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<br>NEW YORK. JULY 8, 1893.<br>

OIL FUEL AND bOILERS AT THE GREAT EXPOSITION. ed into boxes or headers at each end, and these placed a mud drum for the collection of sediment The The motive power for the great Exposition at Chi- headers are connected with the drum above by circucago is chiefly supplied by a great assemblage of water lating tubes or other connections. A clear idea of the tube boilers-the greatest in number and operating details of construction and of the variations in different power ever before collected in one locality. The fuel makes may be obtained by reference to the accomfact forms a part of the Palace of Machinery. Our second view shows the type of burner used for the combustion of the oil ; the operation of which will be readily understood by a glance at the picture. The burner consists simply of a tube which enters through the front of the boiler into the combustion chamber. The oil, under a pressure of 6 pounds to the inch, rises through the pipe marked "oil" into the burner, and is atomized and blown into the combustion chamber in the form of a fine inist, by means of a steam pipe, which passes centrally through the burner, and delivers its steam jet at the extreme end of the burner tube as shown. A great flame of gas is thus produced, with intense heat. The handling of coal and ashes is thus avoided, while economical results of the most satisfactory nature are attained. These oil-burning boilers attract much attention from engineers.
Other interesting exhibits pertaining to the use of oil are the oil engines, in which vaporized oil takes the place of steam in driving the pistons of engines, thus doing


OIL-FIRED BOILERS AT THE GREAT EXPOSITION. Boiler Company, four boilers, 1,50 Bore powe Heine ight boilers, 3,000 horse power National, four boilers, 1,500 horse oower; Campbell \& Zell, nine boilers, 3,750 horse power ; Babcock W Wilcox, ten boilers, 3,000 horse power; Stirling, four boilers, $\mathbf{1 , 8 0 0}$ orse power. In the annex are our Heine boilers of 1,500 horse power, three Climax of 2,000 horse power, and two Stirling of 900 horse power. These boilers, while separated from the main boiler room by the south entrance to Ma chinery Hall, are connected with the main system the same as any of the other batteries. They are not yet in use, however. All the boilers, as will be seen by the illustrations, are of much the same type, except the Climax, which is vertical, with U-shaped tubes opening into the central drum. The Jumbo of the boiler house is a Climax of 1,000 horse power.
The Abendroth \& Root boilers have 126 tubes four inches in diameter by 18 feet in length, arranged in courses 14 wide by 9 high. They have 7 drums 14 inches in diameter by 20 feet in length, and one header 30 inches in diameter by 12 feet in of these exhibits form the subjects of illustrations which with water. The water level is carried about the length. The Gill boilers have 360 tubes 4 inches in we present on another page. Returning now to the middle of the drum, which, on account of its compara- diameter by 18 feet in lencth, 3 steam drams 42 inches creat boil two boilers, which generate steam for gines. One of the best descriptions of this plant is that recently given in the Chicago Tribune, and from it we make the abstracts that follow :
The boilers have a rated horse power of 20,500 , but they are capable of developing a horse power greatly in excess of the rating within the limits of economy. They evaporate about 750,000 pounds of water per hour and burn about 50, 000 pounds of oil in the same length of time. One pound of oil will evaporate about fifteen pounds of water. Assuming the evaporation to be 750,000 pounds of water an hour, the horse power generated pould be 25,000
The permanent form which the water tube boile has now assumed consists of a bank of tubes, usually 4 inches in diameter and from to 18 from to 18 feet ength, inclined upward at an an gle from the rear, surmounted by a water and steam separating drum from 30 to 50 in ches in diamete and about the same length as the tubes. Th tubes are expand.
 ater and 6 inches long, and 3 steam drums 36 inches by 18 feet. The Climax 500 horse power boil ers have a main shell 42 inches in diameter by 29 feet high. The main shell is $3 / 4$ of an inch thick, with vertical seamswelded. Each has 475 tubes 3 inches in diametar and 11 feet 6 inches long before bending.
The monster 1,000 horse power boil er Jumbo has a main sbell seven-eighths of an inch thick. It is 56 inches in diais 56 inches in dia meter and 35 feet
8 inches high. It 8 inches high. It has. 864 - 9 -inch tubes which were 12 feet 6 inches long before bending. It is capable, it is said, of developing 1,800 horse power.
(Continued on
page 88.)

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## THE CENTRALIZATION OF MOTIVE POWER

For a number of years the distribution of power over a large area from one or more producing centers or stations has been a problem of engrossing interest to engineers. Before the advent of modern electricityfor such a name may be considered the due of this greatly developed industry-all sorts of methods were proposed for the distribution of power. Many of such methods have been utilized. Thus in pipe con-
duit systems compressed air, rarefied air at a very slight excess over atmospheric pressure, and water under high pressure have all been utilized as the base of more or less successful and extensive operations. As a purely mechanical method the transmission by wire cable has proved reasonably effective. A light cable running at high velocity has proved itself suited for transmitting very high horse power for great dis tances
Electricity has now been found capable of doing this class of work with good efficiency. The alternating current, working under high pressure, needs but a mall wire to carry a large horse power. The high speed cable transmission alluded to above is compara ble to it in this respect.
The transmission of power over considerable dis tances is so far proved that a new movement in the engineering world in the direction of centralization of power is discernible. Doubtless this movement will, in the next few years, be fraught with most important
results. In this country, especially, it has taken root. results. In this country, especially, it has taken root. Thousands of horses are now employed drawing stree cars through the streets of our cities. This means a division of power into very low units, without any cen tralization whatever. Within the last few years the great street railroads have felt the impulse, and in our large cities, by the use of the cable and slot or by the electric trolley line, have centralized their power and have substituted each a single unit of thousands of horse power magnitude for the many one or two horse power units formerly assigned to each car.
In the suburbs of the same cities the electric road has been greatly developed. The motor machinery for a car carrying thirty to fifty passengers is of inconsid erable weight, giving a high efficiency from the point of view of ratio of weight moved to load carried. The generation of power at a central station is far cheaper than where small generating plants-the boilers-are distributed in locomotives all along a railroad line. These advantages are such as to have made the elec tric road a serious rival to steam roads. It is easy to believe that the day will come when the locomotive engine will be relegated to an altogether secondar place in the economies of mankind
Electric power is now furnished by the city companies. This has made possible the installation of small factories, so that in the best buildings in our best streets workshops are established with machinery driven by electric motors. But most of the great factories still run in the old way. At Niagara Falls the project of providing power for factories of the largest size will soon be accomplished. An industrial city will be erected about the nucleus of the power works, electric railroads
will be run from them, the lighting of neighboring cities will be provided for, and Buffalo will possibly be the recipient of many thousands of horse power from the same place.
Transmission of power by electricity is now an ac complished fact. The production of power economi cally in central stations is the problem to be solved. Such a locality as Niagara Falls contains in itself the solution. But Niagara is unique. Natural gas seems to be on the decline. The old time coal fire and steam boiler are still in the ascendency. In the SUPPLEMENT of the present week an interesting paper contains the suggestion of establishing steam plants in coal mines. Coal as such is of exceedingly slight value. When extracted from the veins and lying on the floor of the mine, it represents but little. But after coal has been hoisted or drawn out of the mine, has been screened and placed in cars, and after these cars have carried it perhaps two or three hundred miles to the seaboard ; after it has been transferred to vessels and has been towed hundreds of miles further to the wharves of some city, and has been hoisted out of the vessels' holds, then its value is enhanced.
By establishing an electric plant in the heart of a coal mine, the fuel account would be almost nothing and a rival of Niagara Falls might be established. From some coal mine in the heart of Pennsylvania, power might be distributed over a great area, includ ing cities and railroads on all sides. The culm heap would disappear, ashes would be stored in the empty chambers, and future geologists would have these ashes to deal with as examples of igneous changes, while fossil men and boilers would interest the archæo logist of the fuelless days yet to come.

A Concrete Bridge.-A bridge of concrete is being constructed over the Pennypack Creek at Pine Road, Fox Chase, Pa. The outside surfaces will be pebble dashed and outlined in imitation of pointed ston work, so that when completed it will present the appearance of a handsome cut-stone structure.

Professor J. M. Schaeberle, of the Lick Observatory, arrived in New York on June 24 from South America where he had gone to observe the solar eclipse of April 16.
He set up his instruments near Merciditas, Chile. The big telescope was erected a month before the eventfu day. Preliminary observations were then carefully conducted. The plates used with the large telescope were 18 by 22 inches. He had also a Clark equatorial with a 6 inch lens, a 6 inch Dallmeyer lens with a 3 oot focus, and two small cameras. On the day of the eclipse he made about fifty negatives of the corona. With the large telescope he made eight negatives, and they are larger than any that have ever been taken by any one of an eclipse. The big plates of the corona how the full length of the plates, and the details are brought out with great precision. The photographs taken with the smaller instruments are also valuable He is confident that the theory he had before making the observations is sustained beyond a doubt. His theory may be thus stated :
The corona, which appears during every total eclipse, is caused by the fact that the sun was covered with immense volcanoes, which continually belched forth great masses of molten material, which the sun drew back to it with a speed which could not be reaized. The mechanical actions seem to be shown plainly on the large photographs. Until the professor himsel publishes in full the account of his observations it will be premature to discuss the infiuence which his discovery will have upon solar physics.

A Paper to Prevent Forged Documents.
It is very desirable that dishonest persons be prevented from duplicating certificates of stock, bonds drafts, and such valuable documents: and many devices have been employed for this purpose. A new process has just been introduced in making a paper which will at least be difficult to imitate successfully. Ink is applied to a lithographic stone, and another similar stone is placed on its face and rubbed together until the ink is so distributed that a variegated design is produced. When the ink is dry, the design is trans erred to paper after the usual manner in lithographic rinting. Of course any color may be selected for the nk. It is manifest, also, that the design thus cheaply produced can be varied indeflnitely until a pleasing or ffertive one is obtained. A counterfeit is detected at once when compared with a sample of the genuine paper.

## Experiments with Rattlesnaken

In the pathological laboratory of Johns Hopkins Hospital it was necessary recently to determine the ex act action of the poison of the rattlesnake. The creatures were kept in a wire-covered box. When one was required for experimental purposes, it was caught ound the neck by a noose at the end of a stick. A deep glass vessel was then presented to the enraged animal, and it instantly struck its euge with its fangs. The poison, which was caught in the bottom of the vessel, was free from all foreign admixture. Minute quantities injected beneath the skin of rabbits produced marked lesions. For some reason or other the snakes refused food, and in order to keep them alive an egg mixture had to be forced down their throat by means of a stout glass tube.

## A New Use for the Tricycle.

A company has been formed in Milan for supplying he city with tricycles. At a trifling cost a person may hire one of these machines, to behad at certain defined places, and take a drive either for business or pleasure Each tricycle has a driver, so that the hirer has nothing o do with either its propulsion or direction. The fare may depend upon the distance to be traversed or the time to be occupied by the journey. As to speed, it is believed the tricycle can go about twice as fast as the ordinary cab horse ; that is to say, if the payment is to be for a definite distance. But if the tricycle has been engaged by the hour, the speed, as a rule, is not remarkable. This system of local transit is on a par with the Japanese hand cart method or "rickshaw." The Jap vehicle is, doubtless, preferable to the tricycle.

## Scientific Excursions.

The tenth geological expedition to the West has just gone out from Priceton College, under Professor Scott. The first of these useful enterprises set out, under Professor Brackett, in 1877, the second in 1878 under Pro essor J. B. McMaster, and all of the others under the present leader. In time it is hoped that a complete representation of American fresh water tertiary fossils may be obtained from the promising fields discovered in Colorado, W yoming, Utah, Dakota, Oregon, and Montana. Hitherto the finds have been most encouraging. Immense numbers of extinct vertebrate specimens have been collected. Among the very important fossils may be mentioned the bones of a mesonyn, the only complete skeleton of the kind yet found, and the legs and pelvis of a three-toed horse.


The World's Columbian Exposition is now an "open fair" to a sufficient extent to satisfy the most radical. The gates are open for visitors at eight o'clock every morning and do not close until eleven o'clock at night, seven days in the week.
Near the Sixty-fourth Street entrance to the Exposition grounds are the exhibits of the Pennsylvania and of the New York Central and Hudson River Railroad companies. The New York Central exhibit is on the left. The building erected by the railroad company, and which forms a part of this exhibit, is much like a triumphal arch in architecture.
Two tracks of considerable length extend along one side of the building, and here are exhibited the latest models of car and engine building. One train consists of the famous engine 999 , which holds the record for speed at the rate of 112 miles an hour. Attached to this engine is a train of three cars, comprising two day coaches and baggage and buffet car of the latest type, such as are used on the Empire State Express. On a short track on the side of this train, near the engine, is the famous old engine DeWitt Clinton, with the three passenger coaches attached. These two trains stand in the same relative position as illustrated in the Scientific American of May 13. On the track, at the left of the Empire State Express, is a train of five Wagner cars, fitted in the most magnificent manner. This train comprises the baggage and smoking car Columbus, the parlor car Pinzon, the compartment car San Salvador, the sleeper Isabella, and the dining car Ferdinand. In the car Columbus is a barber shop, bath room, library, etc. The Pinzon is finished mostly in white and gold, with the richest of silk draperies. The San Salvador has accommodations for sixteen people in the compartments, all of which are furnished in different colors. One compartment, called the bridal compartment, is most beautifully furnished. The Isabella is finished mostly in white mahogany, while the upholstering is in brocaded plush. This car, like the others and like the dining car Ferdinand, has the richest of silk draperies and every possible convenience. The entire train is lighted by electricity.
The exhibit of the Pennsylvania Railroad is contained in a building designed to represent a model passenger station of classic architecture. It contains a main hall 100 feet long and 40 feet wide, in which is displayed a collection of models, reliefs, maps, and
illustrations covering a vast field of railroad topics and making in themselves a most valuable and instructive exhibit. There are many models of engines and cars used in the early days of railroading, and also models of stage coaches and wagons used before the railroad era; also models of canal boats and other early means of transportation. Among the models is one of the first trains run on the Camden and Amboy and the Philadelphia and Columbia Railroads. Among the models of cars is one of the old passenger car Victory, and of an emigrant car made over into an ambulance car to use in the hospital service during the war. The photographs and other illustrations cover an infinite variety of subjects connected with railroading. Among them are pictures of wrecks, of scenes at the time of the Jobnstown flood and afterward, etc. Ferry transportation is illustrated by models of early types of ferry boats and of this company's latest and finest boat, the Washington. Methods of transferring freight cars across waterways are also illustrated.
Another set of models illustrates the advancement of modern block signal systems. Among the reliefs are two representing four centuries of progress in transportation, one dated 1492-1792, the other 1792-1892. Turning to the financial part of railroading, there is an exhibit that shows in a peculiar way the amount of money represented by this road. Silver dollars are laid on the top of sections of two rails, the dollars touching each other, and a placard explains that it would require as many silver dollars as could be laid on both tracks of 7,980 miles of road to equal the amount of money invested in this railroad. There are also four tracks on which is the outdoor exhibit. These tracks represent the standard adopted by this railroad. They are laid with steel rails weighing 100 lb. to the yard, with the latest type of frogs, switches, stone ballast, signals, etc.

