
a weekly journal of practical information, art, science, mechanics, Chemistry, and manufactures.


THE NEW WAR SHIP OLYMPIA-"WARMING UP" FOR THE SPEED TRIAL.


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the laboratory and the workshop.
The germs of civilization are engendered in the laboratory and closet of the chemist, but are in great part cultivated and brought to fruitage in the workshop of the artisan. Every step in civilization has been at first but an idea. These ideas, conceptions, or generalizations, arise in the brain of the experimenter and thinker, but he is usually powerless, through lack of tools and manual skill, to realize his conceptions. It is not often the case that a scientist possesses both the genius to conceive original ideas and the mean and skill to execute them himself, or to compensate the skill of the mechanic and artisan in working out his ideas into realities. The possession of such means is usually found to dull the enthusiasm of the inventor, and it must be admitted that the most efficient stimulus to such brain work is the res angusta domi. Many scientists have their brains and their port folios crowded with outlines and sketches of inven tions which they hope to give to the world at some future day, when good luck shall have come their way. But in numerous cases, good luck never comes, but instead thereof, the rider on the pale horse. Such inventions are then lost to the world. The question arises whether it is not the solemn duty of such men, in most cases, to publish their ideas, and place them on record, at least in such forms as to be available, in the shape of raw material for the practical man to elaborate, thus contributing their share to the weal of their race. A man who does this will not then have lived in vain, and cannot then be reproached, or re proach himself, as a "wicked and slothful servant, who " hid his talent in the earth."
A man of wide and varied scientific and technological experience-of a class of which we have many-often finds his brain teeming with new ideas. He can scarcely consider an industrial subject, when the
mood is on him, without finding his mind crowded with novel combinations. These it is no irksome task for him to think out and elaborate, but a positive pleasure. Such pleasure is akin ta that which actuates the poet and the artist in working out their inventions and conceptions. But the poet and the artist have the advantage that a penful of ink or a brushful of pigment is all they need to realize their inventions for public behoof. Here is where the scientist is weak, and often at the mercy of circumstances. In order to progress, he must go to the workshop and open his mind to the artisan and obtain the vicarious aid of his tools and his skill. We have then a very important and essential correlation between the scientific technologist and the wage earner, which deserves and should have discussion and consideration, as a factor, both heretofore and hereafter, in the progress of the arts of civilization. It is true that we have, in large cities, professional model makers, but this is a business specialty, which has but small bearing on the subject from our present point of view.
But there is another important side to this subject. We now have great numbers of technological journals, as exponents of almost every branch of the industrial arts. The main burden of their song, however, consists, in all cases, of continual expositions of accomplished facts, that is, of inventions already madestrides already taken in advance. This is all well; but in vain does the man of the workshop look for suggestions which will enable him to take part in the contest, in this glorious intellectual strife to bencfit man, the only warfare that should be tolerated on the "dark and bloody ground" of our planet, the only kind of war that does not "make the angels weep." The wage earner may be, and often is, a man of great native brain power, and even of extensive reading and high intelligence. But his energies are absorbed for his daily toil. He seldom has time, or means, or skin generalizations. He needs to have these more or less prepared for him, and then he can often get opportunities to realize them in the form of a working model, or piece of apparatus; say, a new oil lamp or gas burner or glow lamp, a new metallic alloy, or a new use or application of some one of the great multitude of materials and agents that have been continually coming before the world and growing cheaper during this century.

Occasionally complaints come from one of these men, that the field of invention seems to have narrowed or become exhausted, and asking what there is left to which they can bend their minds. This is due merely to the lack of spare time and energy to think and study. The conceiving of new inventions may be partly a matter of genius or intuition, but it is a faculty which requires knowledge and application to master and practice to acquire skill therein. The field, instead of narrowing, is now rapidly broadening, and in an increasing ratio. The new metals and chemical materials continually coming forward and cheapening must necessarily insure this resu't. Future articles of this series will set this forth further. As one example, fine electrolytic copper is now but half what it cost a few years ago, and the sources and methods of production have been so greatly multiplied, im-
any important future rise in price. Hence copper and its numerous valuable alloys can now be applied to new uses, for which it has hitherto been too costly. Numerous other examples will be cited hereafter.
It is now proposed that this journal shall do more than hitherto to remedy the deficiency we have pointed out, and to indicate paths of promise to inventors, so far as human science is allowed to determine these.

## Prize of Fifty Thousand Dollars Offered for Improved Method of Propelling Street Cars.

The Metropolitan Traction Company sent a letter to the Board of Railroad Commissioners in November ast, offering a prize of $\$ 0,000$ for the invention of a system of street railroad propulsion superior to the cable and the trolley. In this letter the officers of the company say :
On streets where the lines are straight and the business is heavy the cable system is the most economical yet invented. For general use in a city, winding about through the streets following the routes of travel which the public wish to pursue, it is impracticable. You require straight routes for cable roads. We have in addition to the lines upon which the cable will be laid over eighty miles of street railroads now operated with horses, all below the Central Park. It is to these lines in particular that we now desire to direct your attention.
Up to the present time the only system whose pracicability has been demonstrated is the overhead trolley. We are well aware, however, that its application in the streets of New York would not meet with the approval of the community. What we most desire now is to hasten the development and perfection of a better system. We therefore submit the following proposition:
First-We will set aside the sum of $\$ 50,000$ to be warded as a prize to any person who shall, hefore March 1, 1894, submit to your honorable Board an actual workinc system of motive power for street railway cars demonstrated to be superior or equal to the overhead trolley.
Second-The qualities necessary to meet this requirement shall be left to your decision ; but with the pres ent state of the art, a system to win the award must necessarily approximate the trolley as a standard of economy in operation, but should be without the fea tures objectionable to the public that are in it.
Third-We shall exacl no rights in the invention in eturn for the $\$ 50,000$, and shall have nothing whatever to do with the making of the award further than to pay any expenses which your honorable Board may deem it necessary or wise to incur, either in the em ployment of experts, the giving of hearings, or the conduct of experiments-this in order that no effort may be spared to achieve the desired result.
In answer to this proposition, Mr. S. H. Beardsley, in behalf of the Railroad Commissioners, sent a letter to President John D. Crimmins, undertaking to cooperate with the company with certain limitations.
Mr. John D. Crimmins states that the offer of the company was made for the best interests both of the company and of the city. He was sure the overhead trolley would never be introduced into New York. The general idea was to encourage the invention of some sort of underground trolley system which would be free from the disadvantage of liability to kill horses and men in the streets above it.
We presume that any system of streetcar propulsion that presents the merits of economy and superiority over present methods would be carefully considered and adopted if found suitable to the requirements of the company.

