having the seed tubers treated and those that were treated. The treated seed yielded potatoes that were clean and froc from disease. The treatment is easy of application and the yield is increased. The seed tubers were soaked for one and one-half hours in a one one-thousandth solution of corrosive sublimate
The author claims that the ordinary method of spray ing the vines is simply a waste of energy, as the incep tion of the disease is from below.

## OPENING OF THE WORLD'S COLUMBIAN EXPOSITION

 CHICAGO, MAY $1,1893$.The formal dedication of the Exposition buildings in October last was attended with much pomp and ceremony. It was, therefore, decided that the exercises pertaining to the opening of the great affair should be impressive, yet at the same time very simple. Among the most prominent guests who received invitations for the opening exercises were: The President of the United States, the Duke of Veragua, the lineal descendant of Columbus, the Vice-President, members of the Cabinet, the judges of the Supreme Court, the diplomatic corps, senators, members of the House of Representatives, the governors of the several States, the mayor and city government of Chicago, Chicago park commissioners, the members of the governing boards of the Exposition, and the members of the board of lady managers.
The programme is as follows :

1. Music-Columbian March and Hymn-John K Paine.
2. Prayer.
3. Presentation of chiefs of departments and foreign commissioners by the Director-General.
4. Music-"In Praise of God"-Beethoven.
5. Address and opening of the World's Columbian Exposition by the President of the United States. 6. Starting of machinery, during which time will b performed "Hallelujah Chorus"-Handel.
6. Official visit from the President of the United States and the officials of the World's Columbian Exposition and the World's Columbian Commission to the various departments, arrangements having been made previously with each chief to receive them.
The formal opening exercises were arranged to take place in the Grand Plaza, on the east front of the Administration building. The invited guests of the occasion were seated on the platform, as well as the mem bers of the grand chorus. It is estimated that 100,000 people may here witness the exercises without being overcrowded. After the opening programme has been carried out and President Cleveland has declared the Exposition opened, and pressed the electric button by which the machinery is put in operation, the guests where to be escorted through the buildings and grounds. How to Reach the Grounds.-The accompanying official map of Jackson Park skows the arrangement of
the Exposition grounds and buildings, and the relation of the Midway Plaisance to it. The steamboats land their passengers at the great pier. The Illinois Central Railroad has built a station at 60th St., where all passengers by this route will be landed. All the other railroads land their passengers in the Great Railway Terminal station inside the grounds. The elevated railroad has built a station over the annex to the Transportation building, which is near the heart of the grounds. Most of the visitors reaching the grounds by the cable roads land at the north end of the grounds, near the 57th St. entrance. The more important entrances to the grounds are. 57th St., 59th St., 60th St., 62d St., and 64th St.
The Midway Plaisance, as will be seen from the map, comprises a strip of land between 59th and 60th Sts., extending from Stoney Island Avenue to Cottage Grove Avenue. It is here that all concessions have been granted, with two or three exceptions, that are not necessary features of the Exposition. There are several entrances to the Midway Plaisance, and it is reached from the Exposition grounds by a large entrance opposite the Woman's building. A viaduct has been built by which Stoney Island and the other avenues crossing the Plaisance are elevated, so that visitors can pass back and forth without crossing any highways.
The Entrances.-Entrance tickets to the grounds are on sale at hotels, railway stations and in many other designated places throughout the city and also at an abundance of ticket offices at the entrances to the Exposition grounds. There are nearly two hundred ticket windows at the entrances to the grounds and 325 turnstiles. The several routes by which the grounds are reached from all parts of the city are so far perfected in their arrangements for carrying passengers that there is little doubt that they will be able to accommodate all who may attend.
The Japanese make one of the most complete and comprehensive exhibits of any foreign nation, being represented in all but two or three of the larger buildings, in addition to some special exhibits and concessions. Their displays in the Manufactures and Liberal Arts building include silks, pottery, porcelains, art work and other manufactures, while in the Agricultural building is a fine exhibit of tea and other products, and in the Horticultural building many plants, flowers and examples of Japanese gardening and floriculture. At the north end of the Wooded Island the Japanese government has erected a very attractive structure, which has just been dedicated with considerable ceremony, and which will be formally presented to the Chicago and which will be formally presented to the Chicago
park commissioners at the close of the Exposition as a park commissioners at the close of the Exposition as a
permanent memorial. The building is a fine specimen of Japanese handiwork and architecture. It is one story high and consists of three pavilions, each representing an important era in architecture and decoration in the history of Japan. The right wing represents an era corresponding to the period of the discovries of Columbus. Other features of the Japanese exhibit will be the Japanese village, concession for which was granted on Midway Plaisance, and tea houses in the Exposition grounds proper. The Art Gallery, Fisheries building and other buildings also contain interesting exhibits from these people.
Side Shows and Concessions.-So many concessions have been granted by the World's Columbian Exposition that the impression has got abroad that the fifty cents admission fee to the grounds entitles the visitor to see only a part of the Exposition proper. This impression is erroneous, decidedly so. All the buildings, both those erected by the Exposition and those erected by the several States and foreign nations, are open to the public without cost, and all the exhibits in the Exposition are also open to the inspection of the public without additional cost. The fifty cents admission permits the visitor to see the whole Exposition and enjoy many comforts such as seats in the buildings and grounds, retiring rooms, drinking water, and the like. But there aremany duplicates of these comforts,'besides other extras, for which a small charge is made. Visi tors will have an abundant supply, without cost, of all the conveniences necessary to their comfort; but if they are willing to pay for extras, they will secure a little more seclusion and perhaps somewhat more luxurious arrangements. There are always plenty of people who are willing to pay extra for special conveniences, and the Exposition proposes to take advantage of this tendency and benefit by it, so as to increase its legitimate income in every way possible. The estimated cost in round numbers is $\$ 22,000,000$ to open the Exposition to the public. In addition to this, there will be large running expenses during the six months it is open; so that in order to meet the outlay from entrance admission alone, there would be necessary an at tendance of about $50,000,000$ people. In order to make the Exposition a model as an exposition and also a success as a business venture, the management has availed itself of every possible source of revenue.
The many concessions must bring in returns to the amount of some millions of dollars. It need not be a necessary part of the programme of each visitor to pay a visit to the promenade on the roof of the Manu-
factures and Liberal Arts building; to buy spring $\mid$ been an interesting herd of cattle at the Exposition water, when sterilized lake water is furnished free; to grounds which has attracted considerable attention pay for the use of retiring rooms, when equal con- from its early arrival. This herd consists of fortyveniences are furnished for nothing, and so on through nine Jersey and thirty-two Guernsey, but others are a long list of similar concessions, so long as none of his legitimate rights are interfered with; but if he can spare the cost, he will indulge in some or all of these extras and not begrudge the few cents they may cost, if his money goes toward making the Exposition a success financially.
The various enterprises on the Midway Plaisance are under the auspices of the Exposition management, but strictly speaking are not a legitimate part of the Exposition, though an interesting and perhaps a neces sary adjunct to it. These various enterprises requir an admission fee.
will be represented by at least fifteen cows. The milk from each cow will be weighed as soon as drawn, and be tested as to its percentage of butter, fat, and other solids. The milk from all the cows of the same breed will then be mixed and tested in a like manner. The cream is to be separated from the milk by improved mechanical processes and the following scale of points will be used in testing the butter ; flavor, 55 ; grain, 25 ; solidity, 10 ; color, 10 . The scale for testing cheese will be as follows : flavor, 55 ; texture, 25 ; keeping quality, 15 ; color, 5.

A PHILOSOPHICAL statistician calculates that in the year 2000 there will be $1,700,000,000$ people who speak the English language, and that the other languages will be spoken by only $500,000,000$ European people.


THE WORLD'S COLUMBIAN EXPOSITION, CHICAGO, 1893-OFFICIAL MAF OF GROUNDS AND BUILDINGS.
an electrical rocking chair.
A dynamo attachment for a rocking chair, designed to send a mild current of electricity through a person sitting in the chair, such current being generated by the motion of rocking, is shown in the accompanying illustration, and has been patented by Mr. Charles E. Hartelius, of Bay Ridge, N. Y. (box 94). The dynamo, which may be of any usual type, is fastened on the under side of the chair seat, and on one side of the field


Hartelius' electrical attachment for rocking chaira.
of the dynamo is a keeper connected with a handle rod on the chair back, by adjusting which the pole pieces may be connected at any desired point to control the strength of the current. The dynamo is driven by a belt from a shaft journaled in hangers on the chair bottom, the shaft being operated by a belt from one end of a lever in connection with a spring and ratchet mechanism. The lever is pivoted to the lower end of a hanger, and at its rear end is a caster or roller, which runs upon the floor, so that as the chair rocks the lever is alternately depressed and elevated. The dynamo is connected by wires with electrodes on the arms of the chair, or with hand pieces, which may be held by one desirous of receiving the current, or with metal foot rests, so that one may by either means receive a mild current of electricity. A gentle current may thus be taken for any desired length of time, the chair being used in the ordinary way when the body is kept out of contact with the electrodes.

## TRICKS IN PRESTIDIGITATION.

Multiplication of Coins.-In prestidigitation, very simple experiments, that seem childish as soon as the secret of them is known, of ten produce quite an effect during the performance and cause the spectators more surprise than do many skillful and complicated tricks. Such is the case with the one that we are about to describe.

Upon a small rectangular tray of japanned sheet iron, similar to those in common use, are placed seven coins (Fig, 1). A spectator is asked to receive these in


Figa 12 AND 8-MULTIPLICATION OF COINs.
his hand and to put the coins back upon the tray, one by one, and to count them with a loud voice as he does so. It is then found that the number has doubled, there being fourteen instead of seven. The same operation repeated gives as a result twenty-one coins.
As may be seen in the section in Fig. 3, the tray has a double bottom, forming an interspace a little wider than the thickness of one of the coins, and which is di vided breadthwise into two equal compartments by a partition, B. These two compartments are closed all around save at the ends of the tray, where there are two apertures, A and C, that in length are double the diameter of the coins. In this interspace are concealed fourteen coins, seven on each side. When the contents of the tray are emptied into the hand of a spectator, the coins concealed in one of the compartments drop at the same time (Fig. 2). The operator then takes the tray in his other hand and thus naturally seizes it at the end at which the now empty compartment exists, and this allows the seven coins that are contained in the other compartment to join the first ones, when the latter are rapidly emptied into the hands of the spectator for the second time.
A square tray, with a double bottom divided into four compartments by divisions running diagonally from one corner to another, would permit of increasing the number of coins four times.

Let us say, however, that skillful prestidigitators dispense with ful prestidigitators dispense with
They hold the coins sometimes the double bottom. They hold the coins sometimes
under the tray with their fingers extended, and sometimes on the tray, under their thumbs, and renew their supply several times from secret pockets skillfully arranged in various parts of their coats, where the specta
them.
The Wine and the Water.-After having done con siderable talking, as required by his profession, a prestidigitator is excusable for asking permission of his spectators to refresh himself in their presence, especially if he invites one of them to come to keep him company.
An assistant then brings in upon a tray two claret glasses and two perfectly transparent decanters, one of which contains red wine and the other water. The prestidigitator asks his guest to select one of the two decanters and leave the other for himself. No hesitation is possible. The guest hastens to seize the wine and each immediately fills his glass. How astonishing ! Upon its contact with the glass the wine changes into water and the water becomes wine. Judge of the hilarity of the spectators and the amazement of the victim! The pretended wine was nothing but the following composition : 1 gramme permanganate of potash and 2 grammes sulphuric acid dissolved in 1 quart of water. This liquid is instantaneously decolorized on entering the glass, at the bottom of which has been placed a few drops of water saturated with hyposulphite of soda. As for the water in the second decanter, that had had considerable alcohol added to it, and at the bottom of the glass that was to receive it had been placed a small pinch of aniline red, which, as well known, possesses strong tinctorial properties. The glasses must be carried away immediately, since in a glasses must be carried away immediately, since in a
few instants the wine changed into water loses its few instants the wine changed into wate
limpidity and assumes a milky appear-
ance. -La Nature.