All switching is done by the standard pneumatic interlocking switches and signals. On one track is shown the original locomotive John Bull put into service in 1831. This is believed to be the oldest loco-
motive in America. The two cars to which this loco-
motive is attached are passenger cars that were used
on the Camden and Amboy road in 1836. The two on the Camden and Amboy road in 1836. The two
cars which transported the large Krupp guns are also shown, each car with a model of a gun in place. One car with its load weighed $460,000 \mathrm{lb}$., the other $253,300 \mathrm{lb}$.
The Smithsonian Institution makes an exhibit in the Department of Ethnology in the Government building that gives an excellent idea of the physical peculiarities and modes of dress of the native peoples of this country and of Alaska. In a series of glass
cases there are shown life-size models of these natives, each dressed in the manner peculiar to the tribe he represents.
It is a fact seldom appreciated that an Indian woman n carrying a child has the child strapped to her back looking in the opposite direction, while with the Esquimaux woman the child is so placed that it can readily look over the woman's shoulder. Rows of other cases contain large displays of the handiwork of In the galle
In the gallery is the Alaskan exhibit, where are shown samples of minerals, wares, and household uten sils manufactured by the natives. Samples of grain are a revelation as to the richness of the soil in parts of this far-away corner of the United States. The most attractive features of the exhibit are the distinctively Alaskan wares, which reveal an unexpected skill among these people. Their carving in ivory, horn and wood is shown by many samples, and there genuity.
An attractive feature of the exhibit in the Leather and Shoe Trades building is a collection of footwear from all parts of the world, representing every conceivable type, some of them going back as far as the middle ages. Among the exhibits are specimens from China, Uruguay, Siberia, the Philippine Islands, Fin land, the Caucasus, Australia, Sweden, Russia, Asia, Africa, South America, Mexico, Palestine, Jerusalem Norway, Curacao, Japan and other countries.
Leather of nearly every conceivable kind and of all colors is shown in abundance. Among the more noticeable hides shown are a horse hide with the mane and tail intact, walrus hides which are from an inch and a half to two inches thick and an African elephant hide which weighs 800 pounds.
It is a misfortune there are exhibits in any of the galleries of the Exposition buildings. So much walking is necessary in order to inspect the various buildings that visitors hesitate about climbing stairs, and seem to be more willing to risk losing a chance to see
attractive exhibits than to climb the stairs. It is late now to install passenger elevators to supplement the stair service, and it only remains to advise people to by all means see what the gallery in each building contains. Some of the rarest and most remarkabl exhibits are located in the various galleries.
Informal gatherings are held in the rooms of the Associated Engineering Societies, No. 10 Van Buren Street, every Monday evening from 8 to 10 P. M. Visiting engineers and their friends are cordially invited.

How to see the exposition in a week.
The great majority of people who will visit the World's Columbian Exposition at Chicago will probably not have over a week at their disposal for sightseeing. With so little time as this it is an embarrassing question to decide how to best utilize it. There are probably one hundred buildings in the Exposition grounds and in the Midway Plaisance that every person attending the Exposition would find greater or less enjoyment in visiting. Besides this, there is a great deal of interest in studying the grounds, especially the landscape gardening. Besides these two things, which can easily absorb hours and days of time, there is
another matter that should be borne in mind at all times, and that is the immensity of everything. Every visitor at the Exposition must consider these things, so as to save strength as well as time. A knowledge of the general plan of the grounds is necessary to accomplish this. Thus, suppose a man from Iowa should reach the Exposition grounds in the morning, determined to go to his State building and register and to then visit the Dairy. After registering, he asks the guard where the Dairy building is, and is told that it is in the southeastern corner of the grounds. If he take the most direct route in an effort to walk to this building, he would have to walk nearly three miles, whereas, were he to take the Intramural road, he could go almost from the door of one building to the door of the other in twenty minutes, at an expense of ten cents, thus saving a greatdeal of time and strength, both of which are important considerations.
It would be quite impossible to lay down a general rule for all people to follow in planning how to best see everything; others would be content to see only certain specific exhibits. A mistake most liable to be made is for people to enter the first building they see after finding themselves in the grounds and to become
the situation the day has come and gone and they have seen only a part of one building.
No person visiting the Exposition can regret first of all taking a general view of the grounds. The Intramural road skirts the grounds in such a manner that a good idea can be obtained of the location of the buildings and the arrangement of the walks and promenades. The electric launches on the waterways apnades. The electric launches on the waterways ap-
proaildings, and the round trip on one of these boats is not only a delightful trip, but it also adds greatly to one's understanding of the location of the buildings. Having made the trip on the elevated road, which is raised from twelve to twenty feet above the ground, so that the view is thus much more enhanced, and also having perhaps made the round trip on an electric launch, the visitor is ready for the work of studying the exhibits.
The safest place to begin is in one of the largest buildings, such, for instance, as the Manufactures and Liberal Arts building, which consumes at least a day. It would take another day to see what there is in the Electricity building, the Mining building, the Palace of Mechanic Arts and the Transporitation building. The third day would be consumed in looking over the Agricultural building, the United States Government building, the Fisheries and other buildings. No one should fail to devote at least one day to the Gallery of Fine Arts. The remaining two days would cover a glance at some of the State buildings and foreign government buildings, to the concessions in Midway Plaisance and to a second look at exhibits which excited the most interest.
It would be a delightful study to take up as a subject the splendid exhibit made by Germany, and folow it from building to building until everything German had been seen. The same line of study would be particularly interesting in the Japanese exhibit, as also the French, English, and exhibits of other nations. But to attempt to divide the work in this way would result in the loss of at least half a day in going from one building to another.
In the gallery of the Fine Arts building Japan makes more of an exhibit than it does on the main floor. A visitor who neglects to see this Japanese art work in the gallery loses much, because the whole art exhibit of Japan is a revelation. It shows that these people possess artistic feeling, the existence of which the outside world has never fully appreciated.
The mechanically inclined visitor will find a feast for his eyes in the Transportation building, and more especially in the annex to this building, where there is a grand display of locomotives, American and foreign, old style and new style. In the gallery of this building are many smaller exhibits in the line of transportation and a particularly fine display of bicycles.
In the Mining building gallery are many displays of minerals equally as interesting as many of the displays on the ground floor. In the Electricity building here is more in the gallery that the average person will be interested in than there is on the ground floor, because exhibits in the gallery comprise mostly electrical devices rather than methods of generating elec tricity, to which the ground floor is mostly given up. The gallery in the Manufactures and Liberal Arts building is given over almost \{wholly to liberal arts, and here one finds extensive exhibits which concern the education of the young. The ground floor of this building is given over to the department of manufactures, and here is exhibited in perfection the choicest of manufactures of all the leading nations of the world. A person cannot visit one of these exhibits without feeling in touch with the people and the nation making it and becoming interested in them. Japan makes a remarkably fine display of ornamental and artistic wares. Germany, Austria, France, Russia, Denmark, Norway, Switzerland, Italy, Spain, and, in fact, all corners of the world make exhibits of manufactures and wares each peculiar to themselves. The section occupied by Great Britain contains not only the exhibits from the British kingdom, but also a large and fine exhibit from Canada, and many choice exhibits from Australia and other British colonies.
In the Agricultural building nearly every foreign nation makes an exhibit more or less pretentious. In the Palace of Mechanic Arts visitors are instinctively drawn toward the great power plant, where are engines aggregating twenty-five thousand horse power, many of the engines being in operation all the time. It is here that energy is generated to supply the electric lighting of the Exposition and to furnish in addition 5,000 or more horse power of electrical energy for power purposes. Then there is the Leather and Shoe Trade exhibit, the Forestry exhibit, the Dairy exhibit and many others not quite so large, but each interesting and instructive.
In connection with such a week's visit comes the question of expense. Seven days' admission to the grounds, at 50 cts. an admission, would amount to \$3.50. An excellent lunch can be obtained at any one of dozens of restaurants in the grounds for a like sum or for less. It is a popular thing for people to carry lunch with them, and every day at noon thousands of people
(Continued on page 26.)

## A MUSIC BOOR OR FOLIO.

The illustration represents a strong and cheap book or folio, made without the use of mucilage or glue. the covers of which are adapted to be folded back to back, and in which any desired number of sheets may be quickly and strongly fastened in place. The improvement has been patented by Mr. William H. Ayres, of Sackett's Harbor, N. Y. The covers are of board, having at their meeting ends strips of metallic binding, each strip being doubled over the edge of the board, while near opposite ends are eyes formed of wires, held in the loops of the strips. These eyes engage split rings, similar to the common key rings, and which serve as hinges for the covers; also serving as a means of attachment for the sheets of music held between the covers. The sheets are held at their ends between metallic strips, one of which has prods struck up from the body of the metal, to be passed through the sheets and through slots in an opposite strip, being then bent down upon the strip. One of the strips is adapted to hold in place a wire forming eyes adapted to engage


## AYRES' MUSIC BOOR OR FOLIO

the rings, as shown in the sectional view, Fig. 2, any number of the binding strips, holding sheets of music, being placed between the covers until the rings are full. On one of the covers, near its outer end, is a metallic strip carrying a keeper with an elastic band, which may be adjusted to fit over the end portions of the sheets and not obscure the music. The placing of music sheets in or the removing of them from this folio is readily effected.

## THE MYSTERIOUS TRUNK.

A trick known by the name of the Indian Trunk, the Mysterious Trunk, the Packer's Surprise, etc., formerly had much success in theaiers of prestidigitation. This trick, which may be presented in several ways, is consequently executed by different means, one of which we shall describe.
The following is in what the experiment consists The prestidigitator has a trunk brought to him, which he allows the spectators to examine. When every one is certain that it contains no mechanism, a person comes upon the stage and enters the trunk. It is found that he fills it entirely, and the cover is shint down. A spectator locks the trunk and guards the padlock.

The trunk is afterward wound in all directions with ope, the intersections of the latter are sealed, and the whole is introduced into a bag provided with leather straps, and which may in its turn be sealed at each of its buckles. When the operation is finished, the spectators who have aided in the packing remain on the spot to see that nothing makes its exit from the trunk, which has been placed upon two wooden horses. The prestidigitator then fires a pistol over the trunk, which, when divested of its covering, ropes, and unbroken seals, is found to be entirely empty.

By what means has a human body been able to disappear without being perceived by the spectators who were constantly looking at the trunk, and, better still, by those who were handling it an instant before, and who still surround it?
The whole credit of the trick is due to the cabinet maker who constructed the trunk. The latter, in the first place, is exactly like an ordinary trunk, and the closest examination reveals nothing out of the way about it. Yet one of the ends, instead of being nailed, is mounted upon a pivot on the two long sides, so that it can swing. The swinging motion is arrested by a spring plate bolt. When the person in the interior presses upon a point corresponding to this bolt, the pivot becomes free and the end of the trunk swings.
The following is the way that the operation is performed in order that the spectators may not perceive the opening of the trunk. The operator's assistant takes his place in the trunk, which is closed and locked and the padlock sealed. Some obliging spectators then aid in tying the trunk, around which the rope is passed twice lengthwise, beginning at the side opposite the opening part. The rope is then passed over this part and runs in the axis of the pivots. Then the trunk, for the convenience of tying, is tilted upon the end where the rope passes. It is then that the assistant inclosed in the interior presses the bolt. The end of the trunk then has a tendency to open, and as the prestidigitator has taken care to tilt the trunk at a carefully marked point of the stage floor, the movable end meets in the latter with an exactly similar trap that opens at the same time, and it is through these two traps that the invisible vanishing takes place.
As soon as the assistant has passed through the trap, he pushes up the latter, and consequently the movable end of the trunk, which closes upon its spring plate bolt.
The time that it takes the man to pass through the trap is insignificant, and while the ropes are being crossed the operation might be performed several times. Afterward, there is nothing to be done but to proceed with the experiment as we have said, care being taken, however, not to abuse the complaisance of the spectators, and not to allow them to try the weight of the trunk.

When the vanished person descends beneath the stage, he is supported by some other individual if the theater is not well appointed, and by a trap with a counterpoise if the construction of the stage admits of it. This trap permits of expediting things in certain cases of the reappearance of the confederate, but is useless in the process described above.
Such is one of the artifices employed. Whatever be the process, the presentation of it is of ten complicated by causing the person who has vanished to reappear in a second trunk that has previously been ascertained to be empty and that has been sealed and enveloped under the eyes of the spectators. It will be easily comprehended that the operation here is inverse to
that of the first, and that the confederate beneath the tage awaits the proper moment to be lifted into the interior of the second trunk, whose movable end is opened outwardly by the prestidigitator at the desired moment.
Boxes with glass sides also have been constructed. The management is the same, but, as the person inclosed is visible up to the last moment, care must be taken to so pass the ropes as not to interfere with the trap of the trunk, which then consists of one of the sides, and which operates at the moment when the trunk, bound with ropes, sealed and laid upon this side, is about to be wrapped up.
This presentation has still more effect upon the spectators than the preceding, and seems to present greater difficulties.-La Nature.
an instrument for measuring distances.
This compactly folding instrument for measuring linear distances and vertical heights is styled by the inventor a "metroscope." It has been patented by

baillie's "metroscope.",
Mr. James L. Baillie, of Shawnee, Ohio, and is also adapted for use in drawing or painting, enabling the artist to produce the principal objects in exact proportional sizes. Fig. 1 shows the manner in which the instrument is used, Fig. 2 showing it folded, and Figs. 3 and 4 illustrating the construction of the hinge. A rule of the usual kind is employed, preferably an ordinary pocket rule, to afford a base or support for the height and distance measuring devices. Besides the usual middle hinge, it has other hinges to enable the members to be folded at right angles, these hinges being made narrow, occupying only the middle portion of the members, and permitting the slide to pass by them. A slide whose back supports uprights is mounted on each end of the rule, one of the slides carrying a vertical scale having a central longitudinal slot at one side of which the marks represent hundredths, while on the other side they represent inches and tenths of inches, showing the distance when using a ten foot pole. The other slide carries a sight plate having peep holes in the vertical plane of the slot in the first upright, the operator peeping through one of the holes and through the slot to the object sighted. A slide held to move on the scale may be fixed in any desired position by a set screw.