## The Torpedo Net Testing.

At the government torpedo station, Newport R. I., the torpedo net testing has progressed as far as the condition of the season will permit. There are four nets now at the station, three of the American known as the Midgley defense nets, and one Bullivant of the English make, such as are now used by foreign nations. Projectiles are used to test the relative strength of the nets and show their condition when pierced. The projectiles are $27 \mathrm{ft} .4 \mathrm{in}$. in length, and 16 in . in diameter, weighing about $1,600 \mathrm{lb}$. It is not expected that any net will stand a projectile which will pierce the strongest ironclad afloat. Your correspondent was shown the different nets that have been pierced, which are the Midgley nets only, and in each one the upright or woven wire strands only have been severed. The horizontal strands remained unbroken. It is absolutely necessary that they be non-corrosive in salt water, and as thin and light as possible. Wire heavily galvanized with zinc will resist salt water, but the ends of the wires where cut are not galvanized and will corrode in the water, so that they are coated over with a varnish, but sometimes this varnish is rabbed off by rough handling. The commander in charge is desirous of obtaining a metallic mixture of the greatest possible strength and absolutely non corrosive in salt water. The result will be looked for with interest.

## The Electric Light column.

On the evening of the 13 th inst., says the Philadelphia Ledger, the huge wooden casing in front of Wanamaker's was taken down, and there stood re vealed a handsome column of incandescent bulbs, with broad spiral stripes, each of a different color, white, blue, purple, orange, green, yellow, and crimson predominating. The column is about 25 feet high, and from it extend four long arms lined with rows of glass bulbs of different colors, two of the arms in the side aisles terminating in 25 bulbs each, and two in revolving balls of 266 bulbs each, at either end of the Chestnut Street facade, all handsomely colored. At inter vals of a few seconds each stripe flashes with light, one brilliant color swiftly following another until the top of the column is reached, when the varying light is diffused along each of the arms until the two large bulbs are reached, where the flashing continues until all the colors are shown. Meanwhile the two large balls are kept revolving, and flash continuously with varying lights and colors. The whole affair, whose effect is very pretty, is ingeniously managed by a switchboard in the basement under the column, where a large cylinder, somewhat like that of a music box, is kept revolving by the dynamos of the establishment, the teeth in the cylinder closing and cutting off the circuit as contact is made with or withdrawn from the rows of separate conductors on the sides of the switchboard. As the lights change from one color to another they go out completely, leaving no lingering glow in the carbons to spoil the effect, as would be the case were it not that this has been guarded against by a current of air being ingeniously injected automatically by the machine.
The arrangement was a part of the famous electrical display at the World's Fair, where it elicited the admiration of thousands of visitors.

Opening of the Manchester Ship Canal.
The necessities of modern commerce have produced great ocean-going steamships, "the shuttles of commerce," and also the huge ship canals, which facilitate the movements of these large vessels and lessen the cost of transportation. We have from time to time described the progress of one of the great engineering feats of the day-the Manchester ship canal ; and now we are glad to state that the canal is completed, and that the official opening took place December 7. The public opening will not take place until New Year's day, when a procession of vessels up the canal will take place, headed by the bark Wilhemine from Parrsboro, Nova Scotia. This vessel reached Garston November 27, and is now waiting for the opening of the canal to public traffic. It is laden with lumber. The company will pay $£ 100$ for the delay it incurs in waiting for the public opening of the canal. The captain of the Wilhemine will receive a handsome gold watch as a memento of the occasion.
The Midland counties of England are large consumers of raw material, and much time and expense will be saved by using the new canal. The Manchester canal will probably prove as valuable to Manchester as the North Sea canal has been to Amsterdam or the Cronstadt canal is to St. Petersburg. It is a curious fact that Peter the Great's original plan when he founded St. Petersburg was to make the new capital a port for sea-going vessels by means of a ship canal. The new Manchester canal compares favorably with other ship canals, except as regards length. This great undertaking cost about $\$ 75,000,000$. The work has been illustrated and described in the Scientific AmeriCAN.

## The Sea Trial of the New York

The cruiser New York has just completed a series of general tests. According to law, the New York could not be legally accepted by the government, or the contractors receive the $\$ 50,000$ reserved from the previous payments for building her, until a final test was made. The object of the test was to determine, by a forty-eight hours' run, her sea-going qualities and her structural strength. The rough December sea was admirably adapted to test the endurance of the new boat and the results considered as a whole are satisfactory, and the results considered as a whole are sath
although some defects were made apparent.

The men were sent to their allotted stations on Mon day, December 11, and every part of the vessel was subjected to a rigid inspection, every engine was minutely examined and run at varying rates of speed ; the guns were fired, but not a rivet started and every bolt was in place when the three hours' firing test ceased. The turret-turning machinery was defective, and will be altered. The amidships magazine was found to be too near the fire room, as when the vessel is under steam the temperature reaches $120^{\circ}$ in this compartment. Some of the ammunition hoists were inade quate to supply the guns rapidly enough. The arrange-
ment of the sick bay in the bow is a serious defect, as ment of the sick bay in the bow is a serious defect, as the vibration is felt most here and the roar of the waves when at sea is deafening. The sick bay was flooded during the trip, water coming in through the
torpedo tube. This fauit of location is not to be laid torpedo tube. This fauit of location is not to be laid
at the door of the contractors.

## Digestibility of Farinaceous Foods

These enter so largely into the dietary of all invalids, that nurses and others should know that they are not all equally able to be digested. Experiments have lately been made on the different starchy foods, as to the rapidity with which they digest when treated by malt and pancreatic preparations. One gramme of each of the following starches and meals was boiled
and made up to 100 c . c. with water. In each case the effect of 1 c . c . of pancreatic essence on the mucilage at 100 deg. F. was noted, a dilute solution of iodine, placed in drops on a white slab, being used as an indicator: Indian Corn.-After digesting three hours with the pancreatic essence still gave a distinct blue with the indicator. Twenty hours' digestion appeared to have o further effect
Wheat.-Distinct blue after two hours' digestion.
Rice.-Distinct blue after two hours' digestion.
Tapioca.-After half an hour's digestion gave only faint green with the indicator.
Arrowroot.-Ceased to give a blue in ten minutes. Potato.-Ceased to give a blue in ten minutes.
Oatmeal.-Gave a scarcely visible blue after digestng eighty minutes.
Wheat Flour.-After two hours' digestion gave a ery faint blue.
Potato Flour (2 grammes).-Ceased to give blue in en minutes.
Thinking that prolonged boiling might have some effect on the convertibility of starch, some experiments were instituted to test the point. Solutions of arrowroot and corn starches were brought to the boiling point in one case and in the other boiled for ten minutes. The time required for digestion was, in each case, the same, i.e., the arrowroot ceased to give a blue in ten minutes and the corn still gave a blue after three hours' digestion. These experiments were repeated with malt extract and point to the following conclusions: Arrowroot and potato starches are the most readily converted into sugar by the amyloly
ferments. They are, therefore, the most suitable for testing malt and pancreatic preparations. Arrowroot testing malt and pancreatic preparations. Arrowroot
and potato starches are the best for weak digestions. and potato starches are the best for weak digestions.
Chemically there seems to be no difference in digestibility between low-priced arrowroots, nor between the latter and potato starch. Root starches are more digestible than seed starches. So long as starch granules are burst, further (limited) boiling does not render them more digestible. In further experiments it was found that the addition of either acid or alkali to the pancreatic juice retarded the conversion of starch, but with saliva in the absence of either the conversion took place in four minutes.-Pop. Med. News.