## Manufacture of Bronze Powder.

The United States commercial agent at Furth says the greater part of the bronze powder exported from Germany is manufactured in and near the cities of Furth and Nuremburg, about a hundred establishments being engaged, the factories being generally situated on some small stream, where water furnishes cheap power for driving the hammers and stamps. Bronze powder is composed of copper, tin, zinc, and antimony melted in proper proportions, and cast first into rods of half an inch in diameter and about three feet long. These rods are then rolled until about two inches wide, and then cut into suitable lengths for handling. These pieces then go to the hammers, where they are beaten into a very small fraction of their former thickness, and are then taken to a sulphuric acid bath, where each sheet is washed to remove all impurities, rust, and dirt. After being thoroughly dried, the


Fic. 4.-WATER changed Into WINe and Wine into WATER

## AN IMPROVED WRENCH AND CUTTER

A tool adapted to use as a wrench for ordinary purposes, and also as a pipe wrench or pipe cutter, is shown poses, and also as a pipe wrench or pipe cutter, is shown
in the illustration. It has been patented in the United States, England and Canada, by Mr. Theodore Fletcher, of Macdona, Texas. The shank or handle of the wrench, which is integral with its inner jaw, has a screw-threaded portion on which is mounted a spoolshaped nut, carrying a collar to which is pivotally connected a lever, the latter being pivotally connected by means of a link with the shank of the outer jaw.


FLETCHER'S WRENCH AND CUTTER.
Both jaws have at one end flat surfaces, to engage a nut, while at their other end they have concaved toothed surfaces to clamp a pipe. A removable rotary cutter is secured on a pin in a recess in the flat surface of the inner jaw. By gently squeezing the handles together, after the jaws have been adjusted upon a nut or pipe, an exceedingly firm grip is obtained, its pressure increasing with the strength of the pull, while the jaws may be automatically opened by slackening the hold upon the two handles, thus enabling the tool to be used almost as a ratchet wrench, and saving much time. When the cutter is to be used, after adjustment with the wheel in place, the lever affords means of bringing all the force desired upon the cutter.

Discard the old-Get the Best.
Only a practical man can appreciate the immense advantages which arise from the use of good machinery. To the manufacturer whose capital accrues large interest through the aid of his employes and machinery, it may seem unreasonable that machinery, which in his estimation should last forever, rightfully belongs to the scrap pile. A little common sense, and just a bit of mathematical computation, however, says the Woodworker, will usually abolish such illusion. Notwithstanding the most careful attention that can be given it, the time surely comes in its life when age and the effects of repairs render a machine unfit for further service.

## AN IMPROVED CORRUGATED BIT BRACE RING.

The illustrations represent an improved form of corrugated ratchet ring for bit braces, which is being manufactured and put on the market by the American Bit, Brace and Tool Company, of Buffalo, N. Y. The ring, instead of having its outer surface knurled or


IMPROVED BIT BRACE RING IN PLACE.
milled, as usual heretofore, has a corrugated surface, as more plainly shown in the small sectional view, the other views showing the ring in position on the brace. This form of ring is designed to enable the workman to obtain a firmer grip in using the brace, being deemed especially advantageous when the hands are moist or greasy. The improvement will commend itself particularly to plumbers and linemen, as well as to carpenters and mechanics generally.

## HYDRAULIC PROPULSION OF VESSELS.

Improved means of applying the jet principle in the hydraulic propulsion of vessels are shown in the accompanying illustrations, Fig. 1 being a sectional and Fig. 2 a plan view of a jet-propelled vessel patented by Mr. James C. Walker, No. 1741 De Sales Street, Washington, D. C. Main pipes, A, one on each side, open into the water at the bow, and extend back through the boat near the keel, having a slight decline and diminished size from bow to stern, where they discharge. Smaller pipes, B, extend from the main pipes through the sides of the boat, where they terminate in nozzles which may be turned in any direction by means of levers, C. Air and waste water pipes, $D$, lead from near the bow to a well or reservoir, E, at about the lowest point in the bottom of the boat, to draw in pure air and remove water from the front to draw in pure air and remove water from the front
part of the boat. From this reservoir a waste water pipe, $F$, extends close to the keel to an outlet near the stern, and other pipes, G, H, lead from the reservoir to an outlet at the stern above the water line. In the main pipes, A, near the bow, are force water wheels or propellers, each having a rim fixed to the outer edges of its blades, so that the wheels will work close to the inner surfaces of the pipes, and these propellers force the water through the pipes, branches and nozzles, with great velocity. The stern nozzles are straight, but so jointed to the main pipes that they may be readily turned to the right or left by levers connected
with the engine room or pilot house, the vessel being with the engine room or pilot house, the vessel being
thereby steered with great facility. There are valves in the main pipes to shut off water from the front in case of accident or when at the wharf, and valves, $I$, in the main and suction pipes, are adapted to shut off water from the stern nozzles when the vessel is moving backward or standing still. By means of the side nozzles the boat may be steered in any direction without rudder or using the stern nozzles, and if the boat should get aground, the directing of the nozzles down-


Fig. 1.-WALKER'S JET-PROPELLED VESSEL.


Fig. 2.-WALKER'S JET-PROPELLED VESSEL.,
ward would not only tend to lift the boat, but to scour out the bottom under it. The drawing in of so much water at the bow, thus saving the force which would otherwise be required to push this water out of the way of the vessel, is designed to be especially advantageous, the force thus expended also operating as a suction to draw the vessel forward.

## AN IMPROVED SCAFFOLD TRUSS.

The construction and use of an adjustable telescopic scaffold truss, to facilitate the repair of ceilings and all kinds of outside work upon buildings, are represented in the accompanying illustration. The improvement has been patented by Mr. Thomas Kennedy, No. 279 West 118th Street, New York City. Fig. 1 shows the truss in perspective, Figs. 2 and 3 illustrating its use, and Fig. 4 being a section of its lower portion, showing how a close adjustment of the truss may be made for a particular elevation. The telescoping sections are simiparticular elevation. The teltively diminishing size transversely, and the whole is mainly of wood, so that it may be readily built by any carpenter. The several sections are vertically adjustable by means of bolt holes in opposite sides, through which are passed detachable screw bolts, fitted with locking nuts. For a nice adjustment, after the truss has been extended to the approximate height desired, the bottom section is fitted with a crank and gear, actuating a screw, as shown in Fig. 4, by means of which the other sections may be collectively raised or lowered. The top section is provided with short or long heads for the support of the scaffold floor, the planking of which is held in place by screw irons on the head, and a screw clamp is provided for readily binding in place top planks
or stretchers. The adjustment of all the parts is effected without the use of a nail, so that the scaffolding may be readily put up and taken down with little or no noise, and the entire structure, when not in use, can be closed up, so as to occupy but little space.

## AN IMPROVED ELECTRIC BELT.

A belt to be buckled around the waist, and supported by shoulder straps, the belt carrying a battery and attachments for sending a current of electricity through the body in the treatment of acute and chronic diseases, is shown in the illustration, and has been patented by Dr. George F. Webb, of Cleveland, Ohio. Fig. 1 represents the complete apparatus, Fig. 2 a cross section through one of the batteries and its case, and Figs. 3 and 4 a cross section and inverted plan of one of the electrodes. The battery cases at the back of the belt are attached thereto by buttons, any desired number of such cases being used, and each battery is in a waterproof pocket, preventing injurious effects from the acid. The battery consists of a number of connected elements hinged together to conform to the conments and shape ments and shape
of the body, the elements comprising a central copper plate, inclosed by a jacket of absorbentinsulating felt, and an outer double zinc plate. The several elements are connected together by copper hinges, so that the entire force of the battery may be used when necessary, the hinges connecting the zinc plate of one ele-
 copper plate of the next, and suitable terminals are provided for the attachment of conducting cords or wires. An adjuster or cut-out is also provided for use in case only a portion of the battery power is required. Connected with the battery by the conducting cords are the electrodes on different parts of the apparatus, to contact with the body. The electrodes are preferably made of aluminum, of oval convex shape, as shown in Figs. 3 and 4, and are bent to form a clasp readily engaging the belt or straps on any desired part of the breast or back. A neck band is also provided on which an electrode may be used, the electrodes being arranged according to circumstances to contact with the necessary parts of the body, while the amount of the current is regulated by the adjuster.

## An Improvised Aspirator.

Dr. Smith, in the Medical Record, says an aspirator which any one could make had been first used by him during the civil war. Take a quart bottle, a tightly fitting cork, pierce the latter with a glass tube, attach to this one end of a rubber tube and the other end to an aspirator needle. Put a drachm of ether into the bottle. Put in the stopper, set the bottle into hot water, and when the ether has become vapor, take it out of the water, introduce the aspirator needle, and as the ether condensed on becoming cool, it would form almost a complete vacuum in the bottle, so that nearly a full quart of fluid would be drawn into it.


KENNEDY'S 8CAFFOLD-SUPPORTING TRUSS,

## Lamination in Metal.

Prof. John Tyndall contributes something new upon the subject of cleavage, as it occurs in crystals, rocks, ice and other bodies; and his studies lead inevitably to the conclusion that lamination results from the operation of the same laws under analogous conditions as those which produce the property known in mineralogy and crystallography as cleavage.
At first one would suppose wax, or baker's dough, to be most unlikely substances wherein to detect any tendency to cleavage; yet it is precisely with these materials, wherein plasticity is a most prominent physical property, that Prof. Tyndall has performed experiments that are commanding the attention of the scientific world, and the results of which have an important bearing upon the metallic processes. In these plastic materials and others, such as clay and graphite, Prof. Tyndall has proved that cleavage may be developed in as marked a degree as in slate-even the varieties of the latter used for roofing-by the simple application of pressure to the plastic mass. Cakes of wax that have been thus treated are easily split up into regular laminæ, so uniform in character as to excite the surprise and admiration of those who have witnessed the experiments.
These researches appear to have proved that any material, no matter how plastic or how homogeneous it may appear to be, has within it the condition for the development of cleavage, and that the only external condition necessary to produce lamination is a sufficient degree of pressure exerted in one direction upon the mass. The resulting planes of cleavage will be at right angles with the direction in which the pressure is applied. The philosophy of this effect lies in the fact that, as relates to the cohesion of its particles, no substance is strictly homogeneous; that is to say, the particles, granules or molecules of substances do not possess cohesive power equally in all directions; and hence, when pressure is applied to them, they slide over each other (the sliding surfaces being those of least cohesive power) and move toward a point of less pressure. In the case wherein pressure is applied in one direction only, the sliding will be in a direction at right angles with the direction of the pressure, and thus plates, laminæ or strata are generated in the mass, the limiting faces of these layers having less cohesion than their interior parts.

It is thus that under the action of the rolling pin flaky pie crust is formed. The same kind of stratification is formed in a biscuit, while in bread, the loaves of which are shaped by kneading, this stratification is absent, and a fibrous structure-called by bakers the "pile"-results from the difference in the manipulation. It is entirely indifferent what kind of material is thus operated upon, provided that it will in some degree yield to pressure without crushing into powder ; the result of pressure exerted in one direction more than in any other will result in lamination more or less marked. An illustration of this kind of action is found in iron and other metals. When iron undergoes the ordinary process of rolling it is taken at a welding heat from the furnace, and the uniformly distributed heat weakens the cohesive power of the particles quite equally throughout the mass; the result is a fairly homogeneous bar or plate. However, in bars the tendency to longitudinal stratification is manifest, and when the bars are cold and cohesion has again been restored to its normal power, it can always be found that iron so produced is stronger longitudinally than laterally.

## The Bell Telephone Instrument

This patent expires and becomes public property in 1894. The Bell receiver is in some respects a superior transmitting instrument, so the Electrical World says, to any of those especially designed for the purpose, in that it introduces no local disturbances, such as are inseparable from variable contacts. The microphone transmitter is, indeed, a convenience, but, as before stated, by no means an essential. For long distance work in telephony, as in other transmissions of electrical energy, high potentials are necessary, and for this purpose the use of the induction coil in connecthis purpose the use of the induction coil in connec-
tion with the microphone, to transform the local currents of low potential into those of high potential for transmission, was early adopted. But the same effect exactly can be produced by properly winding the coils of the Bell receiver with an additional number of turns of fine wire. It will be remembered that for the first year and a half.or two years of the art of telephony the microphone was not used at all. Two instruments exactly alike of the Bell type were employed, one as a transmitter and the other as a receiver. It is not, however, so generally known to what distance a transmitting instrument of that kind is generally effective. It will therefore be a surprise to many to learn that as early as 1879 speech was distinctly transmitted from New York to Yonkers, a distance of 25 miles, and between New York and Philadelphia, a distance of 90 miles, and that in 1883, after the completion of the Postal Telegraph Company's lines to Chicago, conversation was carried on during the day time between New York and that city, notwithstanding the fact that the wire
was grounded at both ends. The wire used in this experiment was one of the regular wires used for tele graphic purposes by the Postal Telegraph Company, and was a compound wire composed of copper and steel, the former metal being employed to add conductivity, and the latter to give strength to the wire. Our recollection is that it was a No. 8 B. W. G. Conversation was also carried on at about the same time between New York and Cleveland, the Bell instrument being used in all these.