AN IMPROVED ROLLER COTTON GIN.
This machine is designed to quickly and thoroughly strip the seed from the lint of any grade cotton without danger of tearing or pulling the fibers apart. It has been patented by Mr. Frederick L. Montgomery, of No. 390 Eleventh Avenue, New York City. The


MONTGOMERY'S ROLLER COTTON GIN.
feed drum beneath the hopper has the usual roughened surface, as may be seen in the perspective view, Fig. 1, and opposite the drum is a transverse feed table guiding the cotton down to the ginning roller, there being a second feed table, at an opposite angle, below the feed drum. The ginning roller, on the main driving shaft, is covered with leather or other elastic material, and on its periphery are held two rollers, one a knife roller to separate the seed from the lint, and the other to press the lint to the drum while the seed is being removed. The rollers are small shafts extending the entire width of the ginning roller, Fig. 2 being a central transverse sectional view, and Fig. 3 a front view of the rollers and their bearings, Fig. 4 showing the gearing by which they are driven. Each section of the bearing is pressed on at its underside by a spring, whose tension may be regulated by a set screw, to hold the rollers in proper contact with the ginning roller. Both rollers are so supported by their bearings that they will be prevented from spreading, and will be held uniformly against the surface of the ginning roller throughout their entire length, while the yieldingly mounted boxes carrying the rollers permit a heavier or lighter bunch of cotton to pass through, while preventing any seed from passing the same way. The knife roller revolves in the same direction as the ginning roller, but it is geared to revolve at a much higher rate of speed, and in front of it, directly below the lower feed table, is a discharge table, over which the seed separated from the lint is delivered to one side of the machine. The lint adhering to the covering of the ginning roller, after passing the small rollers, is removed by a stripper cylinder which acts as a brush.

## SURFACE TENSION.*

The existence of surface tension is shown by the following simple experiments : (1) Two round pencils, made of light wood, and not more than $1 / 4$ inch in dia-


Fig. 1.-EXAMPLE OF SURFACE TENSION.
meter, are placed in contact one on the other in a horizontal position. Place between the two pencils several drops of pure water, so that all of the line o contact is well moistened. In a little time, a quantity of water will adhere to both pencils, which will take a concave, curved shape, a cross section of which is shown in Fig. 1. The lower pencil, in consequence of the tension of the concave surfaces, $a$ and $b$, on opposite sides of the line of contact, will be suspended from the other pencil. The adhesion is strong enough to admit of moving the pencils about. (2) Clean a copper ring made of wire about ${ }_{3} \frac{1}{2}$ inch in diameter and having a diameter of $21 / 2$ or 3 inches. Lay the ring carefully upon the surface of very pure water, contained in a well-washed glass vessel, as shown in Fig. 2. The ring will float in spite of its specific weight. Nee dles, quicksilver globules, thin rings of platinum, etc. may also be made to float upon the water. (3) Take a sheet of light but not glossy paper, about 5 or 6 inche long and 3 inches broad, and turn down upon al four sides a margin about 1 inch broad. Then lift up these edges and form a box 1 inch high as shown in Fig. 3. Place the box upon a table, and moisten by means of a brush all the inner surface, then pour water in to a depth of $1 / 4$ inch. The tension of the surface of the fluid will cause the opposite long sides of the box to approach each other, and the little paper box will close on itself. (4) Take a cylindrical cork hav ing a diameter of $3 / 8$ inch and a length of $5 / 8 \mathrm{inch}$, and in the middle of one end of the cork insert a fine iron wire, from 2 to $21 / 2$ inches in length, provided with a hook, on which is placed a little basket to receive the ballast. Upon the other end of the cork is fastened a rame, which consists of a fine iron wire ring 3 inches in diameter, and two pieces of the same wire are inserted in the cork so as to support the ring perpendicular to the axis of the cork and concentric with it. Plunge this little instrument in water contained in a vessel of sufficient depth. If the weight in the ves sel is suitable the cork will be held in a vertical position, and only project a short distance above the surface o
the water. If the whole apparatus be pressed down vertically in the water until the ring is submerged, as shown in Fig. 4, the ring will not leave the water, being held by the surface tension of the water, but will rise a little above the water level, and the water will take


Fig. 2.-FLOATING RING.
the form of a concave meniscus. To liberate the ring so that it will rise up out of the water apparently by a free impulse, and allow the system to regain its first position of equilibrium, let fall a drop of ether upon the water. This will decrease the surface tension, when the buoyancy of the cork will lift the ring above the water. (5) Dissolve 11/4 oz. of Castile soap and $11 / 4$ oz. of crystalline sugar in a quart of water. In this plunge a square bent from small slender iron wire, and draw it out again. It will be filled with a


Fig. 3.-DISTORTION BY SURFACE TENSION
thin film of the liquid. Lay upon this film a loop of silk thread, as shown in Fig. 5. It will form an irregular outline. If the film be perforated within the silk loop, the thread will suddenly form a complete circle.

Horse Power of Windmills.
According to observations of the United States Signal Service, the average velocity of the wind within the range of its record is nine miles per hour for the


Fig. 4.-FLOATING AND SUBMERGED RINGS.
year along the North Atlantic border and Northwestern States, ten miles on the plains of the West and six miles in the Gulf States. It is a well-known fact that the pressure of the wind increases as the square of the velocity, and from observations a tenmile breeze has a pressurs of 0.492 pound per square mile breeze has a pressure of
foot of surface expoeed to its force, a fifteen-mile
breeze equals $1 \cdot 107$ pounds and a twenty-mile (brisk wind) has 1.968 pounds pressure per square foot.
The horse power of windmills of the best construction is as the proportional squares of their diameters and inversely as their velocities; for example, a ten foot mill in a sixteen-mile breeze will develop 0.15 horse power at sixty-five revolutions per minute. A twenty-foot mill with the same breeze and at forty revolutions per minute will develop one horse poryer a twenty-five-foot mill, thirty-five revolutions, one and three-fourths horse power; a thirty-foot mill, twenty-eight revolutions, three and one-half horse power ; a forty-foot mill, twenty-two revolutions, seven and one-half horse power; a fifty-foot mill, eighteen revolutions, twelve horse power.
The increase in power from increase in velocity of the wind is equal to the square of its proportional velocity, as, for example, the twenty-five-foot mill rated above for a sixteen-mile wind will with a thirty-two-mile wind have its horse power increased by $\frac{22}{16}=2$ $=4 \times 13 / 4=7$ horse power ; a forty-foot mill in a thirty-two-mile wind will run up to thirty horse power, and a fifty-foot mill to forty-eight horse power, with a small deduction for increased friction of air on the wheel and the machinery.
The modern mill of medium and large size will run and produce work in a four-mile breeze, becoming very efficient in an eight to sixteen mile breeze, and increase its power with safety to the running gear up to a gale of forty-five miles per hour.
It has been often asserted that one of the great drawbacks to the general use of windmills for other than the exclusive pumping of water is the fact that when most needed the wind is at fault. This may be ever so true, but the fact that they have been so used for centuries and are largely now in use for milling purposes does not make them of less value in the view of the storage of twenty-four hours' work of the wind


Fig. 5.-TENSION OF SOAP FILM.
for a six to ten hours' output of power at the required time.
For mechanical work that can be carried on only during the ordinary ten-hour day this becomes a serious inconvenience; but as such power is always available from five to eight hours and often twelve hours in the twenty-four, a means of storage and transmission of power at any time to the time and distance required for use should be the proper recourse for rescuing an intermitting power from this difficulty, and thus make possible a uniform power of ten hours for an intermitting power of twenty-four hours.-Iron Age.

## Cement for Rubber and Leather.

No. 1.
Carbon bisulphide
No. 1. ..................... 4 ounces.
India rubber in fine shreds. ounces.
ounce.
Isinglass ...
Put a thin coating of the solution on the parts, allow to dry, heat to melting, place the partsin close contact, and hammer out all air bubbles.

No. 2.


Mix together and melt by a gentle heat.
Cleanliness the First Law of Health.
The following words of the late Dr. $\cdot$ Richardson should be ever kept in mind: "Cleanliness covers the whole field of sanitary labor. Cleanliness, that is purity of air; cleanliness, that is purity of water; cleanliness in and around the house; cleanliness of persons; cleanliness of dress; cleanliness of food and feeding; cleanliness in work; cleanliness in habits of the individual man and woman ; clearaliness of life and conversation; purity of life, temperance, all these are in man's power."

OIL FUEL AND BOILERS AT THE GREAT EXPOSITION. (Continued from first page.)
These boilers, with the exception of one Camp bell \& Zell and the three Climax, are arranged in batteries of two. Each pair of boilers feeds steam into one common pipe which delivers into the 36 inch steam headers under the gallery floor. Of these headers there are seven; five in the main boiler plant and two in the annex, the longest being 150 feet in length. The headers are connected by pipes ten inches in diameter, except that between the main boiler plant and the annex, which is twelve inches in diameter. These connecting pipes are arranged with elbows and nipples to allow for expansion. The expansion in so large a system is considerable. If the header had been made in a single piece, the expansion in the 800 feet in length would have been about twenty inches. Such an amount would have been utterly unmanageable. By means of the connecting pipes the same effect is produced as though there were but a single header. The main headers are securely fastened in the center to large masonry foundations. They are further supported every few feet by rollers placed on oundations of masonry. These rollers permit the headers to expand freely in each direction.
A four-inch drain pipe runs the whole length of the boiler plant and discharges into a large tank outside. The headers are connected with three two-inch drain pipes, so that in case of emergency, if a battery of boilers should get to foaming, for instance, they can be quickly emptied. The water of condensation is carried back into the boilers by Westinghouse loops. The Westinghouse loop is simply a pipe carried from the bottom of the header up some distance above the top of the boiler, thence across to the rear of the boiler house, down below the water line, and then into the boiler through an ordinary check valve. The height of the vertical pipe is so calculated that the weight of the column of water in it added to the wessure in the header, which, of course, is somewhat less than the boiler pressure, shall be sufficient to overcome the excess of pressure in the boiler, and so carry the water of condensation and entrained water through the check valve and into the boiler. Water glasses are placed on the headers, so that if water should accumulate by any chance, it can be readily discovered.

The boilers are fed by pumps and injectors of various makes, all being listed as exhibits. The Abendroth \& Root boilers are fed by means of six Watson injectors and two Deane pumps, $71 / 2 \times 41 / 2 \times 10$ inches. The Gill boilers are fed by two Korting injectors and two Barr pumps, one $10 \times 6 \times 12$ inches, the other 10x6x10. The pumps supplying these boilers are regulated by a Thomas automatic feed water regulator, which keeps the water at a constant level Heine boilers are supplied by eight Penberthy injectors, two Knowles pumps, 10x5x12, and two Blake pumps, $8 \times 5 \times 12$. Four Hayden \& Derby injectors and two Davidson compound pumps 12 and $20 \times 101 / 2 \times 20$ are required to supply the National boilers. The Zell boilers are supplied by six Nathan injectors, one Cameron pump, one Laidlaw \& Dunn $71 / 2 \times 41 / 2^{x 10}$, one Wilson Snyder $14 \times 8 \times 18$, one Canton, one Worthington and one Boyts Porter pump. The Babcock \& Wilcox boilers are supplied by Hancock inspirators and three by Snow pumps. One is compound 8 and $12 \times 7 \times 12$, the others are $10 \times 5 \times 10$ and $8 \times 5 \times 10$, respectively. Two Buffalo pumps $10 \times 6 \times 10$ and $71 / 2 \times 5 \times 8$ and one Gould pump run by an Ideal engine and Schaefer \& Budenberg injectors are used to feed the Stirling exhibit. In the annex two Marsh pumps supply the Heine boilers. The Climax boilers are fed by one Blakeslee and one Smedley, and the Stirling boilers are supplied by one Hall and one McGowan pump. Thus intending purchasers or any one interested in power plants may see most of the leading injectors, inspirators and pumps in practical operation and judge of their relative merits for himself.
On every make of boilers is a feed header into which the pumps of those boilers deliver. From this header separate pipes are run into each boiler.
Oil is the fuel used. The oil is atomized by a steam jet as it is discharged from the burner into the furnace. The various makes of oil burners are shown in operation. Any one interested in comparing the various makes will find twelve Reid burners under the Abendroth \& Root boilers, sixteen under the National, and forty-six under the Campbell \& Zell; thirty Larkin burners under the Babcock \& Wilcox and twenty-eight under the Climax; sixteen Arms burners under the Gill boilers. The Heine boilers use seventeen Graves, sixteen Burton, eight Wright, and twelve Reid burners; the Stirlings use eight Burton and eight locomotive burners. The oil is fed from an oil vault half a mile from the boiler house. Two mains run from this vault into a five-inch header which runs the entire length of the boiler house. This header is tapped frequently, and every make of boilers is supplied through a separate pipe. The pressure, as allowed by the underwriters, is six pounds. Running along the tops of the boilers from one end of the boiler house to the other
a two and one-half inch steam pipe, with valves be ween each make of boilers. A two-inch steam pip eeds into this from each boiler. From this two and one-half inch pipe, steam is carried into the oil burners for atomizing the oil. As steam is necessary to burn the oil, the pipe obviates the necessity of using wood to start up any battery of boilers after it has been llowed to cool down, so long as any other battery ha team up. The Gill and the Campbell \& Zell boilers have independent steam connections with the burner n addition.
The safety valves, which are the ordinary pop valves, are set at 125 pounds.
The entire room is in charge of George Ross Green, who is known as the superintendent of the boiler house. His rank is that of second assistant engineer Each exhibitor furnishes firemen and water tenders to care for its boilers. They work in watches of eight hours each, one or two men being required, according to the number of boilers in the exhibit. In addition the Exposition furnishes a gang of thirty men under three foremen, who look after cleaning, oil, and oiling epairs, alterations, and so on. One man's duties consist in watching for smoke and promptly reporting any offense in this particular. He sits in a little house back of the boiler room, where he has a clear view of back of the boiler room, where he has a clear view of
all the chimneys. Electric communication with every furnace is provided, so that as soon as a chimney be gins to smoke the fireman is warned by a bell to look after the matter. Another man looks after the valves, of which there are 108 on the headers alone, and a grand total of 1,200 in round numbers in the boiler house.
Mr. Green has devised an ingenious yet simple cheme for keeping a record of the condition of the boilers and engine. On the north wall of the boiler house, near the east end of the gallery, hang two huge blue prints. On one is a diagram of the boiler house and machinery hall showing the location of every boiler and engine, each being numbered. The key to these numbers is given on the bottom of the blue print. A brass peg is screwed into each spot occupied by a boiler or engine. At one corner are stacks of red, white, and black tags about half an inch wide and two inches long. A white tag hung on a peg indicates that that particular engine or boiler is working; a red tag shows that the boiler or engine is hot and ready to be put in operation at a moment's notice ; black shows that the engine or boiler is not in use for some reason. Whenever an engine or boiler is started or stopped, the foreman on duty goes to the diagram and hangs a suitably colored tag on the peg which stands for that engine or boiler. Thus the record is constantly kept up to date. On the second blue print is a diagram of the headers and header valves with similar pegs and tags. Whenever a request is made for steam for an engine the foreman in charge sends the valve man to open the valve and hangs a white tag on the proper peg to show that it is open. In changing watches the foreman coming on duty can see at a glance just how things stand. This saves a vast amount of labor in making out lengthy reports at the end of each watch.
An elaborate record is kept in the boiler room show ing when each boiler is started up, when shut down when valves are opened and when closed, the steam pressure, furnaces that smoke, repairs made, and so on.
Failure of the East $\underset{\substack{\text { End } \\ \text { Dam. }}}{\text { of the Great Austin }}$
A serious break has occurred in the great dam at Austin, Texas, which was recently completed. The massive masonry inclosing the penstocks gradually went down at the east end, making a great crack in the wall where it leaves the top of the dam. The granite wall inclosing the wheel pits was swept away. Several of the pits were utterly destroyed, and the machinery in them tossed about and carried off by the force of the roaring torrent sweeping through the cavern under the penstock level. Water is working its way through nearly all the masonry surrounding the penstocks, and it will be a total loss. Some of the large penstocks and machinery have been injured, and a conservative estimate places the loss to the city at $\$ 200,000$. It appears now that the plans of Engineer Frizell, who had charge of the work from its inception, but who was relieved before its completion, were not carried out, and the masonry failed to be extended into the east bank some
fifty feet to a point designated by him.-N. O. Timesfifty feet to a point designated by him.-N.O. Times Democrat.