## Effect of Light on oysters.

At a recent meeting of the Academy of Natural Sciences, Philadelphia, Professor John A. Ryder spoke of the effect on oysters of exposure to light. He referred to recent observations of Dr. Scheidt on the pigmentation of these mollusks under abnormal conditions. The right valve of the shell having been removed, the oysters were kept in a trough of running salt water. In fourteen days they showed a pronounced blackening of the entire right mantle, where normally there is no pigment, and this was again bleached when excluded from the light. Other specimens which were guarded from the direct action of the light remained uncolored, thus demonstrating that light is the active agent in producing the deposit of pigment granules. Blue glass was found to stimulate coloring, while red glass had the opposite effect.
Professor Benjamin Sharp remarked that a common species of flounder, Aclinus lineatus, commonly called the hog choker, has the underside almost if not quite as strongly colored as the upper side, thus differing materially from the other species of this group of fishes. Correspondingly it was found that its habits were so modified that the lower part of the fish was frequently so exposed as to be acted on by the light and not kept in contact with the rocks as in allied forms.

## Dyeing Leather, Feathers and other Animal

 Fibers.F. Obermeyer, of Vienna, has a new process of dyeing animal fibers, which is said to be peculiarly applicable to feathers, leather, and horn. It depends on the fact, first, we believe, pointed out by Knecht, that the animal fibers resemble amido compounds in their constitution, and are therefore capable of becoming diazotized. This is done by subjecting them to the action of weak solutions of sodium nitrite acidified with hydrochloric acid for twelve to twenty-four hours, under conditions which exclude light. The diazotized fibers are then treated with either-first, neutral aqueous solutions of phenols at $80^{\circ} \mathrm{C}$.; second, cold ammoniacal solutions of alkaline phenolates without excess of free alkali ; third, neutral solutions of amines; fourth, acetic acid solutions of amines. In this method of dyeing and with such solutions the fibers remain quite uninjured. Red, yellow, and brown shades can thus be dyed. Those produced from amido bodies can be further diazotized and redeveloped into new shades,
chloride, ferric chloride, zinc acetate, potassium, etc., the shades are modified, being made darker and faster. All the shades are full and brilliant. and on the whole fast to soap.

## Soap Bubble Solution.

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

Boil until completely dissolved, and before use diute the solution with four times its volume of water. It is somewhat difficult to float soap bubbles upon carbon dioxide, because if you managed, after a score of trials, to free your bubble from the pipe on which you blew it, the bubble usually bursts the moment it touches your heavy gas. You must remove every trace of hydrochloric acid, which is carried over with the gas, by washing, the presence of this acid being fatal to the life of a soap bubble.

Canal Cutting and Dredging on the Sacramento. The progress of work by the new canal digging machine on Grand Island and of the dredger for strength ening the levees are thus described by the Record Union: The machine built to cut the drainage canal inside the island is a one-yard Marion Steam Shovel Company's ditch dredger. The machinery was placed upon a hull 22 feet by 70 and cuts a canal 23 feet wide. This machine was started to work Soptember 18, and excavated during the remainder of that month 16,100 vards, requiring of course some few days for the thorough adjustment of the parts. During the month of November it excavated 62,770 yards, or 2,414 yards for each working day in the month, or 115 yards for each working hour.
The material was deposited on both sides of the cut, and the month's work was a uniform canal 12,413 feet long for $21 / 3$ miles, 23 feet wide and a little over an average of 6 feet deep. The only delays were occasioned by fog on the morning watch, which on six or seven mornings occasioned a delay of three or four hours.
This machine is in charge of Allen Adams and is giving the landowners first-rate satisfaction.
The dredger Grand Island, built for the river levees, is a clam shell, with a hull 40 by 80 feet and with a boom 105 feet long. This machine is handling a bucket weighing 8,000 pounds, with wire ropes in place of chains. It was started to work on the 30th of October and for 22 hours per day is delivering, as nearly as may be, one bucket per minute, averaging in the material it is working in (fine river sand) two cubic yards to the bucket. This material, from the point of excavation to the point of delivery, is being moved 150 feet.
This dredger is building a roadway outside of the present levee 16 feet wide, and at the same time furnishing material to put a two-foot crown on the levee. It has already made one mile of this work, and it is expected to progress at the rate of about a mile in 11 days. It is in charge of J. Hyde, and with a few more days' breaking-in of the machine and crew will be a very efficient machine.
The machinery is all completed by Byron Jackson for the additional pumping plant to be installed at Ryde, and this plant will have a capacity of 30,000 gallons per minute, with compound engines of the newest type, and will, it is believed, with the large plant al-
ready in, give complete control of the rain and sipage ready in
waters.

## The Plumber's Hat.

Has a plumber a right to wear his cap in one's house? This was the point submitted to the Highgate justices by an ex-fellow of Balliol. The plumber and his son came to the ex-fellow's house to clear away a stoppage in the bath. Arrived at the scene of operations they kept on their caps, as is the use of British workmen. The householder lectured the parent plumber on the bad example he was setting his son in not teaching him to take his cap off in a gentleman's house. The parent replied by setting up the custom of the trade to work covered. The plea was overruled, and the father plumber's cap thrown out of the window by the indignant ex-fellow. Then the parties aggrieved adjourned to the open air (it was drizzling), and went-the plumber capless and the ex-fellow carrying the plumber's cap-to seek counsel and advice of the nearest policeman, who referred them to the justices. The ex-fellow says that he was on the way called by the plumber "a thick-heailed old fogy." Yet the justices fined him 10s. for his manner of giving a lesson in manners, and gave him no redress for this very unacademical language.

France will soon adopt an interesting innovation in the postal card system. The cards will be issued in the form of checkbooks, with stubs. The sender of the postal card can make memoranda of its contents on the stub, and can have this stamped at the postoffice before the card is detached, so that a verified office before the card is detached, so tha
record of the correspondence can be kept.