## Decisions Relating to Patents.

## REISSUE OF LETTERS.

In his affidavits accompanying an application for an original American patent the patentee swore that the invention was the same as that covered by a British patent issued to him in 1889. In an action for infringement of a reissue of this patent defendants claimed that he first claim of the reissue was identical with a prior English Ipatent issued to the patentee in 1888. It is held by the Circuit Court that, even if this were true, and the affidavit consequently false, there being no other evidence of fraud, the whole of the reissue was not invalidated thereby, it appearing that the question of identity may have been a doubtful one, which the applicant would probably leave to his attorney. 1.
After the reissue of the original American patent, and before his application for the reissue, the patentee applied for a second American patent, swearing that the invention therein claimed had never been patented with his knowledge or consent, in any country. This statement was untrue as to part of the claims, for they had been described in the English patent of 1889. The Circuit Court decides that this false statement, in the absence of the other elements of an estoppel, did not preclude the patentee from asserting the claims of the

The court also rules that the fact that the claims of the reissued patent No. 11,153, granted March 24, 1891, to John B. Dunlop, upon original patentissued to him September 9, 1890, for pneumatic cycle tires, omitted certain strips of elastic material, which, by the original patent, were to be inserted between the edges of the wheel rim and the strengthening folds enveloping the tire, so as to protect these folds from injury by the edges of the rim, did not invalidate the reissue by thus broadening the claims, for these strips were not essen tial to the combination, and did not involve inventive skill, and it appeared that no adverse rights accrued in the meantime, and that the reissue was applied for within four and a half months from the date of the riginal. 2.
The Circuit Court lays it down that reissued letters patent No. 10, 600 , granted May 26, 1885, to the Carpente Straw Sewing Machine Company, as assignee of Mary P. C. Hooper, upon original letters patent dated January 4,1876 , for improvements in straw braid sewing machines, are void as to the amended fifth claim; wherein a new element, viz., a lip, is added to the combination claimed
The court also holds :
(a) Where a claim in reissued letters patent covers a combination to which a new element has been added, it is in legal contemplation "broadened," and is invalid when it covers machines used for long years by innocent parties, without infringement of the original patent, with the knowledge of the patentee, and without interference by him.
(b) Even where the invention covered by reissued letters patent is described in the originaland the claim of the reissue is narrower, but covers machines used for long years by innocent parties without molestation narrowed claim is void.
(c) For a reissue to be valid as covering " the same invention" as that in the original, within the meaning of Rev. St. $\S 4,916$, the patentee must have described and intended to secure in the original the invention of the reissue. 3.

## DESIGN PATENTS.

Letters patent No. 408,416, issued to William C. Krick, are for an improvement in floral designs, whereby, instead of tying single flowers to a toothpick and sticking them into a floral piece, so as to form a letter or design, the letter or design is first cut out of some stiff material, the flowers fastened to it, and when the form is complete it is fastened to the floralpiece by toothpicks. It is held by the Circuit Court that a want of patentable novelty is not so manifest on the face of the patent as to render a bill for infringement demurrable. 4.

The Circuit Court decides that design patent No. 20,347, issued November 25, 1890, to Frederick Bergner, for an album case set upright on a baseboard, and having on its exterior an oval ornamental frame, with an open center, is invalid, since the patentee invented neither the album case nor the ornamental frame, but merely conceived the idea of placing the ornament on the case; and this conception is not patentable, for the statute only provides for patents on designs for articles of manufacture and for ornaments to be placed upon or worked into such articles. 5.

## patentability.

The United States Supreme Court holds that the irst claim of letters patent No. 224,991, issued March 2 , 1880, to A. W. Brinkerhoff, for an improvement in "rectal specula," consisting in a slide extending the entire length of the tube, is void, in view of the prior art; and the fact that the slide of the patent is of metal, while former slides were of glass, is immaterial, since the material of which the slide is composed was not claimed as an essential feature of the device. 6.
It is held by the Circuit Court that letters patent No. 303,116, issued August 5, 1884, to Sarah Caverly, for a machine for rounding bent handles, consisting of a cylindrical cutter head, revolving vertically, having in the center of its periphery a groove, with cutterknives set diagonally, and adjusted from both sides of the cutter head into the groove, are void for want of novelty, such cutter heads, either made in a single piece or made of two disks, having been in use long before the date of the invention. 7.
The Circuit Court rules that the 5th, 6th, and 7th claims of reissued letters patent No. 8,765, dated June 24, 1879, to Jay S. Corbin, for an improvement in wheel harrows, consisting of the combination with a gang of rotating harrow disks of a lever for setting the same, are void for want of novelty, the improvement being merely a change in the location of the lever previously used. 8.
The Circuit Court of Appeals lays it down that the first claim of letters patent No. 154,293, issued August 18, 1874, to William Starling, for an improvement in sulky plows, consisting of the combination of a crank bar with the plow beam, lever, and axle, so that the horses are made to raise the plow out of the ground, is void for want of novelty. 9.
It is held by the Circuit Court of Appeals that letters patent No. 354,717, issued December 21, 1886, to P.' P. Mast, for an improvement in cultivators, consisting in the construction of couplings by which the beams and alignment rods are connected with the axle, and in the construction of the beam brackets and crossheads which carry the shovel standards at the point where the brackets and standards join, so as to maintain the alignment between the shovels and the axle, irrespective of a change in the lateral position of the shovel beams, are void for want of novelty. 10.

1. Featherstone v. G. R. Bidwell Cycle Co., 53 Federal Reporter, 113.
2. Same.
3. Carpenter Straw Sewing Machine Co. v. Searle, 52 Federal Reporter, 809.
4. Krick v. Jansen, 52 Federal Reporter, 823.
5. Bergner v. Kaufmann, 52 Federal Reporter, 818.
6. Brinkerhoff v. Aloe, 13 Supreme Court Reporter
7. 

. Caverly $v$. Deere, 52 Federal Reporter, 758.
8. Galt v. Parlin \& Orendoroff Co., 52 Federal Reporter, 749.
9. Starling $v$. Weir Plow Co., 53 Federal Reporter, 119.
10. P. P. Mast \& Co. v. Rude Bros. Mfg. Co., 53 Federal Reporter, 120.

## Period of Infection in Mumps.

The question as to the transmission of the infectious diseases and the exact stage of the disease at which infection is most likely to occur has been satisfactorily settled regarding most of the exanthemata. In mumps, however, the case is different, some authorities main taining that the disease may prove infectious throughout the whole of its course, while others are of opinion that this is only the case at the commencement of the attack. Dr. Rendu, in a paper read before the Societe Médicale des Hopitaux, related two cases which are valuable as throwing light upon this point. A young lady visited her mother on Jan. 2, who complained of slight malaise; on the following day, however, she developed mumps. On Jan. 24 her daughter, who had seen her on the second, but not since, was likewise at tacked. In the interval she had seen no person who who was suffering.from the disease. Dr. Rendu argues, therefore, that a case may be infectious even before the characteristic parotid swelling has made its ap pearance. A second case was very similar to this one. A child ten years old was attacked after being in company with a friend who, although then showing no signs of the disease, was found a few hours afterward to be suffering from it. Mumps is, therefore, evidently infectious at the termination of the period of incuba tion. Dr. Rendu is of opinion that infection is con veyed by means of the breath.-Lancet.

In an interview on the subject of the extensions and alterations of the elevated railway system by a Tribune reporter with one of the directors, the latter evidently expressed himself somewhat differently from what he intended.
Reporter: " Do you think the present elevated struc ture strong enough to support the further weight of three tracks and more rapid trains?"
Mr. Sloan: "Certainly; you have no idea of the anxiety with which our engineers watch the present structure. It is carefully examined continually."

## Sorrespondence.

The Cause of the Density of snow.
To the Editor of the Scientific American:
This last winter I had occasion to observe the cover of snow in the State of Moscow. Although last winter we had no thaw, the snow in some places presented a very dense mass. The snow presented the greatest density in the places exposed to the greatest squeezing of the wind, whose force depended upon the force of the wind and upon the angle of the meeting of the wind with the surface of the snow. But in protected places, in hollow ways, in forests, etc., the snow always was extremely light and tender. Though the squeezing of the wind is sometimes not very strong, in a great space of time it can strongly press the snow.
N. Smirnoff.

St. Petersburg, Russia, Physical Laboratory of the University, April, 1893.

## How to Cement Wood to Glass and How to Bore Holes in Glass.

To the Editor of the Scientific American:
Having had occasion to cement wood to glass, so thought perhaps your readers would like to know how it was done. In making a Wimshurst influence ma chine, the hubs were of wood, and every winter the cold made the cement all strip clean from the glass.
I took some gummed labels, such as druggists use on prescription bottles, and gummed them to the glass where I wanted my wood to be fastened, and allowed each label to dry on the glass, and nothing but a scraper or soaking in water will loosen it.
Then I cemented the hub of wood to the paper instead of the glass, and it holds strongly and perma nently. Cement for this purpose may be made of virgin rubber 2 parts, resin 1 part, and gum shellac 2 parts, all melted together and applied hot.

I notice in the Scientific American more or less inquiry how to drill glass plates. I'll tell you my way
Take a small common three-cornered saw file and break off an inch of the end of it. Then take to a grindstone and grind a blunt, triangular point on it, being careful not to hurt the temper. Leave the file in the handle and bore just like you would with an awl. The point of the file should not be longer than the file is thick. Use turpentine as a lubricant, and keep the cutting edges on point of file sharp with an oil stone. I have bored holes 2 inches deep in a short time by hand in glass by this method. In boring a plate, I have found it best to bore from both sides, using very light pressure toward the last, always lay ing the plate solid on a paper-bound book.
Palmer, Neb., April 10, 1893.

## Electric Smelting and Casting.

Mr. George Ambrose Pogson, the British vice-consul at Hamburg, reeently explained to a number of gentlemen who visited him at the Wharncliffe Hotel, Sheffield, the "Taussig" system of smelting and casting metals in exhausted chambers. The system is claimed to produce, by a single process, every 15 minutes, with an expenditure of 360 cwt . of coal per $1,000 \mathrm{cwt}$. of fin ished cast metal, bronze, iron, steel, copper, brass, zinc platinum, gold, or silver, free of pores or bubbles. The process is effected by electricity by means of flat metal electrodes in an exhausted furnace, large moulds being set up outside the furnace, and exhausted by one process simultaneously with the exhaustion of furnace. Castings up to 30 pounds of iro: 1 have been made in the presence of her Majesty's representatives at Ham burg within 15 minutes, the air pump in use showing 92 per cent exhaustion of air ; ampere gauge, 2,500 voltage, $21 / 2$ volts.
The electric current does not effect its work from out side through surface of crucible or furnace, but by con duction through the metal itself which is about to be smelted. Siemens-Martin steel is fused without any other parts of the electric current undergoing any ma terial increase of temperature. By use of metallic electrodes all contamination of metal by carbon is absolutely avoided, as coal slack is not present in any large quantity, refuse is reduced to a minimum, and oxidization and creation of air bubbles are, it is contended, by this new method of smelting in a vacuum, by means of removal of carbonic acid gas, etc., also avoided. The metal becomes more liquefied, and, on account of the casting forms being denuded of air, per mits of extremely close and fine casting, even of objects of excessively small diameters. Among other pertinent justifications for these assumptions is the fact that the samples which have up to the present been tested in
the proof-rooms of the Royal Technical School at Charlottenburg, near Berlin, have, notwithstanding the prejudicial circumstances under which they have been produced, aecording to a copy of the government report in regard to such tests, shown very satisfactory results. From the nature of the system adopted it
currents of great strength, but low voltage, is attended with absolute freedom from danger. Small iron propellers and similar objects are constantly melted and cast at Bahrenfeld in the presence of witnesses within a period of 12 to 15 minutes. Currents of 20,000 to 30,000 amperes are no exaggeration, and exhaustion of air from the largest chambers now presents no difficulty.