## The Campania.

The average speed of the new Cunard steamer Campania on her last trip from Liverpool to New York was as follows:


## ©arrespondence.

## Remedy for Ivy Poison.

To the Editor of the Scientific American:
In your issue of June 17 some one signing himself H . M. suggests a cure for Rhus tox. or poison ivy. He describes its effects, as myself and others can testify, who have been so unfortunate as to come in contact with it. He prescribes pills and promises relief after taking a few doses, or after a few days. Bean leaves bruised and applied will afford instant relief and arrest any further progress of the affliction. I have found a decoction of dried bean leaves quite as satisfactory; so that the prudent may always have the remedy, summer or winter.
Plymouth, Ind., June 22, 1893.

## Bright Gold Patented in France.

To the Editor of the Scientific American:
The facility with which a patent can be obtained in France has often been commented upon. A most striking example of recent occurrence has just come under my notice. The long known liquid bright gold has just been patented in France to a Mr. Pertsch, whose process consists in the treatment of balsam of sulphur with the chloride of a precious metal, thus obtaining a resinous compound of the precious metal uitable for china gilding, etc.
The very same process was used as far back as 1830 by the chemist Kuehne, at Meissen, Saxony. It is described in Dingler's Polytechnisches Journal, of 1861, and a French patent was issued for it, in 1851, to Dutertre Brothers, of Paris (vide Bulletin de la Societe d'Encouragement, March, 1861). Nevertheless, a new French patent has just been granted for the same process to another party. Your own "Scientific American Cyclopedia of Receipts "gives, on page 231, under "Gold Luster for China Painting," the principles of this "new" patented process.
P. M.
[In France patents are granted to every applicant whose papers are in proper form, without official examinations as to the novelty of the invention, and the patent holds good if the invention is new, but not therwise. Applicants make their own examinations. -Ed. S. A.]

## Electroplating Ships, Bottoms.

To the Editor of the Scientific American:
In an article on "The Maintenance of the Speed of War Ships," in June 3 Scientific American, you conclude: "But invention has not yet reached the point of adequately protecting a ship's bottom from barnacles and seaweed."
What is the matter with electroplating them with copper? The first expense, of course, would be great; but the actual cost of plating a large ship after the first expense for solutions, dynamos, and a suitable drydock would not be excessive.
At first glance there are other objections that appear. The difficulty of keeping a large surface of iron clean until the first coat of copper could be deposited is one. This can be overcome by a plan I used to keep the surfaces of the iron columns for the Philadelphia Public Buildings clean. They had each a surface of about 300 square feet, but after being pickled and freed from rust and scale, there was no trouble in keeping the exposed iron surface clean and free from oxide until such time as they could be got into the plating tank, and as they weighed about six tons, this took some time.
Another objection is that copper deposited from a solution of sulphate of copper always contains pin holes, which, of course, would admit the sea water and set up galvanic action between the copper and the iron of the hull. Also that the surface of the deposited copper would be rough, and thus interfere with the sailing qualities of the ship. These objections I have overcome by the use of a new plating solution that de posits copper in a much finer and more dense state than that deposited from the ordinary sulphate solution. Copper deposited from this new'solution is entirely free from pin holes, and the surface, no matter how thick the coat, is perfectly smooth. It also ad heres much better than ordinary plating, which is of great advantage, as there will be less danger of its be ing torn off by the accidental grounding of the ship in a sand bar.
In fact, there would be little danger of the copper being torn off anyway, as copper, when properly deposited on a clean iron surface, adheres very firmly, and nothing short of striking a rock or other equally hard obstruction would injure it. J. D. Darling.
Philadelphia, Pa.

## A Submarine War Boat

The board of ordnance experts who have been considering the proposals and plans for the submarine boat, find only two of the plans suitable. It is thought one of these will be accepted by the Navy Department. All the bids came well within the appropriation of $\$ 200,000$, and it is believed that one of the offers of $\$ 135,000$ will be accepted and the boat built.

## PARSONS' HOROLOGICAL INSTITUTE.

It is comparatively a short time since the manufacture of watches began to be carried on extensively in the United States, although the "'Yankec", clock has been well known the world over for many years. While timepieces of foreign make were mainly sold and used, the watch repairer needed peculiar fitness for his work, which could be acquired only by 10 ng apprenticeship and familiarity with the various types of timepieces. When American watches became popular, watch making as a trade began to decline. Materials of every description became plentiful, easily obtained and readily used, and any difficult job was naturally turned over to the manufacturer. Still these conditions, as regards American watches, afforded no reason why watchmakers should degenerate. On the contrary, every improvement and modification of timepieces and every additional form of movement calls for higher skill in handling these delicate machines.
Recognizing these facts, Mr. J. R. Parsons, of La Porte, Ind., started the La Porte school for watchmakers, the development of which was so rapid as to render it difficult for the founder to keep pace with the requirements. After the success of the school had been assured, several offers of considerable sums of money were made to remove the school to other places. At this time Mrs. Lydia Bradley, of Peoria, Ill., offered to provide a fine building, with all the tools and appliances necessary, for the use of any number of deserving young men and women who wished to learn a trade; and through her agents, Mr. W. W. Hammond and Mr. F. F. Ide, arrangements were made for the purchase of a large watch factory building in Peoria, Ill., with all its tools and machinery. The school was removed to these new quarters and started afresh, with the building and apparatus paid for and plenty of money to insure the success of the enterprise. The school was not only fortunate in being placed in such ample quarters, with sound financial backing, but also in securing the services of Mr. F. F. Ide, whose mechanical knowledge and skill have proved a valuable acquisition.
The object of the institute is not to make money, but to turn out competent watchmakers and jewelers. The tuition is only sufficient to make the institute self-supporting. We understand the attendance is very large, nearly equal to that of all the other schools of the kind combined. The institute gives the student a thorough education in horology, including instructions in making watches, chronometers, clocks and horological machinery in general and repairing the same. It gives a course in optics, and in this department graduates receive a separate diploma. Ladies are admitted to the institute on the same terms as gentlemen, and the list of students includes the names of a number of ladies who are taking the course, as well as some who have already graduated.
To acquire a thorough knowledge of watch making requires a certain amount of time, which cannot be shortened without detriment to the student. Long experience has shown that the length of the course in

Parsons' Horological Institute is sufficient for impart ing a thorough practical knowledge of the subject, and it has also shown that a shorter term is not advisable.
One of our engravings gives a clear idea of the buildings of the institute, while another shows a room devoted to practical watch making.

MAKING wrought iron pipe direct from bars is the process recently started in a rolling-mill at Stubenville, $O$. If it works it means a complete change in pipe manufacture.


PRACTICAL WATCH MAKING.
Mr. C. H. Gill, giving the natural history of a parasite on diatoms. Diatoms are prettily shaped, prettily marked, single-celled plants, with a silicious or glassy skin. In this instance the host plant is only the threehundredth part of an inch in length, but, minute though it be, it has a parasite all to itself, of course infinitely smaller, and Mr. Gill has carefully worked out its life history in his paper, which is illustrated by nine photographs, showing the different stages of the parasite's development.
At the last meeting of the Royal Society. Professor

Dewar stated he had succeeded in freezing the atmo sphere into a clear, transparent solid, although at present it has not been sufficiently proved whether the sent it has not been sumficiently proved whether the
mass was a jelly of solid nitrogen containing liquid oxygen or a true ice of liquid air into which both these well known gases have been equally solidified.
Professor Crookshank recently gave a lecture on "Bacteria" (the microscopical funguses we have hitherto regarded as only baleful, but which are actually among mankind's best friends). One great group produces fermentation, so that without them we should have neither wine nor beej. Another'division is the cause of organic decomposition, among which must be reckoned the nitrifying bacteria of the soils. If it were not for the latter group every animal that died would be as indestructible as an Egyptian mummy, inasmuch as the art of "mummifying" consisted in keeping away the decomposing bacteria. If it were not for the latter the surface of the earth would $b \geqq$ piled with dead bodies, stacked in heaps or choking the rivers; not only that, but in time all the elements capable of building up living bodies would be used up-locked up in these corpses-and life would cease for lack of material to support it. The greatest enemies to this class of bacteria are the undertakers !
Jupiter is thirteen hundred times larger than the earih, so we take a greau deal of interest in it, and its to account being very much less for running expenses.
The third dynamo, giving fifteen to nineteen kilowatts, is used for generating current for supplying the grubbing apparatus at the top of the Polhill, some two miles distant. It requires about twenty-five horse power to drive it at its maximum, although not more than one-third of this is usually required. The current is taken by overhead wires on telegraph poles to the motor on the grubber carriage. Ai the top of the hill several acres have been already grubbed. The ground is being cleared for the purpose of constructing one of a series of large forts for the protection of London. The motor drives, by gearing, a capstan upon which is coiled a few turns of a very strong steel wire rope. A careful study of recent years has thrown a great deal of heary chain is attached to the tree roots, and as the light upon the history and manufacture of worlds. motor is set to work and the rope exerts its force, the One of the keenest astronomers, who was taking special roots come up quietly one after the other. The instal- charge of this huge globe, is Professor Pickering, the lation is an interesting example of the application of distinguished American scientist. In order to study electric power to country work.-Elec. Eng., London.

Items fróm '6Science Gossip."
In the last number of the Journal of the Royal that the surface of Jupiter seems to consist of a uni Microsconical Society there is an elaborate paper by form white mass of cloud, over which is stretched gauzy and thin veil of brown material The well-known belts of Jupiter, he says, are simply dense masses of this thin brown material, and the white spots merely holes seen through it. The most remarkable thing about Professor Pickering's observations concerns the moons or satellites of the planet. He has arrived at the conclusion that Jupiter's four moons are not solid, like ours, but merely condensed masses of meteorites, like those which compose the belts of Saturn.

## New York and Boston now only Five Hours Apart.

For several years past the railway companies have regularly set apart a large share of their earnings in the straightening of their lines, strengthening of bridges, improvement of roadbeds, engines, signals, and other equipments. The good fruits of these efforts are seen in the better accommodations for the public, greater regularity of trains, and increased speed. A recent example is that of the New York, New Haven \&. Hartford Railway, which has reduced the time between New York and Boston to the extent of an hour or more. The fast express, ver the Shore line, now makes the journey in five hours. One may now take breakfast at home in Now York, dine and do business in Bo
the metropolis by early bed time.

|  | Pomade for Bandruff. |
| :---: | :---: |
| Salicylic acid. | .... 30 grains. |
| Powdered borax | ..... 15 grains. |
| Peru balsam. | ... 24 minims. |
| Oil of anise. | ... 5 minims. |
| Oil of bergamot | .. 15 mixim |
| Vaseline. | 3 ounces. |

The Rule or Contrariety in Inventions.
There is apt to be a fine irreverence about the inventor which leads him to suspect that any old way of doing a thing is for that very reason not the best way. Often he observes some timehonored plan of working, audaciously makes up his mind to do the exact opposite, and hits upon success. Guns were loaded at the muzzle for ages, until one day a man of originality thought of loading them at the other end, the preferable end on many accounts besides that of manifest convenience. The same path was trodden by the Frenchman who first put the eye of a needle near its point instead of away from its point. He little knew that he was doing a great deal to make the sewing machine a possibility. One of the notions of the pioneer railway engineers in England was that their rails must be flanged so that the wheels of locomotives and carriages should not get off the track. But some one of skeptical mind inquired: Why not leave the top of the rail flat, or nearly flat, and put the flange on the wheel, an easier thing to do ? Accordingly the flange was taken from the rail to the wheel and remains there to this day, to remind the traveler that an Eastern philosopher said long ago "To him that is well shod it is as if the whole eart were covered with leather."
It is a good many years now since steam was first used for heating buildings, and as air when warmed ascends, what more natural than that steam coils should hug the floors just as the stoves before them had done? But in some of the largest factories in this country the coils are fastened, not to the floor, but to the ceiling, which proves to be a better place for them. As everybody knows who ever sat before an open fire, radiation is a pleasanter means of warmth than convection, than heat carried along by currents of air; floor space is incident ally saved, and the risk of gathering combustible rub bish about the coils is avoided. In the ages of simplicity which came down to Watt's time and the invention of the steam engine, when a kettle was to be heated the proper place for the fire was thought to be outside. But when big boilers came in, with pressing need that their contents be heated in the shortest time possible, it was found gainful to put the fire inside. Ste phenson's locomotive, the Rocket, derived no small part of its efficiency from his knowledge to which side of the boiler to apply flame.
On somewhat the same principle Lord Dundonald, one of the early improvers of the steam engine, forced the hot-air currents under his boiler from above downward against their natural tendency to move from below upward. In this way he made available much heat that otherwise would have bee wasted. The steam engine, whether mounted on wheels or not, always keeps its fuel outside; furnace and cylinder are distinct. To-day the steam engine's primacy is challenged by a motor which uses its fuel inside, the furnace being no other than the cylinder, precisely as in the barrel of a gun. So much more work does a gas engine yield than a steam engine, in comparison with the heat applied, that only the dearness of heat as supplied by gas prevents the speedy sup rsedure of steam for motive power. As gas engines grow steadily larger, their margin of economy becomes so decided that it begins to pay to make gas on purpose to burn in them,
In the reduction of bauxite, the refractory ore of aluminum, it is necessary to maintain an extreme temperature. The melting point of the mineral is high, and only so much of the heat as ranges above that temperature does work. In the Mining Department of the World's Fair is an exhibit showing how the modern metallurgist reduces aluminum with new economy. Instead of employing the old crucible method, and applying the fire from without, he in closes the ore in a non-conducting bed, and by means of a powerful electric current applies the heat from within. Electric furnaces of this type now produce bronze and other alloys at prices which steadily fall as their market enlarges

Not far from the mining exhibit at Chicago stands Machinery Hall. When its visitors see one of the argest steam engines driving machinery with a slack belt, they are wont to express surprise. Ordinary folks to-day think just what machinists thought a few years ago: that tightness is the effective and, indeed, the only feasible condition for belts. But in this case, as in a good manyiothers, the rule of contraries has come, and with profit
Architects, as well as engineers and metallurgists, have found it profitable to go into opposition where some ancient practices have been concerned. In latitudes of much fall of rain or snow, the form of roof which most obviously suggests itself is the common pitched roof, resembling an A, more or less broad ened. Vexed by bursting rain conductors, by im promptu object lessons as to the force of avalanches, Northern architects take not A, but V, duly widened for their roof type. In winter, ice and snow, caught as in a basin, cannot fall to the street. Icicles ar banished, and in conductors carried through the heart of the building, and kept warm by the building, ice i gradually melted without a chance to do damage. $-N$. Y. Sun.