## a machine for forming projectiles.

This is a strong and simple machine designed to form projectiles two at a time, the machine being perfectly under the control of the operator, and rolling the projectiles so accurately that they are well adapted for the best marksmanship. The improvement has been patented by Mr. John S. Griffin, Roslyn, Washington. The small figure shows parts in scetion, with the forming rolls and the hydraulic cylinders which move the rolls vertically. The end standards of the machine have on their inner sides guide ribs which support guide blocks for the ingot and also serve as guides for the piston heads, which move alternately toward and away from each other as the ingot is rolled. The forming rolls align vertically and have convex faces, the face of each roll having a sharp edge extending annularly around it in the center. The piston heads are secured to pistons operated like the usual hydraulic pistons, the tons operated like the usual hydraulic pistons, the cylinders being supplied with water from a common
form of force pump. The upper piston head has on

griffin's machine for forming projectiles.
adapted to receive grain or other material dumped and deliver it to the ground or to an elevator or conveyor. The elevating mechanism may be driven by a beveled gear by turning a crank at one side of the machine. In front of the cover of the hopper are longitudinal openings in the bed, and in each of these openings is a balance or dumping beam, the beams being connected by cross bar and the operation of a lever locking the of the bed is a sosition. Beneath the central portion nected by a chain with a second sprocket wheel journaled in a standard, and by rotating the upper sprocket wheel by means of its crank the lower shaft is rotated to tip the balance or dumping beams from a horizontal to an inclined position or vice versa. Platforms are removably connected with the ends of the bed, so that a team may be driven up one platform to the bed and from the bed down the other platform to the ground. A loaded wagon is thus driven up one platform and over the bed until its wheels rest upon the dumping or balance beams, when the locking bar is disengaged and the crank rotated to carry the beams to an inclined position; the load will then be dumped into the hopper or any receptacle placed to receive it, or will be conveyed from the hopper to the elevator.

## Soldering Aluminum.

By means of the alloys mentioned below, aluminum or other metals, such as iron, tin plate, zinc, copper, brass, nickel, it is said, can be rapidly and easily soldered, either with the brazing iron or blowpipe. Aluminum can also be soldered to any of the above met als; the material is cheaper than any hitherto employed, gives a solid joint, and does not injure the metal by oxidation or otherwise: (1) Unalloyed pure tin, melting point $250^{\circ}$; (2) tin 1,000 , lead 50 , melting point $280^{\circ}$ to $300^{\circ}$; (3) tin 1,000 , zinc 50 , melting point $280^{\circ}$ to $320^{\circ}$; (4) tin 1,000 , copper 10 to 15 , melting point $350^{\circ}$ to $450^{\circ}$; (5) tin 1,000 , nickel 10 to 15 , melting point $350^{\circ}$ to $450^{\circ}$; (6) tin 900 , copper opposite sides lugs in which are pivoted depending rods $\mid 100$, bismuth 2 to 3 , melting point $350^{\circ}$ to $450^{\circ}$. The first which extend downward to the base of the machine and are pivoted to levers, each fulcrumed on a shaft, and connected with counterbalanced weights to return the piston and piston head when the water has been withdrawn from the upper cylinder. The cylindrical ingot is prepared for the machine by slightly reducing it in the center, preventing too much metal from being crowded toward the shoulders of the projectiles. The metal is treated hot, the forming rolls being forced against the ingot from above and below, the ingot being at the same time revolved and firmly held in place by rollers arranged in pairs on opposite sides of the central portion of the machine. These rollers approach the ingot horizontally, the boxes of one of the shafts being coupled directly to pistons which move in horizontal hydraulic cylinders. An independent water supply is provided for the sets of cylinders, so that the forming rolls and the driving rollers may be independently moved when desired. It is designed by this improved machine to effect a great reduction in the cost of twelve-inch and other projectiles and all varieties of mortar shells.

## a portable Grain dump.

A machine designed to facilitate the handling of corn and all kinds of grain, effecting a great saving in labor, is shown in the accompanying illustration, and has been patented by Mr. Charles L. Young, of Imogene, Iowa. The machine may be driven direct to the car side, and used to load the car ready for shipment. The bed of the machine is mounted on a forward axle and two rear axles of angular construction, and near the rear end of the bed is a pit, within which a hopper is secured. The lower end of the hopper is open and

young's portable grain dump.
three do not color aluminum, and can be used for ornamental and artistic objects. Four and five are yelowish in color, but have theadvantage of higher melt ing point and greater strength and hardness, and suggest the possibility of using aluminum for various articles and purposes for which hammered, coated or enameled iron, tin plate, copper, zinc, lead, etc., are now used. The Journal of the Society of Chemical Industry says the last alloy can be made to assume any tint of yellow by varying the proportion of copper, and is, therefore, suitable for soldering aluminum bronzes; the proportion of bismuth is adjusted so as to keep the melting point suitable for the use of the brazing iron.

## For Tired Feet.

Walking heats the feet, standing causes them to well, and both are tiresome and exhaustive when prolonged. There are various kinds of foot baths; authorities differ as to their value. Hot water enlarges the feet by drawing the blood to them; when used they should be rubbed or exercised before attempting to put on a tight boot. Mustard and hot water in foot bath will sidetrack a fever if taken in time, cure a nervous headache and induce sleep. Bunions and corns and callousness are nature's protection against bad shoe leather. Two hot foot baths a week and a little pedicuring will remove the cause of much discomfort.
A warm bath with an ounce of sea salt is almost as restful as a nap. Paddle in the water until it cools, dry with a rough towel, put on fresh stockings, have a change of shoes, and the woman who was "ready to drop"
will have a very good understanding in ten minutes The quickest relief from fatigue is to The quickest relief from fatigue is to plunge the foot in ice cold water and keep it immersed until there is a sensation of warmth. Another tonic for the sole is a handful of alcohol. This is a sure way of drying the feet after being out in the storm. Spirit baths are used by professional dancers, acrobats, and pedestrians to keep the feet in condition.-Pacific Record of Medicine.

The Electrical Review thinks that some simpler device for controlling the brakes and current on trolley cars is required. As it is now, the mechanism is too complicated, there are too many motions to be made by the men in charge ; for it is only by the quickest movements that they are enabled
control their cars in a short time.

## an improved post office box.

The illustration represents attachments for post office boxes arranged in tiers, whereby the proprietor of a box may readily see when it contains any mail matter, but no one can look into the box. The improvement has been patented by Mr. Henry A. Sheldon, Arcadia, R. I. The swinging doors at the front ends of the boxes have each a horizontal slot in which appears the word "full" or "empty," carried by a sign on a plate which moves vertically between the door and inside guide bars. The latter are curved over the


SHELDON'S POST OFFICE bOX.
top of the sign, limiting its movement, and the sign is carried by swinging rods or levers fulcrumed in hangers suspended on a cross rod extending transversely hrough the box near the center and top. A platform in the lower rear portion of the box is suspended from the rear ends of the rods or levers by means of hangers, and the sign is slightly heavier than the platform, so that when there is nothing on the platform the sign will drop to display the.word "empty," but when any wail matter is placed in the box the platform is tilted and the sign "full" is exposed in the slot in the door. The improvement may be readily applied to any ordinary post office letter box, the sign being always automatically operated.