By the employment of 30,000 amperes and 50 volts, a force equivalent to about 2,000 horse power, or somewhat less than that used by the aluminum works at Neuhausen, on the Rhine, the casting form would have a minimum length of 12 meters and a width of $11 / 2$ meters. This would give a body of metal of 180,000 cubic centimeters, or about $11 / 2$ tons. According to the experience gained in experiments at Bahrenfeld, such casting would be effected in one process, lasting in all not longer than a quarter of an hour. The expenditure of coal is, therefore, in round figures, but 50 per cent of that necessitated by the most perfect system at present in use. The use of water power naturally increases these advantages in an enormous extent. The iron furnace seen by Mr. Pogson at Prof. Taussig's works at Bahrenfeld consisted of a rectangular vessel, 6 works at Bahrenfeld consisted of a rectangular vessel, 6
feet by 3 feet by 3 feet. Two electrodes, apparently of feet by 3 feet by 3 feet. Two electrodes, apparently of
wrought iron, were placed upright inside the furnace, so that their surfaces of 8 inches by 4 inches faced the arc-shaped piece of iron which was to be fused; a channel of clay served the purpose of conducting the fused metal from its clay melting bed into the empty clay mould of a model propeller, the mould in question being placed at a lower altitude in the other empty iron furnace.
The wires connecting the flat metal electrodes with the powerful generating machinery put up by Messrs. Schuckert \& Co., the well known German electrical engineers, were already in position, as was also the exhaust pipe connecting the furnace with a steam air pump of about 20 horse power, which also drove the dynamos. Having personally placed the 30 pounds of pig iron in the clay bed, placed parallel with, but a few inches in front of, the flat electrodes, the cover of the oven was swung on; the necessary exclusion of external air being effected by India rubber pads fastened to the furnace cover. Punctually at noon the cover was fastened down, and the pump set working, the current being switched on at the same moment. The indicator of the exhaust pump soon showed an exhaustion of 92 per cent of air. The electric indicators showed repectively 2,500 to 3,000 amperes and 2 to $21 / 2$ volts. The gradual approach from red to white heat could be folowed from the eyelets in the furnace. Fusion was obtained at about 12:8, the indicators showing great unsteadiness until the resistance had been reduced to nil by the current being allowed to pass freely through the fused metal. At 12:14 the furnace was opened, and a minute or two later the clay was being chipped off and a perfect cast of a propeller was exposed to view.

## Identity of Light and Electricity.

From the experiments recently performed in elecrical oscillations, the conclusion that light and elecrical oscillations are identical is very strongly substantiated. The principal parts in which they practically agree are the velocity, rectilinear propagation, laws of reflection, interference, refraction, polarization and absorption by material substances. In fact, the sole certain difference appears to be the wave length. There is difficulty in producing continuous electrical oscillations of less than a foot in length, while light is about the hundred thousandth part of an inch. The only difference between them is that our eyes will long ones. The great question for electrical engineers is to produce these very short wave lengths directly. Hertz by the induction coil and condenser, and Tesla with a specially designed multipolar dynamo, have produced similar waves, which will set molecules in a rarefied atmosphere into such rapid vibration as to produce light. But the great question has advanced only one step. Probably neither of these methods will furnish more than a suggestion to the real solution. A simple computation will show that by the Hertz method, in order to produce directly vibrations apable of affecting the retina, the condenser would be of nearly molecular size; on the other hand, by the
Tesla method, the dynamo necessary would be a mechanical impossibility. However, the outlook is encouraging, and any work done along these lines can not be otherwise than of benefit to science and to practical engineering.
In the domain of wireless telegraphy this subject is of prime importance. Much has already been done in this direction, and much more will undoubtedly be done by the aid of electrical oscillations of high power and frequency. The Edison method of telegraphing
from moving trains is probably the best known pracfrom moving trains is probably the best known prac tical application of electrical oscillations in air to com mercial practice. Betts' method of telegraphing be tween ships at sea is another well known application,
and depends upon the transmissibility of electrical oscillations through water. Although these methods cillations through water. Although these methods
are far from perfect, the end seems not distant, and
we can confidently expect that in the near future we will be able to telegraph on land and sea without wires with great ease by means of electrical oscillations of high power and frequency.-E. S. Ferry in Electrical World.

## Liquid Oxygen.

The phenomena presented by liquid oxygen promise o furnish science with additional data for the completion of chemical, electrical, and magnetic theory. Prof. Dewar, who has made special research into the properties of liquid gases, has already produced small quantities of liquefied oxygen obtained under great pressure at very low temperatures, and has remarked the skyblue color and the considerable magnetic properties of this body. But its extremely low boiling point, $182^{\circ} \mathrm{C}$. below zero, has hitherto prevented any appreciable quantity of oxygen remaining long in a liquid state, and the intense ebullition which occurs has rendered experiments on its magnetic and other properties difficult to accomplish. Recently, however, before a large and distinguished audience at the Roval Institution, Prof. Dewar kept, during the whole of his lecture, a globe the size of an egg filled with liquid oxygen in a tranquil state below its boiling point, evaporating slowly as water at ordinary temperatures. This result he accomplished by the discovery that by surrounding the vessel containing the liquid by an extremely high vacuum, the influx of heat-vibration from the outside air is reduced one-seventh, as is indicated by the amount of escape of gas; or by further precautions even to a still lower amount. The vacuum must be high in the extreme meaning of the term, for Prof. Dewar has produced vacua measurable not in millionths but in hundred-thousand-millionths of an atmosphere, and by means which exhaust a large vessel more quickly than the mercury pump exhausts the smallest. The difference in temperature between the globe of liquid oxygen and the air of the theater was not less than $210^{\circ} \mathrm{C}$., yet the globe remained four-fifths full of liquid by reason of its vacuum jacket at the conclusion of the lecture.

The experiment leads to some interesting considerations as to the principle of radiation across interstellar space, as our own world has its " vacuum jacket." The crucial experiment would be an hermetically sealed bulb of liquid oxygen, self-poised in the center of a perfect vacuum-an experiment impossible under present conditions (unless the magnetic properties enabled the bulb to be so poised). There is always some connection between glass spheres and their support, as well as convection and conduction of heat at the evaporating surface.
The liquid oxygen so obtained becomes the means of further research in liquefaction of gases. Prof. Dewar showed that atmospheric air can be condensed into a liquid at ordinary pressure by the cold of liquid oxygen boiling under the air pump. But the liquid air itself can be producêd by other means, and the cold of one superposed on the cold of the other may enable the final task of liquefying (and possibly solidifying) hydrogen to be eventually accomplished.

The essential difference between a liquid and a gas of identical composition was illustrated by the behavior of atmospheric air. Air liquefies as a whole with the usual proportions of oxygen and nitrogen. But when liquid air is allowed to boil the nitrogen distills off first, showing no appreciable admixture of oxygen until half the liquid has evaporated. Liquid air behaves in the magnetic field and in the spectroscope like dilute oxygen, and the color is simply a more watery blue.
The most interesting part of Prof. Dewar's researches from the electrical point of view, undertaken in conjunction with Prof. Fleming, could only be alluded to in the lecture. It is found that pure metals reduced to these abnormally low temperatures increase in conducting power, perfectly pure metals showing a conductivity increasing as the temperature falls in such a manner that all the temperature curves, if produced, would pass through the zero of absolute temperature. Electricity would pass through a wire of pure metal in interstellar space absolutely without loss. But the smallest impurity or alloy destroys this condition of perfect conductivity. On the otherhand, non-metallic bodies so cooled show a conductivity decreasing with the fall in temperature. These investigations await interpretation. Meanwhile, science is furnished with another test of purity of element. Nickel prepared in the ordinary way does not conform to the law, but nickel deposited by Mr. Mond's process, from its combination with carbon monoxide, obeys this law perfectly. We do not yet know what an "element" is, but the experiments allow it to be stated that some at least of the chemical elements do behave in a manner totally distinct from compounds. At the low temperatures produced, chemical forces remain in abeyance, and oxygen becomes as inert as nitrogen. At a temperature that is conceivably possible to produce, all molecular motion ceases, and every gas becomes rigid. At $-273^{\circ} \mathrm{C}$., or absolute zero, hydrogen itself will become solid and all matter will become dead.-The Electrical Engineer (London).

THE NAVAL PARADE AND REVIEW.
(Continued from first page.) tion with which had been most appropriately set for this time. The Swedish singing societies, Swedish Mechanics' Society, and Swedish Art Society, with other organizations, participated, the presentation address being made by Mr. Ashley Cole and the acceptance by Mr. Paul Dana, while Col. William C. Church made a commemorative address. The statue stands about twenty-five feet from the water's edge, facing
similar nature ever projected, always appeals vividly forth clouds of smoke across her path, the vessel to the imagination, and has commanded unstinted always seeming to be just emerging from the smoke of praise as a highly successful working out of a magnifi- the opposing broadsides. The Miantonomoh, at the cent conception. The statue is made in repoussé of south end of the line, led this thunderous salutation, copper one-eighth of an inch thick, the envelope being $\quad$ vessel after ressel joining in, each with a salute of kept in position by iron plates and braces. Its dimen- twenty-one guns, as the Dolphin passed by, the Presisions are : Base of pedestal, 62 square feet; from water dent standing on the poop deck and lifting his hat as level to top of pedestal, 149 feet; from bottom of plinth his vessel came abreast of each of the others. Arrived to top of torch, 151 feet; from heel to top of head, 111 feet; height of head, $131 / 2$ feet; width of eye, 28 inches; feet; height of head, $131 / 2$ feet; width of eye, 28 inches;
length of nose, 3 feet 9 inches; length of forefinger, 7
near the anchorage of the caravels, and betwe big English ship Blake and our cruiser Philadelphia the Dolphin dropped her anchor, and here the Presi

the columbian naval festivities new yorz-The statue of liberty.
to the crown of the head. The base is of granite and $\mid$ a little over eight feet high.
The sculptor is Jonathan Scott Harley, and he was present at the dedication of his work. Four low-relief bronze figured panels are set on the four sides of the base of the statue. The one above the name Ericsson on the front of the base represents the battle between the Monitor and the Merrimac. Another shows a steam fire engine in action, another the steam war sloop Princeton, the first war vessel to have a screw propeller, and still another panel represents a number of Ericsson's inventions.
Perhaps one of the most noticeable and most warmly admired objects presenting itself to the eyes of the officers of the foreign war vessels, many of whom were on this occasion making their first entry to the harbor of New York, was the Bartholdi statue of Liberty, the illustration of which we herewith reproduce from a former issue of the Scientific American. This noble figure, greatly exceeding in size every other work of a
feet 11 inches. The torch, reached by a spiral stair-
case, will hold twelve persons, and the head will hold forty persons. It may be remarked that on one occasion a bona fide marriage service was performed in this portion of the statue.
The review of the fleet by the President on the 27 th, which was designed to be the crowning feature of the Columbian festivities at New York, had been arranged to commence at 10 o'clock in the forenoon, but the rain was coming down so heavily all the morning that the hour was changed to $1 \mathrm{P} . \mathrm{M}$. At this time the rain had ceased, and the President and his suite stepped aboard the Dolphin, one of the earliest built and smallest of our white cruisers, to pass in review and receive the salutations of the combined fleet. Our first page illustration gives a good idea of the scene. The little caravels were anchored at the north end of the line, between the two columns of which the Dolphin slowly moved from south to north, ship after ship
shooting out red tongues of flame and belching
dent held a reception. Nine admirals and thirty-five captains from the different ships, conveyed to the President's vessel by their gigs and boats, here came to do honor to the President and his party, which included the young mistress of the White House, and for the exchange of those civilities and friendly greetings which the people and the government of the Unnited States can so independently and yet so cordially reciprocate with all the other peoples of the globe.
While this was taking place, the Philadelphia slipped her moorings and moved a little farther up to a point opposite General Grant's tomb, where a salute was fired in honor of the dead hero whom the nation so much delights to honor.
The review over, many of the officers came to the city to take part in a grand ball given in their honor, but the vessels remained at their anchorages, and vast crowds lined the shores to look upon a display of sig: nal lights, flash lights, search lamps, and fireworks, which had been promised. In this exhibition all par-