A Gigantic Irrigation Project.
Hardly has the South Gila Canal Company com-
to irrigate the $3,500,000$ acres of land lying to the east and south of Yuma, which extends into the Mexican State of Sonora, and will also furnish water for 100,000 acres of the Sonora Land Company, lying between the dam and Colorado River, in the valley of the Gila. It is estimated that the dam alone will cost $\$ 5,000,000$, and that it will take two years to complete it.
ofl engines at the great exposition.
The engravings herewith represent an English threeylinder 20 -horse power "Trusty" oil engine, exhibited, the Engineer says, in the Chicago Exhibition. The three cylinders are connected to a three-throw crank shaft, with cranks set at 120 deg., so that the work of the three cylinders is well distributed throughout the period of each revolution. The valve gear is worked from one cam shaft, driven by silent worm gearing. The engine is fitted and controlled with one governor of the rotative type, but either of the cylinders may be cut out at will, the valve gear for each being worked by separate cams. With the exception of the changes in form necessary to the vertical construction, the engine is composed of working parts which operate in the same way as those of the horizontal engine which was described in our impression of the 4th December, was
1891.

Fig. 1 shows the front of the engine, and Fig. 2 shows the arrangement of the valve gear arms centered upon a fixed shaft and operated by cams, one of each set of which is controlled as to position by the governor, as in the horizontal engine. Fig. 3 shows the end of the engine and thereby the valve levers and the double pump for supplying air to the ignition tube lamps, and for circulating water round the jackets. The engine is supported on strong bed-plate of good form, carrying the cylinders on eight turned columns fixed by tight fit in holes on the sides of each bearing, and fastened by nuts which are accessible. The crank is car ried in four large bearings and fitted with two fly wheels. The engine is of good design, and works with ordinary petroleum lamp oils or with the heavier Brox bourne oil. It is made by Messrs. Weyman \& Hitch cock, Limited, Guildford, and is exhibited in the Chicago Exhibition by Messrs. Baker \& Co.

## Enormons Enterprises. <br> The advancing years seem

 to produce an increase rather than a diminution in the number of gigantic schemes We have all heard of th scheme for expending $\$ 40,000$, 000 in the construction of a monster dam in the vicinity of Newfoundland that would turn the Gulf Stream back on itself and give New England a tropical climate, so that the Granite State boys could climb palm trees to shake ofmenced the great work of damming the Gila River and building a canal 125 miles in length, through one of the best portions of Arizona, and before the Sonora Canal Company has completed the survey for its canal in California, when another project of the utmost importance to Yuma and the great area of arable land ying to the south and east of Yuma, in Arizona and the Mexican State of Sonora, is inaugurated. The plan is to dam the Gila River at the gorge, twelve miles east of Yuma, and create a reservoir thirty miles in length and eight miles in width. The dam, which will be of solid masonry, is to be 4,500 feet in length and 110 feet high. It will extend from the mountains on one side of the Gila to the opposite bank on a reef of bed rock, where three small islands rise out of the bed of the stream. These islands will form abutments to the dam, which will be built with such a slope as will carry the water away from the dam without cutting or wearing away the rock at its base. The flume, or canal, which will conduct the water away from this reservoir to the lands to be irrigated, will not be over mile in length.
Fronn the end of the flume to the south and west, canals will be constructed over the mesa and valley lands in different directions when the lands, which all belong to the United States government, are settled. The reservoir, it is estimated, will hold water enough
e succulent cocoanut on their own bleak hillsides, while the Rhode Islanders would offer scant encourage ment to the peripatetic Italian banana vender, as each and all of them would have a banana tree in close proximity to his own back porch.
A more recent scheme is the bridging of the English Channel between Dover and Calais. It is said that this scheme has gone so far that a company has been formed to secure the necessary concessions from the British and French governments. The cost of this bridge is something like $\$ 240,000,000$.
The latest scheme is one for roofing London and other large cities, and thus doing away with the umbrella trust. The projector has not yet considered any such vulgar and insignificant detail as the matter of cost, and hence has not enlightened the public on this point.
Such schemes are, adds the American Artisan, of course, largely visionary; but they indicate a tendency to grapple with the most stúpendous undertakings that is in a manner characteristic of the nervous and progressive age in which we live.
a Frenchman declares that vegetation can be aided by electricity. Potatoes planted in the path, of the electric current grew enormously, and electrifled toma-

Unsolved Problems that Edison is Studying.* Thomas A. Edison, when he was congratulated upon his forty-sixth birthday, declared that he did not measure his life by years, but by achievements or by campaigns; and he then confessed that he had planned ahead many campaigns, and that he looks forward to no period of rest, believing that for him, at least, the happiest life is a life of work. In speaking of his campaigns, Mr. Edison said :
"I do not regard myself as a pure scientist, as so many persons have insisted that $I$ am. I do not search for the laws of nature, and have made no great discoveries of such laws. I do not study science as Newton and Kepler and Faraday and Henry studied it, simply for the purpose of learning truth. I am only a profes sional inventor. My studies and experiments have been conducted entirely with the object of inventing that which will have commercial utility. I suppose I might be called a scientific inventor, as distinguished from a mechanical inventor, although really there is no distinction."
When Mr. Edison was asked about his campaigns and those achievements by which he measured his life, he said that in the past there had been first the stockticker and the telephone, upon the latter of which he worked very hard. But he regarded the greatest of his achievements, in the early part of his career, as the invention of the phonograph. "That," said he, "was an invention pure and simple. No suggestion of it, so far as I know, had ever been made; and it was a discovery made by accident, while experimenting upon another invention, that led to the development of the phonograph.
" My second campaign was that which resulted in the invention of the incandescent lamp. Of course an incandescent lamp had been suggested before. There had been abortive attempts to make them, even before 1 knew anything about telegraphing. The work which I did was to make an incandescent lamp which was commercially valuable, and the courts have recently sustained my claim to priority of invention of this lamp. I worked about three years upon that. Some of the experiments were very delicate and vers difficult. Some of them needed help which was very costly. That so far has been, I suppose, my chief achievement. It certainly was the first one which made me independent, and left me free to begin other campaigns without the necessity of calling for outside capital, or of finding my invention subjected to the mysteries of Wall Street manipulation."
The hint contained in Mr. Edison's reference to Wall Street, and the mysteries of financiering which prevail there, led naturally enough to a question as to Mr . Edison's future purpose with regard to capitalists, and he said :
"In my future campaigns I expect myself to control absolutely such inventions as I make. I am now fortunate enough to have capital of my own, and that I shall use in these campaigns. The most important of the campaigns $I$ have in mind is one in which I have now been engaged for several years. I have long been satisfied that it was possible to invent an ore concentrator which would vastly simplify the prevailing meth ods of extracting iron from earth and rock, and which would do it so much cheaper than those processes as to command the market. Of course I refer to magnetic iron ore. Some of the New Jersey mountains contain practically inexhaustible stores of this magnetic ore, but it has been expensive to mine. I was able to secure mining options upon nearly all these properties, and then I began the campaign of developing an ore concentrator which would make these de posits profitably available. This iron is unlike any other iron ore. It takes four tons of the ore to produce one ton of pure iron, and yet I saw, some years ago, that if some method of extracting this ore could be devised, and the mines controlled, an enorm ously profitable business would be developed, and yet a cheaper iron ore-cheaper in its first cost-would be put upon the market. I worked very hard upon this problem, MBy E. J. Edwa
Magazine, June, 1888.
and in one sense successfully, for I have been able, by my methods, to extract this magnetic ore at comparatively small cost, and deliver from my mills pure ron brick lets. Yet I have not been satisfied with the methods and some months ago I decided to abandon the old methods, and to undertake to do this work by an entirely new system. I had some ten important details to master before I could get a perfect machine, and I have already mastered eight of them. Only two re


Fig. 3.-END view.
main to be solved; and when this work is complete, I shall have, I think, a plant and mining privileges which will outrank the incandescent lamp as a commercial venture, certainly so far as I am myself concerned. Whatever the profits are, I shall myself control them, as I have taken no capitalist in with me in thi scheme."
Mr. Edison was asked if he was willing to be more explicit respecting this invention, but he declined to be, urther than to say : "When the machinery is done as I expect to develop it, it will be capable of handling twenty thousand tons of ore a day with two shifts of
working twenty hours a day in the aggregate, will be able to take this ore, crush it, reduce the iron to ce-ment-like proportions, extract it from the rock and earth, and make it into bricklets of pure iron, and do it so cheaply that it will command the market for mag netic iron."
Mr. Edison, in speaking of this campaign, referred to it as though it was practically finished; and it was evident in the conversation that already his mind turns to a new campaign, which he will take up as soon as his iron-ore concentrator is complete and its work can be left to competent subordinates.
He was asked if he would be willing to say what he had in his mind for the next campaign, and he replied : Well, I think as soon as the ore-concentrating busi ness is developed and can take care of itself, I shall turn my attention to one of the greatest problems that I have ever thought of solving, and that is, the direct control of the energy which is stored up in coal, so that it may be employed without waste and at a very smal margin of cost. Ninety per cent of the energy that exists in coal is now lost in converting it into power. lt goes off in heat through the chimneys of boiler rooms. . You perceive it when you step into a room where there is a furnace and boiler. It is also greatly wasted in the development of the latent heat which is created by the change from water to steam. Now that is an awful waste, and even a child can see that if this wastage can be saved, it will result in vastly cheapen ing the cost of everything which is manufactured by electric or steam power. In fact, it will vastly cheapen the cost of all the necessaries and luxuries of life, and I suppose the results would be of mightier influence upon civilization than the development of the steam engine and electricity have been. It will, in fact, do away with steam engines and boilers, and make the use of steam power as much of a tradition as the stage coach now is.
"lt would enable an ocean steamship of twenty thousand horse power to cross the ocean faster than any of the crack vessels now do, and require the burning of only two hundred and fifty tons of coal instead of three thousand, which are now required, so that, of course, the charges for freight and passenger fares would be greatly reduced. It would enormously lessen the cost of manufacturing and of traffic. It would de velop the electric current directly from coal, so that the cost of steam engines and boilers would be eliminated. I have thought of this problem very much, and I have already my theory of the experinents, or ome of them, which may be necessary to develop this direct use of all the power that is stored in coal. I can only say now, that the coal would be put into a re ceptacle, the agencies then applied which would de velop its energy and save it all, and through this energy electric power of any degree desired could be fur


THE WORLD'S COLUMBIAN EXPOSITION-TWENTY HORSE POWER OIL ENGINE. Fig. 2.-Valve gear view.
nished. Yes, it can be done I am sure of that. Some of the details I have already mastered, I think; at least, I am sure that I know the way to go to work to master them. I believe that I shall make this my next campaign. It may be years before it is finished, and it may not be : very long time."
Mr. Edison looks farther ahead than this campaign, for he said: "I think it quite likely that I may try to de velop a plan for marine sig naling. I have the idea al ready pretty well formulated in my mind. I should use the well known principle that water is a more perfect medium for carrying vibrations than air, and should develop instruments which may be carried upon sea-going vessels, by which they can transmit or receive, through an international code of signals, reports within a radius of say ten miles.
Mr. Edison believes that Chicago is to become the London of America early in the next century, while New York will be its Liverpool and he is of opinion that very likely a ship canal may connect Chicago with tide water so that it will itself become a great seaport.

Paris has 87,655 trees in its streets, and each tree represents a cost to the city of $£ 7$. This makes, in round numbers, $£ 600,000$ worth of trees in the streets.

Exposition Notes.
(Continued from page 19.)
can be seen scattered about the grounds and buildings resting and eating lunch. In order to accommodate lunch parties, the Exposition has provided every convenience for their comfort in the building under the charge of the Bureau of Public Comfort. In addition to the foregoing expenses, there is the cost of an occasional trip on the Intramural road, and there should be a few rides on the electric launches and also on the steam launches out into the lake, so as to secure a good view of the Exposition grounds from the water front. The expense of these trips should not exceed $\$ 2$. Then there are concessions of various sorts, some of which each visitor will want to indulge in according to his taste, the size of his purse and the amount of time at his disposal. But the entire cost of these to the visitor of a week should not exceed $\$ 5$. All these estimates are based on actual experience, and to a person who is at all judicious they should be outside figures, so that the expense in itself for the seven days would cost $\$ 14$. Going back and forth from the boarding place. to the Exposition would not cost over $\$ 2$ at the most for the ordinary means of transportation. The round trip by boat is 25 cts ., and this is a trip that should be taken because of the opportunity it affords of seeing the beauty of the Exposition grounds from the lake. The Illinois Central Railroad has a most excellent and efficient service, for which it charges only 10 cts. a trip, while the cable and elevated roads carry passengers to the grounds for a 5 ct. fare.
If one will come into the grounds from the lake through that marvelous entrance which seems to revive to a college graduate what he imagined the entrance to some of the ancient cities might have been, and sail into the lagoon on a gondola, he will get some impression of the vastness, the architectural beauty, and completeness of this preparation, which it is impossible to describe. Superlatives are unequal to the occasion. Then you must add to that the thirty buildings of the various States of the Union, which, in size and appointment, surpass the buildings of the different nations at the Paris Exposition. The illumination itself was worth a visit from New York.