## an Improved wrench.

The illustration represents a very simple and durable wrench adapted for use wherever an ordinary monkey wrench may be employed, as well as in some places where the latter tool could not be used. It has been patented by Mr. Edward P. Jones, No. 18 Armat Street, Germantown, Philadelphia, Pa. In one view the jaws are constructed to take a polygonal nut and in the other to receive a square nut. The handle of the wrench is formed integral with its upper outer end and jaw, and the lower forward portion of the handle has a downwardly extending lip, the lip being provided with a more or less angular chamber. The lower jaw is vertically adjusted by means of a screw passed through a hreaded aperture in the under surface of the handle back of the lip, the upper edge of the screw engaging with the under face of the head section of the lower jaw shank. When the jaws are shaped to receive a polygonal nut, the handle is placed at an angle of fifteen degrees to the jaw, and where the jaws are


JONES' WRENCH.
formed to receive a square nut, the handle is placed at at angle of about twenty-two and a half degrees to the jaws, this relation between the jaws and handle having been found in practice to be most advantageous for manipulating the wrench in the smallest possible space.
The first tunnel for commercial purposes was executed by M. Riguet, in the reign of Louis XIV., at Bezieres, France.

THE NEW AMERICAN WAR SHIP OLYMPIA.
The cruiser Olympia, built at the Union Iron Works, San Francisco, Cal., has recently been completed, and in her trial trips has proved herself one of the noblest and fastest sbips in the navy. The speed, as contracted for, was to be 20 knots. Her construction was authorized by the act of September 7, 1888. This act called for a cruiser of about 5,300 tons displacement. The speed of 20 knots had then been attained by the Spanish
mental shields, also 4 inches thick. Four can fire direct- iron are introduced between the ribs, as shown in our ly ahead, four astern, or five can fire abeam on either engraving. The lower half of the apron is first built side. The secondary battery contains fourteen 6 pounder rapid-firing guns, protected by 2 inch shields, six 1 pounder rapid-firing guns, and four Gatlings. There are six torpedo tubes, one in the bow, one in the stern, and two on each side. The tubes are of the Howell type.

The ship is driven by twin screws, actuated by triple
and the space between the iron plates and masonry filled in solid with concrete cement, then the upper half is made in the same manner and the cement carried up behind the iron plates to the top.
The top of the dam is finished, as seen in Fig. 2, by laying strong girders, which are firmly anchored to the masonry coping, and upon the girders iron plates


## THE NEW WAR SHIP OLYMPIA RUNNING AT 22 KNOTS.

ship Reina Regente, the fastest war ship then afloat, a
vessel which will be remembered by many of our readvessel which will be remembered by many of our readers as having participated in the naval parade at New York last spring. Bids for the Olympia were called for on April 10, 1890, and two months later were opened and the contract a warded to the Union Iron Works, of San Francisco, which proposed to construct the vessel on its own plans for $\$ 1,760,000$, or on the department's plans for $\$ 1,796,000$. The limit set by the act of Congress was $\$ 1,800,000$. The contract called for the completion of the vessel on April 1, 1893. A speed premium was offered.
To secure more space in the fire room the contractors, at their own expense, lengthened the hull 10 feet. The ship is 340 feet long on the load line, 53 feet beaw, $331 / 2$ feet deep, and ūraws wi $1 / 2$ feet of water. Her displacement is between 5,500 and 5,600 tons. She has three complete decks; one of which is a protective deck, and is virtually a substitute for side armor, none of which she carries. This protective deck joins the hull beneath the water line at an angle of $30^{\circ}$. It is $43 / 4$ inches thick on the slopes amidships. On the forward and aft slopes it is 3 inches thick. Its flat central portion is 2 inches thick. Above the protective deck a belt of water-excluding material is carried up the sides, $23 / 4$ inches thick and rising 4 feet above the water line. She has a cast steel ram in the bow. Her two masts are provided with military tops for Gatling guns and search lights.

The main battery consists of four 8 inch and ten 5

160 pounds pressure and 128 revolutions per minute. The high pressure, intermediate, and low pressure cylinders are of 42 inches, 59 inches, and 92 inches diameter respectively, and of 42 inches stroke. The main valves are of the piston type, worked by the Stevenson link motion. Bronze bed plates are used throughout. The main journals are lined with Parson's white metal put in under a hydraulic pressure of 15 tons per square inch. There are six boilers; four double-enders, 15 feet 3 inches diameter and 21 feet 3 inches long. Two are single-enders, of the same diameter and 11 feet long. All can be worked under forced draught on the ai. tight fire room system. The total orate surface is 824 square feet, and the heating surface is 28,300 feet. She is fitted out as a flag ship, having admiral's quarters, and is designed to carry a crew of 466 men.
Official trials were made November 25, but not completed. The trials are to be soon resumed. On the first trials a maximum speed of $22 \cdot 3$ knots was attained and an average of 22.15 knots, reduced by tidal corrections to $21 \cdot 85$ knots.
We are indebted to Mr. P. E. Law, of Santa Barbara, Cal., for the photographs from which our engravings were prepared. These were instantaneous photographs taken from the deck of the U. S. S. Patterson.

## THE STATE DAM, MOHAWK RIVER, AT COHOES, N. Y

This work is known as the "State dam," in contradistinction from the dam of the Cohoes Water Power
are attached, the interstices between the girders and covering plates being solidly filled with hydraulic acment or concrete. The whole work is of the strongest and most substantial nature.
The dam is built by Messrs. Cunningham \& Morety under contract with the State, the price to be paid being $\$ 90,000$. For the photographs from which our illustrations are made we are indebted to Mr. Chas. McGovern, of Cohoes, N. Y.

## Liquid Chlorine.

Chlorine in liquid form is now being manufactured by Messrs. Pechiney \& Co., of Salindres, in France, and at the Rheinania Works, at Rheinan, near Mannheim, in Germany. The gas is'liquefied by subjecting it to a pressure of 50 atmospheres ( 750 lb .) to the square inch and stored in strong iron vessels holding 120 lb . each. It is delivered from these vessels either in the liquid or gaseous form, and can be used in bleaching. It is said to be as economical in use as bleaching powder, while it has some advantages over that product. It is said, however, that the railway companies consider the liquid highly dangerous, and make difficulties as to carriage.

At the late meeting of the Zoological Society of London a most remarkable instance of evolution in the adaptation of animal organisins to their environments was demonstrated. Mr. Tegetmeier said that the


Fig. 1.-THE NEW STATE DAM, COHOES, N. Y.-THE IRON APRON.