ticipated, but the British ships led all the rest. Just before 8 o'clock the river around the four British ships the Blake, Australia, Magicienne, and Tartar, suddenly assumed the appearance of golden lakes. Somebody had pressed several buttons and the electricity had done the rest. The hulls of the ships, from water line to the rail, were outlined in globules of fire. Simultaneously the electrician of the Jean Bart wove around her huge circular tops necklaces of golden beads. The Kaiserin Augusta revealed herself in bright dotted lines, and the Russian flagship arrayed herself in stars. Then came the exhibition of search lights. Electricians on every ship in the fleet stood to their work and sent their harmless charges through the mists. There was a stratum of fog extending a thousand feet or more above the river. Above that the air was clear, but above the cloudless stratum there was more fog. This condition of atmosphere caused many picturesque effects. The little caravels got a big share of attention. Every light on the leading ships was turned on the antique squadron, and they stood out like cameos.
Down the stream and up the stream the silver indices pointed; they gleamed across the historic river and lit up bits of the Palisades and startled folks $\mid$ for one or more shares of the stock in the engine, at in cottages along the Jersey shore. The finale of the five dollars per share. The result of this undertaking search light exhibition was the concentration of all the glittering shafts on the American ships in one point in the sky. The signal for this display was made from the flagship Philadelphia by the Ardois lights, which flashed red and white in perpendicular strings from the masts. The meeting of the lights suggested a gigantic white-ribboned May pole before it is entwined by the ribbons. At the end of all the Blake showed a fiery figure of Washington, the man who led these colonies in war upon his kingdom. It lacked but an hour of midnight when this magnificent and most interesting display closed.
Although the President and many other officials of high and low rank were anxious to leave soon after the review, to be in Chicago at the inauguration of the Exposition on May 1, there was still a most important feature of New York's Columbian festivitiès to come off on Friday, the 28th. This was nothing less than a great land parade, such as has probably never before been seen in this or any other country, for it was a parade principally of men from all the different ships. Our own vessels furnished about fifteen hundred men, and about an equal number was landed from the foreign ships. There were bands without number, and some ten regiments of the New York State National Guard furnished the escort, but it was a sight well worth seeing and long to be remembered to view the contingents of English, Russian, French, German, Italian, Brazilian, Argentine and Dutch men-ofwar's men swinging along Broadway, together with our own jack tars and marines, all like friends and compatriots, and all the foreigners doubtless forgetting any possible differences of their own in their generous admiration of and regard for the people of the country which Columbus discovered. And thus did New York execute its part of the inaugural its part of the inaugural
work of the world's great work of the world's great
Columbian Exposition for which Chicago has been so long preparing.

Cost of the Fair. Auditor Ackerman has made a report showing that the building of the World's Fair has already cost $\$ 16,708,826$, twice the sum paid for the Paris Exposition, and more must yet be paid out. There is at present a eash balance of $\$ 626,396$, and $\$ 2,361,263$ is dueson contracts.


THE WORLD'S COLUMBIAN EXPOSITION-RARE ANIMALS FROM EUROPE EN ROUTE FOR CHICAGO.
of great importance by these men, who are constantly using engines and know the various good and bad points of existing locomotives.
Some time since it was determined by the locomotive engineers of the Erie Railroad system to join in the construction of a locomotive which should fully represent their ideas as developed in everyday practice in locomotive running. In this system there are between locomotive running. In this system there are bet ween 950 and 1,000 locomotive engineers, who each subscribed


Fig. 1. bentiez's columbian egg puzzle. fi- 2.
The total weight of the engine is something over 67 tons. This weight is distributed as follows: On the rear drivers 44,300 pounds ; on the front drivers 44,450 , 4585 pounds. The dive whee axles are $81 / 2$ inches in diameter, the journals are 12 inches long, and the boxes are heavier than common. To permit of using journal boxes of this length, the wheels are dished, so that the spokes are outwardly convex. The crank pins are $61 / 2$ inches in diameter in the larger part and 5 inches in the smaller part, the cylinders are 19 inches in diameter and the stroke is 26 inches. The steam pressure will be 180 pounds. The whee base is 48 feet and 9 inches, the boiler is of the straight cylindrical type, this form being deemed on many accounts preferable to the wagon top style. The expansion of the inner and outer parts being more uniform, unequal strains are avoided, and the principal cause of leakage is removed.
The brakes are applied at the front of the drivers, to avoid the strain caused by applying the pres-
sure in the usual way.
This noble machine does credit to the engineers who conceived the idea of constructing a perfect locomotive and to the army of practical men who contributed toward its construction. We understand that the engine is to be sold after its exhibition at the World's Fair at Chicago.
This creditable piece of workmanship was produced by the Cooke Locomotive and Machine Company, of Paterson, New Jersey, and we have no doubt it will be duplicated.

## A COLUMBIAN EGG PUZZLE.

The illustration represents a puzzle formed of a casing simulating an egg, with which may be accomplished the feat attributed to Columbus, that of causing an egg to stand on end, the shell of the casing being broken away and two views being given of its interior. A double-floored partition divides the larger terior. A double-floored partition divides the larger
from the smaller end of the egg, the floors of the partifrom the smaller end of the egg, the floors of the parti-
tion being united by a hollow central cylindrical portion being united by a hollow central cylindrical por-
tion, in which is an aperture establishing communication with the annular chamber in the smaller end of the egg. Centrally on the upper partition, in the larger end of the egg, is a collar, open at one side, forming a chamber adapted to receive a ball. A ball is placed in the upper chamber and one between the floors of the partition, as shown in Fig. 1, and the egg can then be made to stand upon its small end by turning it around in the hand until ball 1 is moved into compartment 2 in the large end, ball 3 being at the same time guided through aperture 4 into the lower chamber 5, and to the cavity 6 . The balls then will be in the line of the axis of the egg, and, its smaller end having a very slight cavity to give it a narrow base on which to stand, there will be no difficulty in making it stand on this end, as shown in Fig. 2. This puzzle has been patented by Mr. Manuel Benitez, and further information relative to it may be obtained of the Columbian Commercial Company, No. 126 Maiden Lane, New York City.

In his annual report for 1892, in respect of the Newton Abbot rural sanitary district, Mr. Harvey, in discussing the diminished tendency to spread of scar let fever, puts it down, in a measure, to the free use of boracic acid, an ounce or two of which was given to each mother, with instructions for making an ointment by means of lard.

## Natural History Notes.

Climbing and Swimming Rabbits.-On the continent of Australia the rabbits, by force of circumstances, are obliged to modify their mode of life. These animals are often observed to climb trees in search of food when they cannot obtain it on the ground. At a recent session of the Zoological Society of London, Mr. Tegetmeier exhibited the fore paws of one of these Australian rabbits, which were seen to be adapted to this new mode of locomotion. It is found, in the first place, that they are more slender than those of the English wild rabbit. Their color is paler and the spots are dark. Besides, their claws are sharper and slenderer. In the Australian rabbits differences have also been observed in the manner of raising their young. Thus, in certain localities, we find their ordinary seats, but in others the litter is placed upon the ground, without any covering. In summer they sometimes enter the water, with only their heads projecting above the surface. When they are pursued, during their migrations, they swim exceedingly well and cross the wide rivers with ease.
Ants Breeding In and 1n.-Forel announces that among ants of the genera Anergates and Formicoxenus there is no other male than a wingless ergatoid form, such as sometimes accompanies the normal male in other genera, and that, therefore, pairing must always take place in the ant hill itself between brothers and sisters; so we have here cases of perpetual consanguineous reproduction. "Among ordinary ants the winged male and female quit the nest in which they were born, take flight, and pair in mid air with their congeners of other nests, permitting numerous crosses. But in the case of the genera which have only an apterous male perpetual consanguineous pairing ensues, for in one and the same nest there are found only brothers and sisters and these brothers and sisters can only pair with one another. The fact appears absolutely clear in the genus Anergates, where one finds in each ant hill only a single fecundated female, the mother founder of the colony."

Distribution of Spiders.-Recent catalogues show that entomologists have found 363 species of spiders in the Upper Cayuga Lake Basin, 370 in the District of Columbia, and 340 in New England. Dr. George Marx has complied a list of 292 species which have been study has reached these conclusions:

1. The Arctic spider fauna is composed of the ten families which we may term the common ones, their species constituting the main bulk of the entire spider fauna of the world. They are cosmopolitan, and are found almost wherever animal life is possible.
2. The genera of the Arctic spiderfauna are, without exception, those which also occur in other regions of
the world, and there has been found, so far, not one genus which is original to that zone of eternal ice and snow. This is a very remarkable fact stince in all other Arthropod orders, and those of higher rank, the polar fauna is distinguished by special and peculiar forms. 3. Even among this species a vast number occur which live in milder climates and under entirely different conditions and influences, and we find some families represented by only such forms, lacking entirely original Arctic species.
3. The differences between the faunas of the eastern and western hemispheres are slight, and, generally speaking those forms which are most frequently represented in one are found in the larger proportion in the other.
Coloring Matter of Pollen.-G. Bertrand and G. Primault claim to have established the identity of the coloring matter of yellow or orange pollens of diverse origin with carotin, $\mathrm{C}_{26} \mathrm{H}_{38}$, the substance to which the color of carrots is due. From this generalization they exclude the dry pollens found in the Urticacea, Graminaceax, etc., which owe their yellow color to the
cutinization of their external membrane. The abund cutinization of their external membrane. The abund-
ance of fatty matters present prevented the crystallization of the carotin of the pollen, but its iodide, $\mathrm{C}_{26} \mathrm{H}_{38} \mathrm{I}_{2}$, was prepared. The colored crystal-like bodies that appear when pollen rich in oil is mounted in glycerine and examined microscopically are not composed of carotin, but of a fatty body, probably cholesterin, with which the oil is supersaturated.
The Number of Insects in the World.-It is believed, according to Mr. P. L. Simmonds, F.L.S., that there are five times as many insects as there are species of all other living things put together. The oak alone supports 450 species of insects, and 200 kinds make their
home in the pine. Forty years ago Humboldt estimated that the number of species preserved in collections ed that between 150,000 and 170,000 , but scientific men now
was bay that there must be more than three-quarters of a million, without taking into account the parasite creatures. Of the 35,000 species in Europe, however, not
more than 3,500 are noxious or destructive. There are more than 3,500 are noxious or destructive. There are
more than 100,000 kinds of beetles. Such being an enumeration of the different forms, what an array of figures would be required for tabulating a census of individual insects, each a distinct living thing! Some single species include an incredible number of speci-
mens. The locusts on the coast of the Mediterranean,
for instance, sometimes cover the ground inches thick for miles, while a few years ago 14,000 bushels of locust eggs were collected in a single season in three Algerian provinces. A single house fly lays from 150 to 200 eggs , which in two weeks become equally fertile flies, and insects generally have astonishing powers of multiplication.
The Fertilization of Orchids.-J. H. A. Hicks, in dis cussing the fertilization of orchids without pollen, quotes Professor Henslow, who shows how a microscopical examination of the structure of the essential organs at once renders apparent the reason of so small an amount of good seed being set. The pollen, instead of being in well formed distinct grains, is arrested in development and, while the grains are still in contact, a common extine clothes the whole of each mass. Development does not proceed until the pollen mass has been placed upon the stigma. In the pistil, degeneracy is indicated by the prevailing parietal placentation and by the rudimentary character of the ovules, every par of which is degraded. There is no albumen or nucellus tissue to nourish the embryo, and the suspensor does its best to remedy this deficiency by elongating and es caping from the micropyle, then fastening itself like a parasite upon the placentas and extracting nourish ment therefrom. As a result, myriads of seeds never ucceed in developing even the pro-embryo.
The Autosporadic Seeds of
The Autosporadic Seeds of the Yellow Sorrel.--The effective method that the yellow sorrel (Oxalis stricta) has of scattering its mature seeds, in which it proves to be a decided "touch-me-not," seems hitherto to have escaped observation. In Gray's Manual, and other like works, the seeds are spoken of as having a "loose and separating" coat, but the part this envelope plays in dehiscence and in the distribution of the species is not nentioned.
In May, 1891, Mr. Ernest Walker made some careful observations and the following memoranda:
As the seeds of Oxalis stricta L. attain maturity, the erect loculicidal capsule becomes flaccid. In this condition the least disturbance, as the touch of the hand or shaking by the wind, causes the seeds to be expelled with considerable force, and thrown two or three feet. Sitting for a few minutes by a plant, the tick of the seeds as they were continually projected could be distinctly heard. To place a capsule in the palm of the and and press it suggested the bursting of pop-corn
The shooting of the seed was done so quickly that it was some time before Mr. Walker could
The active agent is the outer coat of the seed. Th consists of a translucent, shining, membraneous envelope stretched tightly over the seed. When it bursts, it suddenly and elastically turnsinside out; after which it becomes flaccid.
This coat is thicker in a line along the ventral margin of the pendulous seed, or along the edge which is next the axis of the capsule. The rupture is naturally along the opposite edge. Doubling back against the axis of the upright capsule gives this membraneous coat or spermoderm the power to project the seed.
Placing some of the seeds under a lens and puncturing the coat with a needle, the rupture was found to occur at other parts than the margin, or at any point the coat might be pricked. In this instance the envelope, not having a "back-stop," was often thrown farther than the seed.
When in the capsule the position of the seeds is such as to throw them not only outward but slightly upward. They are cast farther than if projected horizontally. Some seeds were found as far as three feet from the capsule from which they were thrown.
Weeds as Large as Trees.-Of all the routes across the United States to the Pacific coast there is not one that has not done more or less to familiarize the traveling public with what is called sage brush. The further south the route the more abundant is this weed, which has added a phrase to our language by giving its name to the soil upon which it thrives-often when nothing else of vegetation can endure beside it. To speak of a reach of country as "sage brush land" is to present a picture to the mind of a man familiar with the far West. Through that phrase such a man sees a treeless, parched plain or bench of dull, baked-looking earth, dotted with thick-stemmed, dry, flannel-like, dust-covered shrubs of a greenish, whitish-brown appearance. These grow as garden weeds do in the East, a hand
high or a yard or so above ground. The land which is distinguished by their presence, in greater or less quantities, is that part of the plains and Rocky Mountain region which receives the least rainfall. A major part of it was once known as the Great American Desert.
The sage brush is known to scientists as Artemisia tridentata. Most persons who are familiar with it think of it as an ordinary weed of small size, and even so
high an authority as the "Encyclopedia Britannica" high an authority as the "Encyclopedia Britannica" It will astonish most persons to know that it sometimes grows to such proportions as to provide a section of country with trees of its own wood, producing groves of thick-trunked and comparatively tall trees, instead
of mere weeds. Prof. Elwood Mead, the State Engi-
neer of Wyoming, while exploring the northern end of central parts of that State last summer, came upon a district where the sage brush thrived thus gigantically. Many of the sage trees that he saw were eighteen feet high, with trunks at least a foot in diameter. This was in the Big Horn Basin, east of the National Yellowstone Park and northeast of the Wind River Indian Reservation, where the No Wood River joins the Big Reser
Prof. Mead returned to Cheyenne enthusiastic in his praise of the basin now little known except to the stock-
men whose cows range there. It is as big as some of men whose cows range there. It is as big as some of
the older States, and will provide plenty of water for irrigation from the tributaries of the Big Horn River. Several very large irrigable tracts have been surveyed already. No railroads yet reach the district, but the Burlington \& Missouri Railroad is building to Sheridan in the county of that name, and has employed its agents to "spy out the land" beyond. Prof. Mead had never seen such big sage brush as he discovered there, but since his return he realizes the truth of Solomon's assertion that there is no new thing under the sun, because he has been informed that, at some point in California, the same weed "grows to such proportions that the people cut it for cord wood."
Fixation of Free Nitrogen by Plants.--Schloesing and Laurent, pursuing their investigations on this subject, after describing the methods adopted in their experiments, proceed to detail their latest results. Dealing with seeds planted in prepared soils containing the micro-organisms usually found in good earth, they have not found any plants, outside the Leguminoss, capable of fixing free nitrogen. Their most recent work has been to investigate numerous cases in which the soils employed were rich in nitrogen, but again negative results were met with in experiments upon the higher plants not included in the above mentioned order. Oats, colza, grasses, and potatoes were dealt with, and figures are quoted to show that no measurable proportion of the element in the free state was fixed. It is pointed out that in such investigations it is necessary to ascertain whether any fixation of nitrogen s attributable to the plants or to the soils, and the authors insist upon the importance of the conclusion they have drawn that soils absolutely bare of vegetation, although containing appropriate micro-organisms, do not fix any free nitrogen.
Starch in Plants.--The generally accepted explanation that, in the plant, the transformation of starch into dextrin and sugar is effected under the influence of a diastasic ferment, having been contradicted in re cent years by several physiologists, A. Prunet has conducted a series of experiments with potato tubers in the hope of throwing some light upon the subject. The plan adopted was to make comparative determinations of the quantities of dextrin and of sugar on the one hand and of diastase on the other, found in the anterior and posterior halves respectively of tubers in different stages of germination. The former were considered as glucose and determined by Soxhlet's method, and the amount of diastase was indicated by the pro cess of Wortmann. As an outcome of the research, it is shown that in potato tubers there does exist a relation between the distribution of diastase and that of the dextrins and sugars; and consequently between that of diastase and the conversion of starch. The results, therefore, tend to confirm the general opinion that the digestion of nutritive matters is effected, not by the direct action of the protoplasm, but by means of diastasic substances produced as results of its activity.