This Exposition will be of value to every visitor, $a$ cording to the degree of intellectual or other cultivation he brings with him, to avail himself of the infinite number and variety of the objects presented to his gaze. The whole time that the display will be open, it will soon be discovered, cannot but be altogether insufficient to make anything like a minute inspection of the departments. Take, for example, the Art Palace. In that gorgeous structure there are not less than 8,073 exhibits, one-half of which consist of pictures in oil and the other half of statuary, water colors, pastels, engravings, etchings, and pen and ink, charcoal, black and white, and other drawings-all of exceptional value. Surely one minute cannet be thought too long a time to devote to the study of each example. Yet such a brief time would amount to one hundred and thirty-five hours, or twenty-two and onehalf days of six hours each.
The Japanese building, Hooden, as it is called, has been carefully reproduced at the Fair. It represents the architecture of three different epochs. The central portion belongs to the seventeenth century, the south wing to the fifteenth century, and the north wing to the eleventk century. The main structure has a double roof, sloping in graceful curves on four sides from a gabled over-roof. Two striking features of the exterior decoration are weathercocks representing the bird hoo. They are cast in a metal called kodo, an alloy of gold and copper. In the principal portion are three large images of Buddha, carved in wood by the famous sculptor Jo Cho. Rich traceries of wondrous color adorn the ceiling, and their effect is intensified by the skillful introduction of precious stones. Walls and doors are overlaid with gold leaf. Panels containing either scenes from the paradise of Buddha or texts from the sacred books are disposed alternately as a decorative scheme. Western art may imitate but hardly equal this decorative work. The original edifice-the seat of the great house of Tokugawa for nearly three hundred years-has had a most remarkable history. Although many destructive wars have occurred since its erection, yet the exquisite decorations remain substantially intact.

A few days ago there was excitement near "Blarney Castle." A box had arrived there, and soon there came a custom house officer with an invoice which called for "one Blarney stone." When the box was opened it was found to contain a fragment, weighing forty pounds, of the celebrated Blarney stone itself. That portion had been severed for many years, and was now loaned by the Irish authorities to Lady Aberdeen. It must be returned when the Fair is over. According to the legend, Cormack Macarthy held the castle of Blarney in 1602, and concluded an armistice with Carew, the lord president, on condition of surrendering the fort to the English garrison. Day after day his lordship looked for the fulfillment of the terms, but received nothing but protocols and soft speeches, till he became the laughing-stock of Elizabeth's ministers
and the dupe of the lord of Blarney. Another legend has it that the stone is really a fairy, whose lover had been slain in battle. Before having changed herself into stone, she obtained from the spiritual powers the wish that whoever kissed the stone might receive the ability to become a great talker. The fragment has been placed in position on the model Blarney Castle,
but not quite in such a dangerous situation as in the but not quite in such a dangerous situation as in the riginal.
Among the many articles of rare and curious make is a very delicate handkerchief among Queen Margherita's laces. It is valued at $\$ 30,000$. Three different artists have wrought upon it during a period of not less than twenty years. It is so light that one is not conscious of it touching the hand if the eyes be shut, and it can be easily folded into a gold casket not arger than a Boston bean.
It is said that a Scotsman who employs 4,000 French women near Paris making lace has sent a pair of curtains for a bay window. In the six months required for the making of these curtains two thousand different women worked on them. They are only three yards long; but the cost was $\$ 6,000$. This Scotsman has a $\$ 50,000$ exhibit of laces, and hé came himself to superintend their effective hanging.
Among the mineral curiosities there is a twelve ton ump of cannel coal sent from Lancashire, England, by the Wigan Junction Colliery. Pennsylvania has put up a pyramid of anthracite, ten feet square at the base and fifty-two feet high. It contains just one hundred tons. From George's Creek, Allegheny County, Md., comes a lump of cannel coal 15 feet long, 4 feet wide, and 3 feet thick. The Roslyn lump from the State of Washington is the largest ever mined. It is 5 feet thick, 26 feet long, and weighs more than 50,000 pounds.
Mr. Gladstone has sent one of his axes for exhibition in the Forestry building. It is of fine steel, and is very sharp and heavy. As is very evident from the worn condition of the ash handle, the tool had done considerable service. So far as is known, this is the only instance of an ax having been permitted to pass out of the possession of the veteran British premier, and the principal members of the timber trade of the country appreciate highly the exceptional honor thus displayed to them and their craft.

A CORNER OF THE PALACE OF MINES AND MINING
At the left of the western entrance to this building is the Japanese exhibit--Japan's demonstration to the world that western scientific methods have been adopted. Specimens of her riches are shown-gneiss, sandstone, clay, lava, granite, all beautifully arranged in series of graduated test tubes to show a mechanical analysis. At one end of the series the "mother rock"
in a mass, at the other a tube containing the soil, the intervening tubes, from six to twelve or so in number, showing the degrees of disintegration. This is the work of the Imperial Geological Survey. So are the remarkably beautiful colored geological maps on the walls. They show the strata, mineral deposits, etc., of the islands. The attendant told me that they were executed at the Tokio University. Beside them hang series of photographs of the mining processes. They too, are clear and most carefully made. Ingots of copper and antimony are displayed. The specimens of Museum in New York, but they are so numerous that one realizes that the magnificent crystals are not rare in Japan. Iron ores are represented, chiefly by hematite, marcasite, and pyrite. Anthracite and cannel coal are shown in small masses. Graphite crucibles range from one of the capacity of a pint to those of very large size, of fully twice the capacity of those used at the Brooklyn Chrome Steel Works in the manufacture of steel. Table salt is displayed in bags and glass jars. In the latter some of it is in ornamented disks, as if run in a mould.
Beautiful specimens of native sulphur are in the cases, and on the floor are two masses of "roll brimstone," not less than four feet in length. Among the minerals shown the specimens of rhodonite, beryl, and amethyst are notable. One case is filled with white topazes. The display, so far as I have spoken of it, might have been arranged anywhere in our own country. The object which is characteristic and national is a miniature mountain. Near the summit is a tiny temple, steps cut to it from the foot, and llittle flags placed at intervals on the way up.
This is all the casual visitor sees, but to one who has made the acquaintance of the gentlemanly Japanese in attendance, the mountain is opened. Within are mining galleries showing every step of the process of every possible position. The ore is lowered in buckets, arranged on pulleys run by windlasses. The smelting pots are in the lowest gallery, and a tiny figure holds a book the size of my little finger nail, in which he makes his record of the assay. It is but a step from the Japanese exhibit into that of the Canadian provinces. It is evident they have felt that this is a valuable opportunity to show their neighbors
in a conspicuous place: "Total yield of gold from placer fields from 1858 to $1893, \$ 53,512,652$. The quartz veins from which this has been derived have not yet been worked. They offer fine field for investigation."
The quartz is here in large masses, yellow enough to be suggestive. An immense pyramid of blocks in imitation of gold bullion is close at hand. "Am I to understand that this is real gold ?" said an earnestfaced woman to the attendant.

No, madam, we could not afford to have so much gold out of use," was the reply of the man with inflexible features.

I told her I was sure it couldn't be, but she knew it was ; so I just thought I'd ask."
Very likely the attendant has been asked the same question so often that it has ceased to be amusing to ques.

Asbestos in large quantities is shown from both Quebec and Ontario.
The Johns Asbestos Manufacturing Company has some of its machinery only a few feet away, where one can see the crude material changed into cloth and also see the various grades of paper made of it. The company has had great demand for this for use in the Fair buildings, and in the temporary lodging houses, where it forms walls and ceiling.
Ontario shows a fine display of mica sheets easily two and a half feet in diameter. Sperrylite is a newly discovered arsenide of platinum. It is a yellow dustlike powder found in pockets and assays fifteen ounces to a ton of platinum. Small quantities of gold, osmium and iridium are also found in it. The name of the ore is derived from its discoverer, a Mr. Sperry. Near by is a quantity of black, slaty ore which also contains a small per cent of platinum, supposed to be in paying quantities, but not yet developed.
Nickel derived from pyrrhotite and chalcopyrite is shown in every stage of its reduction from the ore and large photographs of the processes are to be seen. Apatite is shown in every state--magnificent crystals, too fine for any place but a cabinet, and the amorphous masses fit to be ground for a fertilizer. Quantities of steatite and graphite are here, and very rich serpentine. The beautiful serpentine vase was made at the Canadian Granite Works, at Ottawa.
The New Rockland Slate Company, of Montreal would have us believe that no well appointed city house can afford to be without their slate wash tubs made so that the front of the tub forms the wash board.
Nova Scotia shows a variety of building stones, quantities of red and brown hematite, and a tempting display of gold-bearing quartz.
New Brunswick has sent red granite, in column and monument. Gypsum forms a part of the exhibit from this province in its native condition and reduced to plaster of Paris.
Next to the Canadian section is the Australian. In this, one feels that gold is not only widely distributed, but must be very abundant. It is shown in nuggets, strings, grains, octahedra, and embedded in the quartz. But most interesting are the specimens of good sized, rregular masses, separated from the quartz by the ac tion of hydrofluoric acid. Why does this not suggest the opening of a great industry in Greenland in cryolite? Australia shows immense circular piles of ingots of copper and tin, the latter trimmed with ribbons and osettes of tin.
In the South African section blue asbestos is to be seen, about the color of lazulite. The principal attractions in this exhibit are, first, the machinery (which is in operation from two to four in the afternoon) for crushing the diamond-bearing rock, washing the fine particles, and separating the gems; and second, the sturdy Africans who operate it. They look as if they had just come from a kraal. Nowhere have I seen the crowd so dense and eager as about this exhibit.

## An Ericsson Medal.

A medal commemorating the life and services of the ate Capt. John Ericsson has been presented by the Swedish government to Col. W. C. Church, editor and proprietor of The Army and Navy Journal, New York, with whom was left Ericsson's private and busi ness papers, and who has written a biography of the great inventor. The medal is of silver, and beautifully executed, there being on the obverse a medallion head of Ericsson and on the reverse a monitor under steam with Latin inscriptions describing Ericsson as "skilled with Latininscriptions describing Eric
in the mechanic arts and wise in war."

Invention is sometimes thought to have reached its limit, but of the energy in a pound of coal when burned, some one has calculated that only 1 per cent is used in moving a passenger and only one-half of 1 per cent fin incandescent electric lighting. The rest goes in friction and waste. The problem of the next century is going to be the saving of this wasted 99 or $991 / \frac{p e r}{\text { per }}$ cent, just as the problem of the last century has been the $1 / 6$ per cent which makes an electric light.

Metal Ties in Mexico.
According to Engineer John Birkinbine, the Mexican Railroad has now some 150 miles of track, including the Pachuca branch, laid with steel ties which weigh 124 pounds each, or 126 pounds with the two key bolts. These ties are 8 feet 3 inches long, rolled so as to have a longitudinal web, and have clips for holding the rails formed by cutting slots out near either end of the sleeper and bending up the steel. The first metal ties of crude design were placed on this road fourteen years ago. On the Inter-Oceanic Railroad, some 50 miles had been laid with "pot" sleepers, an English monstrosity, consisting of two cast iron dishes oval in form, which were inverted in the ballast and connected together by wrought iron bars, the rails being keyed to the pots. About one-fourth of these have been replaced by steel sleepers, and further replacement is made as rapidly as finances permit. The steel sleepers now used are 6 feet long, weigh 90 pounds each, and have near the ends square bolt holes, but no clips. These nest nicely for shipping, and cost $\$ 1$ gold per sleeper, delivered at Vera Cruz. Wooden ties, 8 feet $\times 6$ inches $\times 6$ inches, cost in the vicinity of Pueblo and Mexico 63 cents for pine and 95 cents for oak ; therefore, at the present exchange, the pine ties cost in gold 42 cents and the oak ties 64 cents each. As railroad supplies pay no duty, the expense for steel ties is, therefore, not greatly in excess of wood. On the Southern Railroad ( 3 foot gauge), steel ties 8 feet long, weighing 110 pounds, are used.

## THE WART HOG, OR VLACKE VARK.

This is a new arrival at the Zoological Gardens. The wart hog, or vlacke vark, or Ethiopian wart hog (P. Athiopicus), is a native of Southern Africa. This species differs from his brother from North Africa (Etians wart hog), inasmuch that his warts at the side of his face are larger; in fact, he is a more formidable animal, his tusks, when full-grown, reaching eight inches in length. The animal lives entirely on roots. The color of this hog is gray, with dark mane, and hair sparsely scattered over the body. When chased, Gordon Cumming says, he presents a most ludicrous appearance on account of his short neck, being unable to look round, and naturally anxious to see if his pursuers are gaining upon him, he is obliged to lift his snout well in the air, so as to look over his shoulder, and with that, and his tail, when running, stiff and upright, he has a most absurd look. The above sportsman also says the animal is not devoid of sagacity.-Black and White.

## Do Doctors Spread Contagion?

The surgeon and the obstetrician utilize the means that experiment and observation have proved necessary to render their work aseptic. In case of the entrance of disease germs, they take prompt means to destroy them, or to neutralize their effects. It behooves us, who practice among children suffering from contagious diseases, to inquire if we are equally careful.
The surgeon about to open an abdominal cavity removes all possible sources of infection from his patient's person and environment, and goes to his work with clean linen and clean hands. Do we do likewise?

Some time ago a prominent operator sent me an invitation to witness an abdominal section, adding in his note, "Provided you have not visited a case of scarlet fever or other contagious disease during the last twenty-four hours." I could not but think, if such precaution is necessary to insure the safety of this patient, what are the risks to the little children that I shall visit after seeing the case of scarlet fever or other contagious disease, and whose systems are fertile soils for the poison to develop it?
The danger of such conveyance is great, as physicians with large family practice know, and many, like myself, have been taught the lesson by sad experience. I can recall several instances in which the children of physicians have falien victims to scarlet fever and diphtheria, the cause being clearly traced to disease brought home by their fathers.
Let me illustrate this danger by a description of a physician's visit to a case of diphtheria. The doctor enters the house, removes his hat, overcoat and gloves, and is shown into the room containing the patient, and comes into direct contact with the atmosphere loaded with the germs of the disease. His hair, woolen clothing, hands, etc., must more or less absorb the poison, in his stay of about fifteen minutes. What does he then do? He replaces his overcoat, carefully buttoning it up, as if to keep as many of the germs as possible warm and well protected. He puts on his hat as he crosses the threshold, jumps into his carriage, covers himself with robes, and drives to his next patient; enters, takes off his hat and coat, and wo to any little ones wholive in that house! The doctor
has probably that with him which will more likely kill than cure.
What should be done to diminish this danger? Stay no longer in a house containing a contagious disease than is absolutely necessary. Don't remove your hat or unbutton your coat in that house. After examining the patient go down stairs, preferably at an open door or window, and give directions for treatment. The family of the patient will respect you for the care you exercise when you explain the reason. Drive without covering with robes to your next patient, and be sure that patient is not a child. Never allow a messenger from a case of contagious disease to call or wait for you in your office. Instruct him to bring written messages and leave them at your door. If the messenger wishes to speak to you, tell him to wait outside your office and ask the servant to call you to the door.
I have more than once been startled on entering my office to see a man or woman whom I knew had been constantly for days and nights nursing a bad case of diphtheria, sitting complacently alongside of two or three children, all waiting to see me. On several occasions mothers have brought children, suffering from severe attacks of diphtheria, to my office and waited to see me.
When you come home from a case of contagious disease, besides washing your hands, face and head with soap and water, hang up your hat and coat in the air, and put on a fresh coat.
I did this some time ago and forgot to bring them in when I went to bed. It rained hard all night-but better lose a hat and coat than a patient.
If you return late at night from a case of contagious disease, besides washing, undress before going into the room where your children are. Keep your own


## THE WART HOG.

children out of your office, and do not take them in the carriage, with you when visiting patients. How do you know but some of your calls may be upon those with contagious diseases?