Fig. 2.-THE NEW STATE DAM, COHOES, N. Y.-SHOWING THE TOP FRAME.
inch breech-loading rifles. The 8 inch guns are mount- Company, located eabout- a mile above the falls, and|English rabbits imported into Australia were gradu ed on the main deck, forward and aft, in elevated steel by its means and a bridge the boats on the Champlain barbettes, 4 inches thick, covered with conical roofs. or Northern Canal are enabled to cross the river, which These are about 10 feet above the deck, giving the at this point is 1,700 feet wide. Several previous dams guns a very extended training capacity. The ammu- built here have been carried away.
nition tube leading to the barbettes is of steel and is $3 \quad$ Fig. 1 shows the method of constructing the apron. inches thick. The 5 inch guns are mounted in the $\mid$ Strong ribs grooved on their inner edges are secured by central superstructure. They are protected by segbraces to the masonry of the dam and then sheets of
ally changing their habits and becoming tree climbers, the ava lable food for them there being largely the bark and leaves of trees. In evidence of his assertions he showed the feet of some Australian rabbits, which showed that they are slighter than those of their Engish progenitors, and their claws are longer and sharper.

## Crystallized Sunshine.

We use it daily in a myriad of forms and combinations. It is a chief and important article of food which we call sugar. The sparkling cubes which we buy for a nickel per pound are lumps of crystallized sunshine, or, if you please, concentrated energy. The growing cane absorbs carbonic acid gas from the air, throws off oxygen and deposits carbon in the plant. The carbon combines with hydrogen and oxygen given up from the water absorbed by roots and from the atmosphere. From a single pound of sugar cane we may obtain 2,800 grains of carbon. In these bodies of ours, often called human furnaces, we burn sugar, and so great is its heat-giving power that ten grains of cut-loaf sugar, when consumed in the body, will produce sufficient heat to raise 8.61 pounds of water one degree $F$., which is equal to lifting 6.649 pounds one foot high. (Edward Smith.)
Some chemists call this force potential energy. It is stored up in different sorts of food in varying volume. There is as much or more in starch than sugar, but in the case of starch it must first be converted into sugar, which the system does as soon as it enters the mouth. Sugar is the very best example of respiratory food, because its action in the system is rapid, and, as a general rule the sugar is fully decomposed or destroyedburnt up, which is not the case with foods consisting largely of albumen. One ounce of sugar burnt up in the system gives four times more of energy than one ounce of Bass' ale, 25 per cent more than oue ounce of cooked beefsteak, nearly four times as much as can be obtained from a like quantity of potatoes.
Crystallized sunshine, as it is turned out in sparkling cubes, or as a granulated mass from the huge, smokebegrimed brick structures that are such conspicuous objects along the river front of New York, Philadelphia and the bay of San Francisco, plays a very important part in our dietary. And until recently it had a very important part in Uncle Sam's economy, for we find that during the past twenty-five years (1866-1891) sugar placed over $\$ 1,000,000$ in the national treasury in the shape of a duty or a tax on the energy-building power of the people. It is not any wonder, then, that sugar plays a very prominent part in the political world. It is a splendid source of financial strength to many governments, as it is a physical strength to those who are its consumers.
Chemically considered, there are several sorts of sugar, but using the term in its general sense, we may say that it can be obtaincd from linen rags and sawdust, as well as from beets and other roots, maize, sorghum, the palm and the cane. The chemical production of fruit sugar, grape sugar or glucose, which will not crystallize, is very different from that of cane or beet sugar. If one atom of water could be eliminated from a molecule of glucose, we would have a chemical formula identical with cane sugar. Will it be the same, if the change is ever brought about? Some chemists claim it will, but nature, in her laboratory, makes different ${ }^{+}$hings from the same chemical formula, and Las tricks of combination that defy our power of research and investigation.-American Grocer.

## Amalgam Cement for Porcelain.

A very stable and lasting cement for articles of porcelain that do not have to be submitted to a very great degree of heat is made, according to the Farben Zeitung, as follows: First prepare a fine powder of metallic copper, by shaking a solution of copper sulphate with granul ted tin. Wash the powder well after precipitation. The proportion of this powder will vary according to the desired hardness of the cement (which is, in fact, an amalgam), and may run from 20 to 36 parts, the rule being the more copper, the harder the cement. Place the desired quantity in a porcelain vessel and add to it sufficient sulphuric acid of 1.85 s . g. to make a pasty mass. Add at once 70 parts of metallic mercury and stir constantly until a homogeneous amalgam is obtained. Wash with plenty of warm water until all the sulphuric acid is removed. To use this amalgam it must be heated until it becomes likes wax. The edges of the article to be united should also be heated to about $375^{\circ} \mathrm{C}$. (about $706^{\circ} \mathrm{F}$.) should also be heated to about $375^{\circ} \mathrm{C}$. (about $706^{\circ} \mathrm{F}$.)
When applied to the heated amalgam a portion of the latter will attach itself to the edges, which may then be joined. As soon as it is cool the article is ready for use. It will then stand heat up to $500^{\circ}$ F. without any danger.

## Vesuvius.

Professor Palmieri writes: "Vesuvius, the activity of which was rather increased last full moon, and then decreased during the last few days, has again commenced to show signs that we may expect new eruptions and flows of lava. From the principal crater much smoke issues, and detonations are heard and redhot stones are thrown out. The eruptive cone in the Atrio del Cavallo emits smoke from its summit with a certain force, while from its base the lava flows more rapidly. A smaller cone in the same place is not quite so active. For many days the seismic in struments have maintained a constant movement struments have maintai
which tends to increase."

## the photoret.

This is the name given to a complete little photographic camera, an American invention, which eclipses for compactness and novelty anything of the kind that has come under our notice. It resembles in outward appearance a nickel-plated watch, and is readily operated with one hand. The lens is rather minute and of fixed focus, but still makes a sharp, small picture which can be subsequently enlarged four or five diameters to advantage. What appears to be the ring and stem of the watch is the releasing pin for the shutter and for revolving the lens, bringing it into a new position for the next picture, and at the same time winding up the shutter spring. There are also numbers stamped on the periphery of the lens holder which indicate the number of pictures that have been taken; these numbers show as the outer case is rotated."
On the front is a small pin-hole called "time stop." If a common pin is inserted here and the stem of the watch be pressed as shown, the lens will remain open as long as the pressure is maintained, and a time exposure may thus be made.
The camera is loaded by unscrewing the back and inserting the sensitized thin film of celluloid face downward. On this film six small pictures may be made. Then in a dark room the film is removed and another inserted. These films are supplied with the camera in special boxes, each containing a compartment holding six fresh films and a vacant one for holding the ex-

posed films. Enough films are supplied with each camera watch to make thirty-six different pictures. There is also a small book of concise directions, which describe fully the method of operating the camera and of making the pictures. The price at which the camera is sold is very low, and it is certainly an article of no inconsiderable utility. Small as it is, it is useful, not only to the beginner in photography, but to those who are experienced in this beautiful art. There are many situations in which the taking of a photograph by means of a pocket camera like this becomes desirable and even important; situations, in fact, in which it would be impossible to use a large instrument. At all times and in all places it is useful. With it the owner may take snap shots of people, of animals, buildings, machinery and objects of nature. The student of science may use it in microscopical illustration. For the preparation of lantern slides it is especially convenient and yields excellent results.