## Pygmies from arrica.

Two Akka girls, who were rescued from Arab capturers by Dr. Stuhlmann and his companions, have been brought to Europe, and will remain in Germany for some months. In the summer they will be taken back to Africa, where they will be placed in some mission house, or otherwise provided for. They are supposed to be between seventeen and twenty years of age.
A correspondent of the London Daily News, who saw A correspondent of the London Daily News, who saw them at Naples, says they are well proportioned, and as tall as a boy of eight years of age. Their behavior is "infantile, wild, and shy, but without timidity." One of them was always cross, bending her head, and glaring from beneath frowning brows, while the other often laughed joyously, was pleased with bead bracelets and other trinkets given to her, and expressed by a queer sniff of her flat nose her appreciation of some chocolate bonbons. After making "a capital dinner on rice and meat," they greatly enjoyed the sunshine in a pretty garden, where they gradually grew more confident, and finally allowed themselves to be photographed arm in arm with the little son of their hostess. "The coquettish one shook with laughter, and seemed to guess that a process was going on flattering to her
vanity, while the cross one still looked gloomy and suspicious. They showed neither wonder nor admiration of the people and things around them in the artistically furnished house and tasteful garden. Their eyes, though large and lustrous, have less expression than the eyes of a monkey." These interesting representatives of one of the pygmy races of the world are

## United States Timber Test Work.

Although all the leading railroad engineers, architects, professors of engineering, and others interested in the timber tests had flooded with hundreds of letters their Representatives and Senators and the Committee on Manufacturing, in whose hands the special appropriation for the work was pigeon-holed, neither the committee nor the House paid any attention to this expression of public interest. The Senate, however, realized that there was value in the work and sincerity in its indorsers, and increased the appropriations for the Forestry Division by $\$ 8,000$, that is, 20 per cent of the amount asked and considered by those in charge as necessary to continue the work on a proper business basis.

Under the circumstances, the testing will be discontinued until after. Tuly, when the new appropriations become available, and then proceed at the slow pace which Congress has set.
Although the result of the efforts of those who took active interest in securing appropriations for the work were not crowned with that success which they deserved, this is the only proper method of influencing legislation, and those interested in the investigation should not fail to move again when the new Congress assembles.

The first compilation of test results is now in the hands of the printer, and will probably be issued within six or eight weeks, as Bulletin 8, Timber Physics, part 2. It will contain the results obtained on longleaf pine, and will especially discuss in detail the results of tests and examinations of bled and unbled timber, results which in themselves justify the expenditure by the government of money on such work.
The Forestry Division will exhibit the methods pursued in this work at the World's Fair, which will be of interest, since nowhere in the world has such comprehensive and systematic investigation of timbers been ever devised. The working plans for a similar undertaking by the Prussian government have only just been perfected.

Another exhibit of interest to railroad engineers and those interested in reducing forest waste will be a col lection of the most approved types of metal railroad ties.

## ANOTHER EARLY FRENCH PATENT FOR A BARBED

 WIRE FENCE.The writer has already called attention in the Scientific American to French patents of GrassinBaledans, 1861, and Jannin, 1865, for barbed wire fences, which are both anterior to the earliest date of invention set up by the first American patentee of a barbed wire fence, who, as is well known, provided the wires of a wire fence with a series of spur wheels.
Almost about the same time a Breton brick manufacturer, Gilbert Gavillard, received a French patent, dated August 27, 1867, No. 77,570, for a barbed wire fence, which may be described as follows, by following as nearly as possible the French description :
This fence is composed of three galvanized wires and of spines, also galvanized, placed between and clamped by two strands, while the heads are covered by the third strand. These strands of galvanized wire are twisted together, so as to present iron thorns on all their faces. In order to form a fence, it suffices to plant posts in the ground and attach thereto, by means of iron wire hooks, three of these artificial thorny branches, which are placed at a sufficient distance apart to prevent animals from going over this thorny obstacle.

A drawing annexed to the patent is herewith reproduced.
It will be seen that it presents, in a very striking way, how an ox is prevented from reaching an apple on the other side of the barbed fence. Although the drawing does not show the form of the barbs, it is evident that they are 1 -shaped, and that the third wire or strand prevents the barbs from dropping out by locking them in place between the two other strands. The Gavillard patent may be considered as resembling the Michael Kelly patent, of February 11, 1868, No. 74, 379.

## Utilization of Coal Dust.

The London Times gives an account of a process by which anthracite coal bricks are now being manufactured by the Coal Brick Syndicate, of London. The bricks are made of grains of anthracite dust, which are forced to cohere by means of a special cementing compound and by great pressure. The coal dust is mixed with the binding material in the proportion of 96 per cent of the former to 4 per cent of the latter. The compound is fed into a mixer, where it meets a jet of steam, a stiff paste being formed, which is delivered successively into a series of moulds under a pressure of 25 cwt. As the mould plate revolves, the charge in each mould is brought between two rams, which exert
a pressure of two tons per square inch on each side of he charge, forming a very dense and homogeneous iter is taken at a rather low figure, and no allowance coal brick. The brick, still in the mould, passes on to great pressures.
the delivery ram, by which it is pushed out on to a Accepting, however, 1,188 atmospheres as the aptable, and is removed for the market. These coal proximate pressure at the stated depth, let us calcubricks are said to make an excellent fuel and to possess late the volume of air which a unit volume of the water a very high efficiency for steam-raising purposes. The would be capable of dissolving under this pressure. Times thinks that with such a fuel at the disposal of the public there is room to hope for a reduction in the pollution of the atmosphere of towns, as well as a reduction in the coal bills of steamship companies and of steam users generally.

## THE DEADLY SCORPION.

The scorpions have become so numerous in the city of Durango, Mexico, that the municipal authorities have offered a valuable prize, to be given the person capturing the largest number this month. Two thousand of the deadly pests were killed at the hospital there recently in one day. For these scorpions the city pays 60 cents a hundred, and three times a week those collected are counted and killed at the hospital, and 80,000 were thus destroyed last year. Persons who get permits to hunt the pests have the right to enter and search private houses for them.
We give a cut of the little Buthus carolinianus, or, as it is now called by systematists, Centrurus vittatus. This is the commonest scorpion of the United States, and is found as far north as Tennessee and North Carolina. Of the larger species of the Southwest we have no figure. This, however, will do fairly well for a representative of the family.

## The Submarine Atmosphere.

It is a well known fact that the amount of gas capable of being held in solution by a given liquid is directly proportional to the pressure exerted, unless chemical combination takes place between the gas and the solvent. But the pressure of any point within a fluid, which is incapable of being compressed, is proportional to the depth of that point below the surface of the fluid. Consequently it is obvious that the water deep down in the ocean must be capable of dissolving greater quantities of air than water at the sur-
To.
To illustrate this point, let us take an extreme case and roughly calculate the volume of air which could be absorbed by unit volume of water deep down in the sea. The depth of the Pacific Ocean is known to be as much as 40,000 feet (or $71 / 2$ miles) in at least one place.
First, we will calculate the pressure exerted upon a


## AN EARLY FRENCH PATENT ON BARBED WIRE.

cubic foot of water at that depth. Assuming that the specific gravity of sea water is roughly 1.026 , a cubic foot of sea water will weigh $1,026 \mathrm{oz}$. (a cubic foot of distilled water is generally taken as weighing $1,000 \mathrm{oz}$.) Then the pressure exerted per square foot at a depth of 40,000 feet will be

$$
40,000 \times 1,026 \mathrm{oz} .=40,000 \times \frac{1 \cdot 026}{16} \mathrm{lb} .
$$

Hence the pressure per square inch will amount to

$$
\frac{40,000}{144} \times \frac{1026}{16}=17,8121 / 2 \mathrm{lb}
$$

The pressure due to one atmosphere may be roughly
taken as 15 lb . per square inch. Thus the pressure at a depth of 40,000 feet is equivalent to that of 1,187 atmospheres. This, with the pressure due to the air
above, amounts to 1,188 atmospheres.
It must be borne in mind that this is only an approx-
mate calculation. For instance, the density of sea
would be capable of dissolving under this pressure.
I have no data at hand for the absorption coefficients I have no data at hand for the absorption coefficients
of sea water for oxygen and nitrogen or for air; so I will take the coefficients for pure water. Here again an error will arise, for sea water cannot absorb so much air as ordinary water; for it has been found that in solutions of different substances the solubility of gases is in most cases diminished.
One volume of water at normal temperature and pressure absorbs about 0.0245 volume of air. With the temperature remaining constant the volume of gas absorbed remains the same under all pressures. But this volume of air, under a pressure of 1,188 atmospheres, would occupy a volume of $0.0245 \times 1,188$ under normal pressure. This quantity. amounts to $29 \cdot 106$ volumes. Hence a cubic foot of water at a depth of 40,000 feet is capable of absorbing 29 cubic feet of air measured at normal pressure.
Since a c. c. of air weighs 0.00129 grm., 29 c. c. will weigh 0.037 grm . That is to say, the water in question would be capable of dissolving about 1-27 of its own weight of air. Nor does there seem any reason to suppose that this amount of air is not absorbed, for the atmospheric gases must permeate the whole of the ocean's depth in order that deep sea fishes may obtain the oxygen necessary for the preservation of their existence. At a depth of 1,380 feet water absorbs its own volume of air (measured at atmospheric pressure). Thus in all water below this depth there is dissolved more than its own volume of air. We have then a second but submerged atmosphere.
In this most marvelous submarine atmosphere are vast quantities of air stored away-how vast it is difficult to estimate. Remembering that three-fourths of the face of the earth is covered by water, one is apt to conclude that there is almost as much air hidden away in the ocean's depth as is found above its surface. What effect such great pressures have upon the solvent powers of the water for solid constituents it is doubtful to say. Probably the solvent powers are much modified by the presence of such quantities of dissolved gases. It is possible that such considerations as the foregoing have already appeared in print. As, however, I have never read or heard of such suggestions, I venture to bring the question before your readers.-Chem. News.