Our board of health instructs us, in cases of contagious diseases, to forbid the children of the household to attend school or other places of public resort. This is a wise precaution, and the doctor, when he has been in contact with contagious disease, should, so far as possible, follow the advice given to the children.
We are told that familiarity with crime leads us to endure it. Likewise familiarity with contagious disease is likely to make us at times careless in using the means necessary to prevent its spread. Physicians are but mortals, and while as a body they are conscientious in the discharge of their duties, candor compels me to confess that they are not at all times as careful as they should be.-Dr. Johen Graham, in Phila. Medical News.

## The Purification of Water.

The drought happily appears to be coming to an end, but the welcome showers of rain must be continued for some time if our stock of water is to be adequately replenished. In the meantime, the water supplied for domestic use must necessarily have become less and less pure and the impurities which pollute the streams less attenuated. The increased proportion of suspended and dissolved impurities which are presented to the sand filters must greatly impede the filtering process, and if this process is hastened-and we cannot doubt but that the temptation must occur to do this-inadequate treatment results and water unfit for drinking purposes may be distributed in the mains. A continued season of dry weather is especially a time at which very careful regand to the treatment of water for drinking purposes should be given. The purification of water supplied to the consumer's house, be it from the pump or the main, may be offected thorcughly and efflciently if he will only exer-
cise ordinary care and judgment in regard to the use of filters or to other treatment of the water. Water may be made fit for drinking by three processes: 1 , treatment by precipitation; 2, by filtration; and 3, by boiling. In some cases it is advisable to combine the effects of two or more courses of treatment. The latter process (boiling), though of course efficient, is not popular, because the water is rendered tasteless and insipid by withdrawal of the gases, chiefly oxygen and nitrogen, and part of the mineral salts in solution. Treatment by filtration is largely in vogue because it it simple and convenient. It is well known, and it is to be feared that it occurs in many instances, that filtration may render the water much less pure. A word therefore with regard to the choice and management of filters. The best and most effective filtering materials are those which not only remove organisms, matters in suspension, or even soluble matters, but which exert an oxidizing action upon the organic contents of the water and an aerating action upon the tents of the water and an aerating action upon the
water itself. Such agents are well burnt animal charcoal, spongy iron, magnetic iron, polarite and coke. For the mere removal of organisms, filtration through kieselguhr and biscuit porcelain is effectual.
Animal charcoal has grown into disrepute owing to the observation that the organic constituents of water in long contact with it decompose more rapidly than they otherwise would do, a fact which is probably accounted for by the presence in the charcoal of calcium phosphate, a material which favors the growth and development of low forms of life. If properly cleansed and frequently renewed, however, animal charcoal exerts a marked purifying as well as aerating effect upon impure water. Whatever medium is used, every part of the filter should be easily got at for the purpose of cleansing or for the renewal of the filtering material. We have repeatedly drawn attention to the investigations of Dr. Percy Frankland upon the action of filtering agents, whose experiments showed that well carbonized coke was one of the best filtering materials that could be used. It is cheap, can be easily renewed, and effects the removal of organisms better than any other material experimented with. A drawback to its use is the long preliminary washing it requires before the water becomes clear, owing to the presence in its multiple pores of tarry matters derived in the distillation of the coal. When foul it is still available of course for use as fuel. A common barrel of eighteen gallons capacity provided with a false bottom and filled with layers of respectively fine, medium, and coarse pieces of coke, the latter at the top, has, in our own experience, answered admirably.
Purification by means of precipitating agents has recently been the subject of considerable investigation, and the purifying effects of this treatment, both as regards the removal of organisms and of suspended or dissolved matter, are surprising. Purification by this means is best accomplished by the use of alum. This substance (two or more grains to the gallon will suffice) is decomposed with the formation of a flocculent precipitate (hydrate of alumina, $\mathrm{Al}_{2} \mathrm{O}_{3}$ ), which rapidly settles and carries down all suspended matter as well as a large proportion of dissolved organic matter. The precipitation is further attended with a very large if not complete reduction in the number of micro-organisms present. In response to inquiries that have reached us from numerous correspondents, we strongly recommend this treatment in lieu of boiling, preliminary to passing the water through a filtering medium of well known purifying powers, such as those we have enumerated. One of the best is, as we have already said, coke. The addition of alum does not interfere with the normal taste of the water, is itself eliminated as alumina in the sediment, removes some of the lime, and, above all, does not de-aerate the water as in the boiling process. By first precipitating, therefore, in the way suggested, and then filtering security is made doubly secure, and the water so treated, which should not be insipid, may be consumed with confidence.
It may be added that tartaric acid or citric acid has been found to be destructive to disease-producing organisms, notably the bacilli of cholera, and an ingenious filter has been constructed in which tartaric acid is first dissolved in the water and then neutralized and removed as calcium tartrate by means of chalk. At the same time the chalk yields carbonic acid to the water, which is thereby agreeably aerated.-Lancet.

One of the rooms of the Press Bureau, at the Chicago Exposition, has its walls entirelypapered with title pages of leading publications from all over the world. These publications include daily papers, religious and trade papers, magazines, etc. A central feature on this wall is the title page of the Scientific Ambrican. Every nation and nearly every colony in every part of the world is represented. The effect of this method of papering is remarkably good.

RECENTLY PATENTED INVENTIONS. Electrical
adtomatic Weighing Scale. Charles F. Wood, Richmond, Va. Combined with a hopper haring a door and a scale beaim is an electro-
magnet with circuit arranged to lift the door by the conmagnet with circuit arranged to lift the door by the con-
tact of the scale beam, the magnet being movable to tact of the scale beam, the magnet being movable to
follow the beam and lift the door by mechanical as well as electrical action, there being also a movable receptacle and a bag holder, with transfer funnel, supporting lever
and operating magnet, to transfer the contents of the and operating magnet, to trannfer the contents of the
weighing receptacle to the bag. The improvement is especially designed to facilitate putting up in packages $a$ mall quanntity of seed or other loose merchandise, doing the work quickly and accurately, and giving to each package a uniform weight
Roadl Vehicle.--John W. Moakler, Denver, Col. This is a vehicle adapted to be propelled
by storage battery or other generator of electricity series of storage batteries being connected to a regulator and switch below the evicle seat, by which the current may be properly directed to the motor. The improvement consists mainly in the application of a worm
screw fastened directly on the shaft of the armature or screw fastened directly on the shaft of the armature or
motor, which saves power and simplifies the constructoin.
Lighting Stistem.-Charles L. Morey, Centralia, III. In the door casing, according to this in$a$ push button sliding in the casing being adapted to close the circuit and light the lamp. The improvement constitutes a simple form of door attachment designed
to aftord sufficient light to enable one to select the to afford sufficient light to enable one to select the
proper key, at the same time illuminating the door lock proper key, at the same time illu
to facilitate finding the keyhole.

Rallway Appliances.
Car Coupling.-James H. Swindell, Reidsville, Ga. This coupling comprises a novel form of latch and cover plate fitted on the drawhead with
pin openings for the coupling pin and a connected guide pin openings for the coupling pin and a connected guide
arm coinciding with those of the drawhead, and the arm coinciding with those of the drawhead, and the
latech is connected with a spring. The longitudinal movement of tthe drawheads in bumping together, is designed to operate the devices supporting the pin and the link holder, the released pin then falling to complete the conpling. The device will readily couple cars of different heights, the coupling in all cases being automatically effected.

## Agricultural.

Suliky Plow.-Joseph Willmann, New Braunfels, Texas. According to this invention a plow block is clipped to and fitted to slide upon the arle, the
plow beam being secured to the block, /while a lever pivoted for movement transversely of the sulky has is capable of a.tachment to any form of wheeled plow, and by its means the plow may be shifted laterally by
the driver during the act of plowing to change the cut or avoid obstructions, etc.

## Miscellaneous.

Ballot Registering Device.-Ur ban $G$. Ies, Wellston, Mo. This improvement is de
signed for use in connection with a ticketconforming with the Australian ballot, the size of the ticket being such that it ftts snugly in a pocket or recess of the voting macchine, where it is placed after the voter has punched
holes opposite the names of the candidates for which he does not desire to vote. The machine has registerIng wheels and pins arranged for mutilating the ticket in such a way that it may be mechanically counted, ac carately registering the vofes and exhibiting the number ay time
Umbrella and Cane Holder.Heinrich Egberts, Bremen, Germany. This improve-
ment comprises three connected and cooperating parts ment comprises three connected and coo-perating partsa plate having recesses to receive the ombrelia handies
canes, etc., cruciform rotatale devices pivoted adjacent the recus ana and gpring pawls or detents that engage the arms of the
derices. To hold the umbrella or other article, the lower end is placed in the trough at the bottom and the upper end pushed into one of the recesses, thus swinging one arm of a cruciform piece out of the way, and causing another one to swing into its place to properly secure the umbrella.
Photograph Holder.-Dion T. Elmer, Monroe, Mich. A flat slotted brace has one end members of the brace is adapted to lie within the slot, card. The improvement forms a very cheap and simple card. The improvement forms a very cheap and simple
device to advantageosuly hold and display a photograph or other cand, and it may also be used as an easel, or to be folded flat in small space, admitting of being sent conveniently through the mail.
Trunk Lock.-William J. Davis, Char lotte, IN. IC. This is an improvement in trunk, box or Valise fastenings, in which the main lock coacts with
other attachments to effect a locking adjustment when the main lock is operated. By means of the improved lock a trank lid may be locked at three different points, pr the improvement may be applied to secure the hinged and folding portions of a valise together, locking them at Urree points, and requiring the main lock to be unlocked end hasp piecese ribrated therefrom to release
Weighing Scale.-John J. Hickey, New York City. This invention relates to an apparatua or weighing liquilas, comprising a platiform supported n a vertically allding carrier and a counterbalancing
Bver carrying at one end the carrier and at its other end reighte, each representing a certain predetermined mea-
ure. The a anged to antomatically and sccorately weigh any desirei neasure of a liquid, sccording as the welghts are placed
Water Heating apparatus.
especially designed for heating water for ase in connec
tion with sods water fountains or for facilitating the ion with so ha water fountains, or frer fhall with h mellow
naking of hot drinks. It comprises a shell with hom heads connected by tubes, with steam supply and return pipe is also connected with the faucet for drawing the hot water, whereby all water rising and cooling in the

Basket Grate.-Erick J. Jahnson, dicago, III. This grate has openings below which are arranged sliding racking grates, connected together for
simultaneous operation. A central grate section simultaneous operation. A central grate section in
mounted to turn in one of the openings, and connected with the sliding racking grates below the other openinge pecially designed for usein fireplaces
Metallic Sole and Heel Plates. Perdinand Davison, Richmond, Va. This inventio provides a machine for cutting these plates from a con and one operation. The machine has a fixed cutter and a fixed head block, the latter having prong-forming dies while a reciprocating plunger die having a cutting edge opposes the fixed cutter, and lateral extending portion re adapted to lap the fixed forming dies.
Fire Escape.-Gothard Lowenstein Brooklyn, N. Y. A drom to be located on a building carries a fiexible ladder, with a locking device by which it may be released from within the building, while connto place when the ladder is let down for use, rendering the ladder stable, so that it will afford a age means of
descent. Means are provided for housing the ladder descent. Means are provided for housing the ladder
wrapped on the drum, so that it may be very readily and enty brought into service
Hose Strap Fastener.-Bernard W McKenzie, San Diego, Cal. This is a double lever-iike
tool for applying and securing wire straps or ties to ool for applying and securing wire straps or thes
garden and other hose, to. unite the hose to the coup garden and other hose, to. unite the hose to the coup-
lings. The device saves wire and the brazing of the
ends of the wire liability of the strap to break at the points where it it brazed together, and the fastener is readily adaptable to lose of different thickness or diameter.
Hose Band.-Isaac St. C. Goldman, Los Angeles, Cal. This is an improvement in bands spindle of a coupling or other attachment to which the hose is to be fastened. It comprises a flexible body hav ing parallel wire members, with a curred lever at one
end, and may be quickly applled without the use of any end, and may be quickly applied without the use of any
special tools, and adjusted to fit hose of different sizes. Its operating lever exerts a progressive and increasing
strain upon the band as it is tightened, the arrange ment being such that the mere operation of the lever and bending of the fastening strap serves to bind the band in plac
necessary.
Chain or Cable Grip.-Gilbert Gag non, Pincher Creek, Canada. Combined with two levers
loosely connected at one end, and loosely connected with lwo intervening grip blocks, are two link bars ehhackled
two
to the to the other end of the levers and in turn connected together at opposing ends. The device may be quickly connected with the towing end of a logging chain or
cable, and fornishes means for the ready connection cable, and furnishes means for the ready connection
therewith of a traction motor or a team of draught ani therewith of a traction motor or a team of draught anh
mails, for the sliding movement of the logs tin any direc mals,
tion.