Workers in almost every profession or trade may derive valuable assistance and be enabled to carry to their offices or work benches ideas and effects, many of which will repay a hundredfold the time and attention bestowed on them.
The design of a fabric, the draping of a garment or hanging, a striking effect in architecture, etc.- these, suggest itself as desirable to the operator, can be captured.

Independently of the greater uses, such as we have
indicated, we welcome the advent of such contrivances
as this, because they are of special interest to the young, and contain the elements for much harmless amuse ment and enjoyment. How much better it is for young folks to be occupied in picture taking than in learning cruel sports, such as bird shooting, pistol firing, etc. The boys and girls, as well as grown people, are likely to be delighted with this little invention.
We give a specimen of the portraiture produced by means of this camera. The small face is that made by the photoret, of which the larger face is an enlargement.
Further information may be obtained from the manufacturers, the Magic Introduction Company, 321 Broadway, New York City.

## The Motions of the Diamond.

Sir R. Ball, who is fond of revealing the marvelous. has been studying the mysterious action of molecules ; and what he has to say concerning the movements of the molecules of a diamond is as truly surprising as anything he has told us about the sun and the planets. Every body is composed of a multitude of extremely, but not infinitely, small molecules, and it might be thought, says Sir Robert (according to a contributor in the Newcastle, Eng., Chronicle), that in a solid, at all events, the little particles must be clustered together in a compact mass. But the truth is far more wonder ful. Were the sensibility of our eyes increased so as to make them a few million times more powerful, it would be seen that the diamond atoms, which form the perfect gem when aggregated in sufficient myriads, are each in a condition of rapid movement of the most complex description. Each molecule would be seen swinging to and fro with the utmost violence among the neighboring molecules and quivering from the shocks it receives from the vehement encounters with other molecules, which occur millions of times in each second. The hardness and impenetrability so charac teristic would at first sight seem to refute the supposition that it is no more than a cluster of rapidly moving particles; but the well known impenetrability of the gem arises from the fact that, when attempt is made to press a steel point into the stone, it fails because the press a steel point into the stone, it fails because the
rapidly moving molecules of the stone batter the rapidly moving molecules of the stone batter the
metal with such extraordinary vehemence that they metal with such extraordinary vehemence that they
refuse to allow it to penetrate or even to mark the crystallized surface. When glass is cut with a diamond, the edge which seems so hard is really composed of rapidly moving atoms. The glass which is cut is also merely a muss of moving molecules, and what seems to happen is that, as the diamon is pressed forward, its several particles, by their superior vigor, drive the little particles of glass out of the way.

## Gardening by Electricity.

By the use of electric light the Hon. W. W. Rawson, of Arlington, Mass., claims that he makes a gain of five days in each of his three crops of lettuce-that is, two weeks in a season-that the gain on one crop pays all the expenses of the electric lighting for the season, thus giving him the gain on the other two for extra profit. His attention was first called to the usefulness of the light by the advance made in the growth at the ends of his greenhouses next the street and in the glare of the electric light. This was so marked that he introduced the light through his lettuce and cucumber houses. Dr. Baily, of Cornell University, says, as the result of his own experiments, that the in fluence of the light is greatly modified by the inter position of a glass roof. Plants injured by a naked light were benefited by the protected light. Five hours' light per night at a distance of twelve feet hastened maturity a week or ten days, but proved injurious to young plants and those newly trans planted.

## A Word to Mail Subscribers.

At the end of every year a great many subscriptions to the various Scientific American publications expire.
The bills for 1894 for the Scientific American, the Scientific American Supplement, and the Architect's and Builder's Edition of the Scientific American are now being mailed to those whose subscriptions come to an end with the year. Responding promptly to the invitation to renew saves removing the name from our subscription books, and secures without interruption the reception of the paper by the subscriber.

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## Sorrespondence.

## To Prevent frost on windows

To the Editor of the Scientific American
If F. P. R., in query 5481, November 18, will make his glass double, leaving one-half inch or more space between, and make it air-tight, he will have no more trouble with frost. I have used windows made in that manner for fifteen years, and never saw any frost on them when the space between the glass was air-tight.
Wallingford, Conn., December 4, 1893.

Watching for Shed Fires, Central Pacific Railway
To the Editor of the Scientific American:
On page 346 is an article under the heading "Snow Sheds of the Union Pacific." The locality described is on the Central Pacific.
In this connection it may be of interest to some of your readers to know that as a further guard against fire a watchman is located high up the mountain side, at Cisco, from which vantage ground he has in view almost the entire line of these forty-odd miles of sheds. Part of his apparatus consists of a dial, with a pointer so arranged that in case of fire at night, by bringing the pointer in line with the blaze and then consulting the dial he is at once able to locate the fire and give the alarm to the fire train at Summit.
The enormous cost of the structure causes the company to take every precaution to guard against its destruction.

Wm. L. Pattiani.
San Francisco, December 1, 1893.

## Steam, Heat and Water

## by johnm. taylor.

Steam is pure water expanded by heat into an invisible vapor. Perfect steam is in no way moist, but is as dry as are the permanent gases. It has in a complete degree those properties of fluidity, mobility, elasticity and quality of pressure in every direction that distinguish gases.
Saturated steam is the normal condition of steam generated in free contact with water, and the same density and same pressure always exist in conjunction with the same temperature. It therefore is at both its condensing and generating points, $i . e$., it is condensed if its temperature is reduced, and more water is evaporated if its temperature is raised.
The pressure and density of steam, generated in free contact with water, rise with the temperature, and reciprocally its temperature rises with the pressure and density. The higher the temperature the more exactly proportionate to the variations of temperature Under this condition, steam is termed "saturated" from its containing the largest amount of water possible at any given temperature.
The pressure of steam at a boiling point of $212^{\circ}$ is equal to the pressure of the atmosphere, which is 14.7 lb. upon a square inch.
The expansive force of the vapor of all fluids is the same at their boiling points.
A cubic inch of water evaporated under ordinary atmospheric pressure is converted into 1,640 cubic inches of steam, or nearly one cubic foot, and it exerts a mechanical force equal to raising $14.7 \times 144=2,120$ lb. 1 foot high.
One pound pressure of steam will support a column of mercury $=2.0376$ inches high.