## Aluminum Light.

A remarkable kind of light has been successfully exhibited by Dr. Philip Lenard, of Bonn, and has formed the subject of a paper read before the Royal Prussian Academy of Sciences at Berlin. Hertz has shown that the rays which proceed from the cathode of a Geissler tube, and are capable of exciting phosphorescence, will permeate thin metal. If then it were practicable to find a sheet of metal foil thick enough to be air-tight and opaque, yet thin enough to be permeable by this discharge, it would be possible to allow these rays a passage into the open air by closing an opening in a discharge tube with such a piece of foil. This idea has been realized by Dr. Lenard by means of an ingeniously arranged apparatus and a hammered aluminum plate 0.003 millimeter thick. This plate forms in the apparatus in question a shutter which Dr. Lenard calls the
"window," because, while quite impermeable to air and light, it allows the rays from a cathode at a distance of 12 centimeters to penetrate it freely. These rays render the air faintly luminous. A halo of bluish light surrounds the "window," and is moderately bright only on its surface. At the same time a strong odor of ozone is recognizable. Substances capable of phosphorescence, if held near the " window," shine with their peculiar light on the side nearest to it. All the phenomena of phosphorescence cease if a magnet is so applied to the discharge tube as to repel the cathode rays from the inner side of the " window.', The atmosphere is a dull medium for the cathode rays to penetrate, coal gas is more permeable, and so is hydrogen, while oxygen and carbonic acid are less permeable than air.

Cost of Columbus, Expedition.
The cost of discovering America by Columbus, says Prof. Ruge, in the "Globus," was $1,140,000$ maravedis, or about $\$ 7,296$ of our money. The money of Queen Isabella, of course, had a higher purchasing power than the dollar of to-day. Of the sum named, Columbus received an annual salary of $\$ 320$, and the two captains each $\$ 192$ per year. Each sailor, in addition to his subsistence, received $\$ 2.45$ per month, or one ducat.
recently patented inventions.

## Engineering.

Hydraulic Excavator. - Adoniram Fairchild, New York City (deceased, Benjamin D. Fairchild administrator). This is an improvement upon a formerly patented invention of the same inventor of a
device for the removal of sand, mud, and gravel from a device for the removal of sand, mud, and gravel from a
water bed, and provides for a construction to permit the outer shell of the excavator to be extended down to form being forced from the exterior to enter this space, carry ing into the lower end of the lift pipe excavated mate rial loosened by water jets within the annular chamber.
The entire device is swung by chains or ropes from a atat The entire devicicis is fung by chains or ropes from
erally movabie support above the water surface.
Boiler.-Frank Saxon, Worthington, Minn. Return flue boilers for road or traction engines are provided by this invention with a front extension to
save the flame sheet and that portion of the flue sheet save the flame sheet and that portion of the flue sheet
above the water line. The extension is hinged to the above the water line. The extension is hinged the
main portion of the boiler, ,o that its interior may
be easily examined, the hinges forming the supply be easily examined, the hinges forming the supply
and discharge pipes, and the extension supplies hot and discharge pipes, and the extension supplies hot
water to the interior of the main boiler. By the improvement a greater amount of heating surface is
tained, with a consequent increased economy of fuel.

## Railway Appliances.

Car Brake.-Howard B. Hanmore St. Paul, and 'Thomas N. McLean, Fergus Falls, Minn Brake levers on the brake beams are, according to this
invention, connected together, and springs under the car body are connected by a link with one brake lever, while a sink connects the other brake lever with a fixed sup. port, and operating levers are connected with the springs.
The construction is such that the operator cannot increase the power more than the coefficient between the load and the rail, thus preventing the wheels from slid ntruction of the wheels.
Car Truck.-Gustavus L. Stuebner, Long Ifland City, N.Y. This is an improvement upon
car trucks having pilot wheels to keep the trucks on the car trucks having piot wheels to keep the trucks on the
track in passing swiftly around short curves. Guide wheels of less diameter than the supporting wheels are
carried by the advance axle and adapted to engage the nner surfaces of the rails, while the trucks are pivotally connected with the car by attaching the body of the car
to the bolster of a truck, enabling the truck to accommodate itself to very sharp and quick turns. The guide
wheels are virtually small ournaled in arms projected from the bolster.
Cable Grip.-Henry A. Shipp, At water, Cal. By this device it is designed that the operator shall be able to graduate the grip on the cable
according to the load to be pulled. A slide is movably held in a grip frame on which is pivoted a lever actuated from the slide, jaws on the lever on opposite sides of its
fulcrum engaging the cable. By means of mechanism frum rum engaging the cable. By means of mechanism
convenient to the operator, the slide may be moved so that the jaws will take a more or less heavy grip upor the cable.

## Mechanical.

Polyhedral Lathe. - Manuel Rul, ary of Mexico, Mexico. This lathe has a cutter shar a tension device, in combination with cutter clamping and guiding ams movable along the tool shaft, and other novel
features, whereby work may be quickly performed features, whereby work may be quickly performed
and prisms of any character be turned, and whereby also a number of articles may be placed in the lathe and presented consecutively to the turning or cutting tools
At one revolution of the chucks it is possible to turn on face of all the articles carried by the chucks, the articles being then reversed to offer another face, and the operation being re
been made.
Moulding Propellers.-Louis His, New York City. To obviate the necessity of using patofrns in casting propeller blades for vessels is the design of dissimilar height having rows of perforations, a per-
forater. ntrcined end piece connecting their outer porforator. n1rcined end piece connecting their outer por-
ticus, while an adjustable bottom has fastening bolts to enter the perforations in the sides and end of with great accuracy and facility, two flasks being employed for the opposite sides of the propeller blades, the ployed for the opposite sides of the propeller blades,
spindle and flasks being arranged upon a perfectly smooth and subst.
in the usual way.

## Agricultural.

Plow.-Ramon G. Rivero, Monterey Mexico. This is a double mouldboard plow, designed to cut the earth uniformly, run comparatively easy, and
completely turn the furrow in all cases. It has a flat straight-edged point, preferably made separate from an
angular share having horizontal lateral wings, and the angular share having horizontal lateral wings, and the
rear edge of the share is riveted to the mouldboards. rear edge of the share is riveted
The plow is very light, yet strong.
Land Roller and Harrow.-Carl Storla, Belford, South Dakota. The forward portion of this implement consists of a harrow for breaking or pul-
verizing lumps of earth, and behind the harrow are front verizing lumps of earth, and behind the harrow are fron
and rear rollers arranged to cover every portion of the and rear rollers arranged to cover every portion of the
ground and prevent the formation of ribs. Each of the ground and prevent the formation of ribs. Each of the
rollers is provided with an efficient scraper and a lubricating device, and the machine has markers to indica
to the driver the line along which the center of the im plement must move to thoroughly cover the ground.

## Miscellaneous.

Placer Mining Apparatus.-Marshal D. Platner, Elliston, Montana. This apparatus has an
upper sluiceway with a perforated floor, below which is a lower sluiceway, into which delivers a mercury tank, there being riftle plates in the lower sluiceway below the
while a pump forces the amalgam from the concentrating
device back to the mercury tank. The invention also covers other novel features, the apparatus being designed to rapidly make a clean separation of sand and gold, and also to facilitate the separat
they occur in the diggings.
Water Wheel and Elevator. John B. Lockwood, Helmville, Montana. This is a deand be revolved by a stream, while it at the same time elevates and discharges water for irrigating or other pur poses. A cylinder secured to a shaft has end flanges,
beyond which the paddles project, while buckets are beyond which the paddles project, while buckets are
formed between the paddles, and guide strips aligning formed between the paddles, and guide strips aligning with inner edges of the flanges guide the water raised
by the buckets to a sluice for delivery at any desired by the
point.

Bioptoscope. - Charles H. Meddins, Omaha, Neb. This is a simple apparatus to show mov-
ing objects in a succession of fixed positions. It consists of a frame with apertures on opposite sides of it pivoted a disk with other corresponding apertures, and having inclined vanes or wings. It is designed mainly as a toy, but may be used to observe the movements of animals and birds, and
parts of machinery.
Stop Watch.-Adolphe G. Guerin, Savannah, Ga. The second hand of this watch may be
stopped through the stem-winding mechanism without stopping the minute and hour hand or interfering with the movement of the watch, facilitating the readjustment
of the second hand in relation to the minute and hour of the second hand in relation to the minute and hour
hand, and also adapting the watch for use for racing hand, and also adapting the watch fins.
purposes. The improvement consists in a special me chanism connecting the second bed to the winding ing device
Wire Stretcher and Reel.-Edgar S. Hoge, Morris, Ill. This is a machine to be drawn stretching the wire as it leaves the reel. The reel is one and be locked, as required, the reel being supported o a crank-handled [shaft, and a ratchet being connected with the shaft. A novel wire-guiding mechanism and
simple brake device form features of the invention.
Treating Sewage.-James J Po rs, Brooklyn, N. Y. A process of chemically treating and purifying sewage before its discharge has been pro through suitable conduits, at the head of which are in troduced disinfectants and substances forming with the sewage compounds insoluble in water, the floating and
sedimentary matter being removed. and the entire body dimentary matter being removed. and the entire bod germ-destroying gas. The water separated out is finally eated with liquid disinfectants
Land Roller.-Eli W. Farr, Cedar Springs, Mich. This machine has a front and rear sec-
tion, and comprises a series of rolls independently mounted upon a frame, the rolls being capable of vertical movement at their ends, or being adapted to be so fas-
tened to the frame that they will be held straight. The machine will work upon even as upon uneven ground,
and when not in use the sections may be uncoupled and and when not in use the sections ma
the machine stored in small space.
Sleigh.-Willie N. Snow, Snowville, N. H. This invention provides an improvement in the
running gear of side bar spring sleighs, by means of running gear of side bar spring sleighs, by means of
which such gear may be cheaply made and very stron The invention covers certain features of construction an