Fence Building Machine.-Benjamin O. Johnson, College Hill, Miss. This is a simple and durable machine, designed to do its work quickly,
and that does not need skilled labor to operate it. It can be readily transported from place to place, and separates the strands to receive pickets, and them the desired position. The construction is such that the strands of wire edapted to support the picketes are under
constant and uniform tension while the machine is in constant and uniform tension while the machine is in

Fence.-John T. Patton, Highland, hio. This is a fence made mainly of wire, the innce may be preventeans whereby the sagging or conce may be prevented, while the wires may be quickly,
cond effectually stretched and held under tension by a connected stretching device until they are

Wire Stretcher.-George B. Steen, Ionia, Kansas. This device consists of an elongated
body slotted at one end and provided with a handle at the other, a clevis being journaled on the body, and there being a ratchet connection between the clevis and tis ody. It is an extremely cheap and simple device, easily
operated, and not readily weering out, and it will effectually stretch a wire up to the post to which the stretcher is attached and hold the wire until it is fastened.
Thill Coupling.-Alonzo P. Dodge, Huntington, N. T. The axle clip of this coupling has
on its underside a forwardly extending lug having in its inner side a socket entered by a knuckle or crank on the thill iron, a bolt with a web at its headed end passing through the knuckle and the lug of the clip. The device is very cheap and simple, facilitates the ready attaching
or detaching of the thills, and the construction is such or exacing or the inilis, and the construction is such
that there will be practically no wear on the coupling bolt, and the parts cannot become accidentally displacea. clyde, N . between the jaws of which is pivoted a hook bar, the body of the hook and free ends of the frame limbs having
ben
a peculiar conformation that adops them for eflient a peccliar conformation that adapts them for efficient
service as a snap hook, while provision is made to lock service as a snap hook, while provision is made to lock
the hook bar in closed adjustment when this is desired.
Wire Stand.-William Kadletz and Robert B. Stocker, Lemhi Agency, IIaho. This stand has a vertical body portion formed of parallel strands of wire, branching at thefr lower ends, where they are bent
inward to form feet, while they also branch at their $n$ pInward to form feet, while they also branch at their npper ends and terminate in eyes carrying saspending
ringg. A cheap, strong, and convenient stand may thus

Artifictal Claw for Fur Trim-Thes.-Abraham and James Jacobson, New York City, lating natural claws projecting from the fur, a a strengthning of the fur at the paw being effected by means of he plate, thereby increasing its durability and preserving its appearance, while effecting a saving of time and tabor in the attachment of the claws.
Nors.-Copies of any of the above patents will be urnished by Monn \& Co., for 25 cents each. Please send name of
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government. Maps showing the general construction and bocation of the canal are given, together with a history of
lon he building and expenses of the canal, also its importance or commercial and war purposes.
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## SCIENTIFIC AMERICAN

BUILDING EDITION
JUNE, 1893.-(No. 92.)

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1. Elegant plate in colors, showing the residence of Joseph P. Beach at Pine Orchard, Conn., erected
at a cost of $\$ 1,200$ complete. Floor plans and two perspective elevations. Messrs. Mann \& Co architects, New York.
Seward W. Jones, at Newton Highlands, Mass, rected at a cost of $\$ 9,000$ complete. Perspective view and floor plans. Messrs. Rand \& Taylor architects, Boston, Mass. An attractive design.
handsome colonial dwelling on Beacon Hill, Boson, Mass. Two perspective views and floor plans model design. Messrs. Shepley, Rutan coolige, architects, Boston, Mass. Colonial residence dwelling at Montclair, N. J. rected at a çost of $\$ 5,500$ complete. Floor plans,
two perspective view, etc. Messrs. Monn \& Co architects, New York. An excellent design
2. Engravings and floor plans of a dwelling at Elm Sta tion, Pa., erected at a cost of $\$ 5,200$.
dwelling erected near Longwooa, Mass. A moder
design. Mr. Austin W. Pease, archite design. Mr. Austin W. Pease, architect, Boston,
Mass. Floor plans and perspective elevation. Cost about $\$ 2,200$.
he First Congregational Church atPlainfield, N. J erected and furnished complete at a cost of $\$ 15,000$ spective and floor plans
3. A residenceat Beardsley Park, Bridgeport, Conn. A very picturesque design, perspective elevation and floor plans. Cost $\$ 0,500$ complete
Beers, architect, Bridgeport, Conn.
put up in thery Boyc The cost of the structure was $\$ 300,000$.
The Fifth Avenue Theater, New York.- Views ofthe auditorium, the Broadway lobby, the Twenty-
eighth Street foyer. Mr. Francis H. Kimball, eighth Street foyer. Mr. Francis H. Kimball,
architect, New York.
Miscellaneous Contents: New lien law in California -An improved spring door hinge, illustrated.-T estimate brick work.-Fou water main.-An im-
proved woodworking machine, illustrated.-An improved scaffold truss, illustrated.-Sawdust building bricks.-Some beautiful arch work, illus-trated.-Mineral wool in buildings.-Wood mantels, inustrated.-Sound titles for real estate.-Durabil
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 use in stove reservoir pipes that are used to heat water for
bath room,to prevent lime from gathering in the pipes? A. Strong caustic soda solution boiled in the pipes will loosen the scale, which may be washed out. If you an take the pipes apart, a sulphuric a. Can you give ne plans to build a cheap Bell telephone? Can I use a battery with it? If so, what is the best way to construct i. A. See Scientific American Supplement, No.
142 , for complete full sized drawing of a working telehone, 10 cents mailed.
(5161) J. A. S. asks: 1. What are the ngredients of rubber paint and what are its advantages, erating rubber in any of the solvents until it has a asty consistency; next dissolving in linseed oil until the solvent is evaporated, then mixing by grinding, a suitabe quantity of pigment. This paint. is said to be dura-
ble. 2. Is there any practical electric motor run by a battery that would be a success in the hands of users of mall power who know nothing about electricity, and ow about the cost of running same? Isee it is proposed to run.sewing machines, corn shellers, washing
nachines, etc. Can it be done cheaply? A. Electric machines, etc. Can it be done cheaply ? A. Electric
motors driven by primary batteries are generally unatisfactory, owing to the trouble and expense attending the man ar battery. 3. How is Portland 231.
(5162) F. P. H. asks : Is there anything can use instead of borax to braze cast iron? I get tmes some of the cogs are broken and it rould help me onderfully to be able to braze them in, instead of dovetailing. A. For brazing cast iron use copper instead of
(5163) L. C. J. asks how to straighten hardened steel. A. In hardening and tempering tools workmen, and not seldom the tool is reheated and the hardened. In most cases this may be avoided. To straighten a piece of steel already heated and tempered,
heat it lightly - not enough to draw the temper-and it eat it lightly-not enough to draw the temper-and it may be straightened by blows from a hammer, if the
character of the tool will admit of such treatment, or, as character of the tool will admit of such treatment, or, as
let on a hard wood block. Although the steel when cold would break like glass with this treatment, when slightly
warmed it will gield to moderately heavy blows aninjured.
(5164) W. S. writes: 1. I hear that it costs $\$ 2$ a day to take cameras into the World's Fair grounds. Is that true? A. Yes. 2. Do they allow a camera. taking a picture over $4 \times 5$ in the grounds? A. camera taking a picture over $4 \times 5$ in the grounds? A. They do not, except in the case of photographers repre-
senting illustrated joornals. Such photographers must obtain a special permit from the official photographer. 3 . How many caustic potash batteries would it take to run a 34 horse power electric motor. Cell contains 2 copper plates $4 \times 5$ inches, and 1 zinc plate $4 \times 5$ inches. Batteries to be coupled up like a bichromate plunge battery. A.
It will probably require not less than 20 cells. 4. What It will probably require not less than 20 cells. 4. What
size wire would it be necessary to wind the motor to size wire would it be necessary to wind the motor to
adapt it to the caustic potash battery? A. No. 20 wire will probably be about right. The motor should have a resistanceof from 20 to 30 ohms , depending upon the manner in which the battery is connected up. 5. Does the battery make more fumes than the bichromate cell ? A. No. 6. How many hours will a bichromate plunge battery work 6 cells, size of plates $11 / 2$ inch by 4 inches ? and amperage? A. 5 to 6 hours. The E. M. F. of each and amperage ? A. 5 to 6 hours. The E. M. F. of each
cell is 2 volts. The amperage depends upon the resistance in the circait.
(5165) W. S. P. writes: 1. In regard to the induction coil in the home medical battery, what
ind of wire is used in the primary coil, and how many feet ? A. It will probably require 5 or 6 feet of No. 36 wire. 2. What number of wire or what kind is used in wire. 2. What number of wire or what kind is used in coil ? A. 12 or 15 layers of No. 36 silk-covered magnet wire, 150 to 200 feet. 3. Do you think Grenet battery
fluid is as good as elect opoion fluid for a Fuller bichrofluid is as good as elect opoion fluid for a Fuller bichromate battery? A. It is the same thing. 4. Is the Grenet fluid any good when it becomes black? A. No. . Could you cive me some directions for making 3 pints
of electropoion fluid? A. Make a saturated solution of electropoion fluid? A. Make a saturated solution
of bichromate of sodium in water, and slowly add onefifth its bulk of commercial sulphuric acid.
(5166) C. T. V. asks: 1. What kind of electricity is that generated by the dynamo? A. Dy-
namic. 2. Why is so much precaution exercised in stringing of fire alarm wires when only one wire is ex posed to the dampness? A. Because the ground constitutes the other conductor, and any leakage from the wire to the ground impairs the efficiency of the line. 3 Can electricity, when grounded, be compared with wate in regard to seeking its level ? A. The earth is generally considered as an electrical reservoir; therefore the wate
(5167) D. C. B. asks : 1. What is the E. M. F. of a nickel-plauing dynamo of 40 gallons ca-
pacity ? A. 7 or 8 volts. 2. About what size wire hould I use on an electro-magnet to be used with this machine? A. This depends altogether on the size of the
wire on the armature, but of course it will be necessary wire on the armature, but of course it will be necessary
to use large wire, on account of the heavy current generated!by the machine. 3. What is the cause of reverse cur rentin plating dynamos, and how remedied? A. The secondary current from the plating vat. 4. It is a series wound machine with a Siemens armature. I think its name is the "Little Giant." What change in the wind ing would adapt it for general experimental purposes A. Windthe armature with finer wire. 5. What would be the power of the machine then? A. Without more data
we cannot reply to this query. 6. Should the commutator of a dynamo change brushes when the poles of the armature are directly opposite the poles of the field magnet?
A. It depends upon the winding of the armature. If the wires ron from the coil straightout to the armature, the change should take place about half way between the
poles. 7. Is plaster of Paris a good insulator? A. poles. 7. Is plaster of Paris
When dry it is a fair insulator.
(5168) W. E. S. asks: 1. Will you give me the formula for charging a Bunsen battery? A.
Make a saturated solution of bichromate of sodium in water; to this slowly add one-fifth its bulk of commer cial sulphuric acid. 2. Will zinc melt? A. Zinc melts at $680^{\circ}$ Fah. 3. Can it be moulded smooth ? A. It can
be cast smoothly in metal moulds. 4. In what number of the Scientific Aneral does it tell how to make an incluction coil ? A. You will find a full description of an induction coil in Supplement, No. 160.
(5169) H. W. B., Jr., writes: I have seen described in the Notes and Queries of your paper a bat
tery composed of sheets of zinc and copper ith blotting paper in between; will you tell me what the paper is wet with, how thick should the zincs and coppers and the paper be to secure the best results? What would be the voltage, amperage and resistance of one composed of ten sheets of zinc and ten of copper, 10 inches by 6 inches A. One half of the sheets in the battery referred to should with a solution solution of zine and the other half waper saturated with the sulphate of copper should be in contact with the copper, and that saturated with the sulphate of zinc should be in contact with the zinc. The zinc plates may be one-eighth of an inch, and for the copper any thickness will do, provided it is stiff enough to maintain its contact with the blotting paper. The voltage is about the same as that of a gravity, practically 1 volt, but the amperage is very small, owing to the re sistance of the battery. Probably you will be able to se
(5170) G. R. asks the cause of hole bout the size of a tackead and larger on the sides of a tails are cut off. These holes form whether metal is poured hot or cold. A. The holes are caused by air which in the operation of casting does not escape from the casting box.
(5171) A. Z. writes $:$ 1. In Wimshurst electric machine described in "Experimental Science," be better than glass ? A. Vulcanite can be used for this porpose, but it deteriorates with time. 2. Is standard supporting joornal and axles of wood or metal? A. They are of wood. 3. Are tinfoil strips connecting brushes in electric connection with axle? A. No. 4. In trying to
make Leyden jars we can hardly find any bottles or jars
r window glass thatwill retain the electricity. What kind
glass or how prepared will answer the purpose ? A. glass or how prepared will answer the purpose? A. although a very poor one. The glass jar should be very thoroughly dried and varnished with shellac before being coated with tinfoil.
(5172) O. C. C. asks : 1. Please tell me the gross weight, charged, of a primary battery maintain$1 / 4$ horse motor power) after a fifteen minutes' run abou period in which such a battery (after say 15 minutes service) will regain its prime strength ? A. The battery
will not of itself recover its original strength; it must b will not of itself recover its original strength; it must be recharged. The process of fully recharging requires from 6 to 7 hours. 3. Which are the lighter and most (5173) T. T. writes : Recently during a thunder storm here a church was struck by lightning. The steeple was struck first, then the interior was visited, paper. It was afterward noticed had scorched the wall gular gold stripe in the wall paper from the ceiling to the floor. Can you explain why this occurred \& A. A very slight conductor serves to lead lightning in any direction, on account of its extremely high E. M. F.
(5174) M. C. P. writes : I wish to ask you a question in regard to my wood saw that I have just 125 pounds, 26 inches in diameter, is a web wheel. I have been running it at about 1600 revolutions per minute. I run it with a horse power; the speed is sometimes higher, sometimes lower. Now, is it dangerous to run it at that speed? The machinist who cast the wheel said it was of good quality. My saw is 20 inches in diameter, and if I reduce the speed I am afraid it will not saw well. If it is regard to the matter. A. The tensional breating trenct of cast iron in the usual foundry practice cannot be trusted at more than 16,000 pounds per square inch. The safe load is made at one-sixth of the breaking strength per square inch or 2,666 pounds. The strain on the rim of your fiy wheel at a speed of 1,600 revolutions per
minute is 3,000 pounds per square inch, or a margin of a minnte is 3,000 pounds per square inch, or a margin of a
little over one-fifth of the breaking strain. This may be little over one-fifth of the breaking strain. This may be (5175) T. D. McC. asks : 1. In the Blake ransmitter, is the fine wire wound next to core or on the outside ? A. In the Blake transmitter the fine wire Does primary circuit in an induction coil coarse wire. 2. the inner circuit ? A. Not necessarily, but according to placed on the core inside of the secondary coil.

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 Annealing wire, furnace for, M. Mc Coneineii.
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Arle and box, wagon, Red






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Boat. See Steam passenger
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This Company also owns Letters Pa tent No. 463,569, granted to Emile Berliner, November 17, 1891, for a Combined Telegraph and Telephone; and controls Letters Patent No. 474,231, granted to Speaking Telegraph, which cover fundamental inventions and embrace all forms of microphone transmitters and of carbon telephones.


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