Thill Coupling.-William H. Tydeman, Walsenburg, Col. When the shaft iron of this de-
vice is in draft position it cannot be disconnected from the coupling, but such separation is readily effected when he shaft iron is carried up to an angle of forty-five de grees. The coupling is practically automatic, as no
wrenches or other tools are required in its manipulation, and an elastic block held against the clip section render anti-rattling.
Flower Pot and Stand.-Alfred A. Holt, Brooklyn, and Jacob P. Kooy, New York, casing for a flower pot, while it has a lower chamber orming a readily removable water receptacle. The pot fits into the stand so that its bottom rests in the water in
the receptacle, and should water overflow from the top of the pot, it will be received and held in the receptacle the casing.
Book Binding and Book.--Johann G. Bast, Brooklyn, N. Y. This binding comprises a series of sections with a rod on the back of each, bind-
ing strips extending across the rods on the outside and ing strips extending across the rods on the outside and
a binding cord uniting the leaves of each section, fastena binding cord uniting the leaves of each section, fasten-
ing the rod to its section and the binding strip to the rods, while also flexibly connecting the several sections of the book with each other. This binding combines when the book is opened.
Music Book or Folio.-William H. Ayres, Sackett's Harbor, N. Y. This invention relates music racks, affording a cheap and strong book, with means for fastening the leaves so that none will be hid den. Any number of sheets or leaves may be quickly fattachment or hinges for the sheets of music, held be ween covers in the usual way
Egg Poacher.-Clara T. Gott, Seattle, Washington. Upon a perforated plate having a central ver
tical handle is fixed a series of disconnected rings, hinged the plate, so that any of the rings may be swung up t remove an egg without releasing the contents of the
other rings. To cook the eggs, each one is dropped into separate ring and the poacher is placed in a pot or asi
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Stow Mfg. Co., Binghamton, N. Y. See adv., page 270 . Screw machines, milling machines, and drill presses. Centrifug Pu, and sand pumping plants. Irvin Van Wie, Syracuse, N. Y. For Sale-Patent Office Reports, 1881 to 1893 complete. Guild \& Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps Split Pulleys at Low prices, and of same strength and Wperks, Drinker St., Pbiladelphia, Pa.
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tricity is " Experimental Science," by Geo. M. Hopkins. by main, 94 ; Munn \& Co., publishers, $66 \mathrm{Broadway}, \mathrm{N}$. Canning machinery outfits complete, oil burners for
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marked or labeled.
(4967) E. B. asks : 1. Are cast iron pole pieces any better than wrought iron for dynamos? A
Cast iron pole pieces are preferred to soft wrought iron Cast iron pole pieces are preferred to soft wrought iron
on account of their ability to retain sufficient magnetism to start the machine. 2. About how long would a storage battery (such as is described in a late number of the ScIentific American) hold its charge if the plates were 2 inches by 5 inches? A. The storage battery might
hold the most of its charge for three or four weeks, but it will beginto run down immediately after charging. (4968) J. C. B. writes : Would it be practical and would it be a successful drive to run a
paper friction on a crown face wheel? I have a fly wheel on an engine shaft ten feet diameter, twenty-four inch fowe. This wheel has three-sixteenths of an inch crown Now I want to put an eighteen inch paper friction on
this wheel to run a dynamo. The question is, Will it be successful drive or will there be too great aloss of power, owing to the fact that the friction wheel is running on a crown face? In other words, What would be the true
action of the friction on the crown face wheel? Can you give me any rule for calculating the power transmitted by paper friction? A. The running of a friction
wheel on a fly wheel of the width and diameter named wheel on a fly wheel of the width and diameter named
will make but little friction, from the small curvature of three-sixteénths of an inch in 2 feet in width. If the riven wheel is covered with thick sole leather, 80 that
will be slightly elastic on the surface, it will take bet ter to the crown and give a better working power. The transmitting power of good friction gear is fully equal to belting with the same pressure on the pulleys as the ten-
sion on belts. See Cooper's work on "The Use of Belt
ing and Friction Gear," $\$ 3.50$ mailed.
(4969) W. F. B. asks : What propor tions of gasoline vapor and air are necessary to run an
engine ? A. 25 to 35 volumes. 2. How many pounds per square inch should it be compressed before it will ignite? A. No compression is needed.
(4970) W C V
(4970) W. C. V. N. writes: Suppose that a drum on a hoisting engine is held by a friction
clutch so that it just raises a weight of one ton, one
hundred feet a minute. Theoretically would that clutch ip if the engine were driven so that the weight wculd ise two hundred feet per minnte, all other thingsbeing speed in hoisting means increased power. The friction clutch set for a given hoisting speed will slip if the (4971) R. M. writes: We desire to use a wire belt to run over a smooth surface and would like to get it down as low as No. 12 wire. We shall run six or eight belts in number, side by side, but all of them enCould you give us an idea of what is the sest wire to use and whether to use a very fine quality of steel or soft wire? The size of the pulleys will be 12 inches for the maller one and the other will be larger. A. The ordinary unannealed steel wire is the best for your purpose. Pulleys should be grooved to fit the wires. Yon would get better service if the small pulley were larger,
say 16 inches, as the constant running of a No. 12 wire say 16 inches, as the constant running of a No. 12 wire
aver a 12 inch pulley tends to crystallize and weaken the steel wire
(4972) F. J. H. asks : How can I make cheap sand pump for pumping quicksand out of well
feet deep? A. You can make a cheap sand pump with a piece of stove pipe or a strong tin can. Put a botm in one end of a length of stove pipe, with a lip like by turning it around in the quicksand a charge can be rawn into the pipe and lifted out. The same can be done with a tin can, by cutting a slot in the bottom from he center to the edge and pressing down one edge into a p. Fasten to a pole, as with the piece of stove pipe. (4973) C. \& T. write : Will you please tell us what is meant by gold filling; for instance, gold-
filled watch cases? What is the process? A. Filled old work is made by backing good gold, 16 to 18 carat ine, with silver or other solder as a filling for stiffening also shows gold, the base metal is plated on both sides, while in a thick slab, with good gold plate, by soldering with silver or other hard solder. The whole is then rolled down to the proper thickness for making the cases.
Rims, rings, and knobs are made by drawing gold tubing Rims, rings, and knobs are made by drawing gold tubing over brass or silver wire and soldering with hard solder, When the rims can be drawn down to the proper shape.
Knobs are struck up by drop presses in thin solid gold Knobs are struck up by drop pr
plate and filled with silver solder.
(4974) J. L. C. writes: I can find no way in which to make solder stick to my soldering iron, whether you can furnish me with an effectual recipe. A. It is necessary to tin the soldering copper with pure tin, not solder. Rub the hot copper on a piece of sandstone a brick to brighten the surface, and at the same time aply a stick of tin to the copper, rubbing the point on
(4975) H. D. M.-The reason why you did not succeed in your experiments was clearly because
you did not follow the instructions. We do not think you did not follow the instructions. We do not think
you ought to expect to have a mixture of sulphur and plumbago act the same towaru yases as the carbon would; neither can you expect the artificial carbon to take the tate Jablochkoff's experiments you will succeed as well
(4976) A. M. M. asks how an electric motor exerts force-by attraction of armature or by repul-
sion of armature, or by both ? Also, why is it that elecic motors cannot be made of more than say 80 horse power? What is it that imposes so low a limit? A.
The force of an electric motor is mainly that of attraction, The force of an electric motor is mainly that of attraction, made of greater power than 80 horse power
(4977) A. M. P. asks: Can aluminum be put on plates like those used for tin, or dipped like tin any more? (If manufactured, name firm.) Can the maany more? (If manufactured, name firm.) Can the ma-
terial be used for keepingfruit in? Can tin and aluminum be mixed and used to plate iron? A. Aluminum melts
at a full red heat, and is not a suitable metal to coat other metals with as tin is used. The electric plating is not ery much used. Tinning iron plate with an alloy of face a little harder and less acted upon by acids. This aloy will no der the beactas. This (4978) C. L. R. says : Our 150 horse nce at night by the heavy exhaust. The company want to put in a sewer for the exhaust, but $I$ am in doubt as to the plan. Hence write you. The sewer will be about 100 feet long, opening into a creek. If you can suggest a
plan to help us, I shall be obliged to you. A. You can plan to help us, I shall be obliged to you. A. You can
muffle the exhaust by turning it into a tank. A cylinder muffle the exhaust by turning it into a tank. A cylinder about 3 feet diameter, 4 to 5 feet long, set upon the roof,
with a larger pipe to the open air. The cylinder may be made of thin plate iron, $1 / 8$ inch thick. A drip should be iserted at the bottom. A common practice in New York is to fit a sleeve on the top of the exhaust pipe, to which attach a double cone drum of heavy galvanized sheet iron, which, for your 150 horse power engine, should be of about the capacity of the tank above mentioned. The opening at
the top should be double the area of the exhaust. A the top should be double the area of the exhaust. A baffle plate is put in the center and braced so as to break (4979) W. P. M. writes: 1. In the winter 1891-92 I built a small steam launch, length 25 feet beam 5 feet. She will run, in slack water, 8 miles per hour, and is fitted with 1 horse power engine and boiler, per minute I wish to 16 if I could 00 revolutions per minute. I wish to know if I could not get more
peed with an 18 inch wheel, or would it be taxing the engine too much? A. Whatever extra speed you naa engine too much? A. Whatever extra speed you naay
get with an 18 inch wheel must be derived from additional power in the engine, and to get more power from the engine means higher steam pressure. If your boiler is strong enough for the pressure required togive the engine
500 revolutions per minute with the larger wheel you may increase your speed. 2. In small launches, say under 40 feet, does increase of length, without a corresponding in crease of beam, detract from safety or seaworthness; or,
in other words, is a launch, fitted with the same machir-
ery, 5 feet beam, 25 feet long, nure safe thain one 5 feet
beam and 30 feet long? A. An increase in length for a given beam over the usual practice, or to the proportions be taken against shipping water in the choppy seas of the lakes. 3. What is the simplest and best way to make a
sea anchor or drag and what size should it be for launch $5 \times 25$ ? Should not care if boat drifted some. Simply wish to be in a position to be able to hold her head to sea in case of accident to machinery. A. For a sea anchor for your boat use a pine board, 1 inch thick, 18 inches wide, 4 feet long, with a couple of battens to stiffen it.
Load one edge with lead or iron, so that it will float edgewise with the light edge 1 inch out of the water. Bore wo holes near the bottom and ends and one hole at the through the holes, so that when the anchor is held at the intersection of the three ropes it will hang level. To the apex of the sling fasten the drag rope.
(4980) T. C. S. writes: We have been considering the construction of a dam across a tolerably mall stream (fed by three springs), for the purpose of
making a fish pond. What is the most approved dam, expense, durability, and convenience being considered? Will add that the incline on each side of the stream is, while not abrupt, rather steep, and that the area drained ing of a dam, however small, should have more than a casual consideration, in view of the total flow that might come from a storm. The construction should also take nature of the ground as to its stability to hold a dam, which also may indicate the depth necessary for a foundation. A curved stone wall, backed with clay and earth, with a central spill and riprap beneath is the best. Lef fell's work on mill dams gives illustrations and descrip(4981) E. L. O. asks: What is the scienificic reason for the use of storm sash? Because they close the joints around the sash, or because heat con denses more rapidly on the glass than on other portions of the building? A. The reason is not a strictly scien-
tific one-it is more a matter of comfort and convenience, tific one-it is more a matter of comfort and convenience,
the main object being to keep out the cold air that presse through the crevices around and between the sash in windy weather. It also prevents excessive circulation of the air within the rooms by cooling against a single glass and dropping to the floor-a dangerous source of cold to persons standing or sitting near a single window in cold weather. The double glass also keeps moisture and frost rooms is prevented from coming in contact with the cold outside glass, the air between the glasses holding too lit tle mo
SEleire, Pa., April 17, 1893. To the Editor of the Scientific American:
DEAR SIR : I notice in your "Notes and Queries," No. DEAR SIR: I notice in your "Notes and Queries," No
4889, F. H. asks what to do for the crank on his $14 \times 16$ same kind of engine in our sawmill and had the same trouble he complains of. We tried all kinds of lubricants but could not overcome the difficulty. Finally I took the
brand had them conuterbored and filled with No. babbitt and bored out to fit the crank pin. Now we have no trouble and can run the engine without any trouble whatever with any kind of oil. Everybody at the shops
said the babbitt would pound out, but it did not. Now all the engines in the mills in this section are fixed in the same way, and nobody experiences any difficulty. Hoping this may help some of your readers,

I remain yours truly
Wiluis Kerr.

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brake. See Car brake. Lock brake. Pressure
brake. Railway brake. Vehicle brake. Wago
Break cut
Brick cuter

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Cins and tobacco, box for storing
ing, T. V. Smith.......re...........ichard....
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hearing tube as described for conveying hearing tube as described for conveying
the sounds; and the eighth, of a permathe sounds; and the eighth, of a perma-
nent magnet and plate combined. The nent magnet and plate combined. The
claim is not for these several things in and of themselves, but for an electric telephone in the construction of which these things or any of them are used."
This Company also owns Letters Patent No. 463,569, granted to Emile BerTiner, November 17, 1891, for a Combined Telegraph and Telephone; and controls Thomas A. Edison, May 3, 1892, for a Speaking Telegraph, which cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.

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