The boiling point of water varies with the pressure of the atmosphere or vapor under which it is effected.
Steam for heating purposes possesses an advantage over hot water in the ease of its application where great inequalities and frequent alterations of level occur, and particularly when the boiler must be placed higher than the place to be heated. For buildings occupied at intervals, steam is more effective than hot water in its rapid generation of heat.

The most prominent of the properties of steam are its high expansive force, its condensation by the abstraction of its temperature, its concealed or undeveloped heat, and the inverted ratio of its pressure to the space it occupies.
The expansive force of steam arises from the absence of cohesion between and among the particles of water. If a known volume of steam of a certain pressure be made to occupy but one-half of its volume, its elastic power will be doubled.
Steam has an expanding force always equal to the pressure under which it is generated, and its temperature theoretically is always the same as that of the water in contact with it.
The sum of its sensible and latent heat is al ways the same and is equal to $1,146^{\circ}$ above the freezing point of water. Under ordinary atmospheric pressure $27 \cdot 222$ cubic feet weigh one pound, and it has a gravity about equal to one-half that of air at $34^{\circ}$; but if the temperature of air be increased $160^{\circ}$, the gravity of steam will equal two-thirds of the weight of air.

Heat is simply a mode of motion or an influence by which motion is produced among the atoms of sub-
stances. The motion is imperceptible, heat being de ected only by sense of feeling.
It is a universal force, and is referred to as cause and effect. Heat and cold are conditions and! not substances. They are relatively, not absolutely, differ ent, being merely higher or lower degrees of heat.
The three most apparent effects of heat, so far as they relate to the form and dimensions of bodies, are expansion, liquefaction, and vaporization. Its effect is most evident in those bodies which are the least influenced by the attraction of cohesion; thus in solids it is comparatively trifling, in liquids it is much greater while in gases it is very considerable.
The force with which bodies expand and contract under the influence of an increase or diminution of heat is irresistible, and is one of the greatest forces in ature.
The ratio of expansion in solids and liquids increases with temperature, while in gases it is sensibly uni orm at all temperatures.
A unit of heat is the quantity of heat necessary to aise 1 lb . of water $1^{\circ} \mathrm{F}$.
Specific heat is the capacity of a body for heat, and is the number of heat units necessary to raise 1 lb . of any substance $1^{\circ}$. The specific heat of all bodies, exept gases, increases with their temperatures.
Latent heat is the number of heat units absorbed by any body in passing from a solid state to a liquid or from a liquid to a gaseous condition.
Heat is transmitted or lost by radiation-projected in rays and in straight lines. By convection rising in fluid masses or through flues. By conduction-passing from one body to another in contact.
The heat necessary to warm a pound of water $1^{\circ}$ will warm about 4.2 lb . of air $1^{\circ}$, or 2.1 lb . of vapor of water, or 9 lb . of iron, or nearly 2 lb . of ice one degree. The heat necessary to convert 1 lb . of water from $178^{\circ}$ (which is about the temperature of return water) to steam is about 1,000 units, and this will heat 52,000 cubic feet of air $1^{\circ}$, or 5,200 cubic feet $10^{\circ}$, or 52 feet $100^{\circ}$, without making allowance for the increase of its bulk because of its expansion, which for a difference of $100^{\circ}$ will equal nearly 20 per cent of its original bulk.

## WATER.

Whether as a solid, liquid, or gas, water is one of the most wonderful substances in nature. At all temper atures above $32^{\circ} \mathrm{F}$. the motion of heat is sufficient to keep its molecules from rigid union; but at $32^{\circ}$ the motion becomes so reduced that the atoms seize upon each other and aggregate to a solid.
It is composed by a chemical union of oxygen and hydrogen in the proportions of: By weight, oxygen, 88.9 parts; hydrogen, $1 \cdot 11$ parts. By volume, oxygen, 1 part ; hydrogen, 2 parts.
Liquids transmit pressure equally in all directions, unchanged and without loss of power. This equality of pressure is their most characteristic property.
Water at 1,000 ounces is assumed as unity in the comparison of gravity of different substances.
It evaporates at all temperatures, dissolves more substances than any other agent, and has a greater capacity for heat than any other known substance except hydrogen gas.
Twenty volumes of water absorb one volume of air under atmospheric pressure.
A miner's inch is a measure for the flow of water, and is an opening 1 inch square through a plank 2 inches thick, under a head of 6 inches of water, to the upper edge of the opening. It will discharge $115 / 8$ gallons in one minute.
A cylinder $31 / 3$ inches in diameter and 6 inches high will hold almost exactly one quart, and one 7 inches in diameter and 6 inches high will hold very nearly one gallon.
The ratio of fresh water to salt water is about as is 36 to 35 by weight
Radiation is effected by nature of surface of body; thus, black and rough surfaces radiate and absorb more heat than light and polished surfaces.
Bodies which radiate heat best, absorb it best.
Radiant heat passes through moderate thicknesses or heati ray of heat, it absorbs a portion of it and reflects the rest. The quantity of heat absorbed by the body from its surface is the measure of its absorbing power, and the heat reflecting, that of its reflecting power.
When temperature of a body remains constant, it is quantity of heat absorbed by body.
Reflecting power of a body is complement of its absorbing power; or sum of absorbing and reflecting powers of all bodies is the same. Thus, if quantity of heat which strikes a body $=100$, and radiating and reflecting power each 90 , the absorbent would be 10 .
Air and gases are very imperfect conductors. Heat appears to be transmitted through them almost entirely by conveyance, the heated portions of air becoming lighter, and diffusing the heat through the mass in their ascent. Hence, in heating a room with air, the hot air should be introduced at lowest part. Convec-
tion of heat refers to transfer and diffusion of heat in
a fluid mass, by means of the motion of the particles of the mass.
A low pressure gravity apparatus is the most healthul, economical, cleanly, and perfect heating appliance known, and may be constructed to heat a single room or the largest building with a uniformity that cannot be attained by any other means.
A gravity apparatus is one without an outlet whose circulation is perfect, wasting no water and requiring no mechanical means for returning the water of condensation to the boiler. It has been very properly likened unto the circulation of blood in the human system.
This form of apparatus is extensively employed in warming private houses, churches, schools, and other public buildings, with very satisfactory results. Its chief merits are its safety, noislessness, the ease with which it is managed, the low and uniform temperature of its surfaces, and the positive return of the water of condensation to the boiler under all conditions.
A low pressure gravity circulation apparatus consists of the boiler with its various attachments for the automatic regulation of its draughts and pressures; main steam pipes and risers for conveying the steam to the various parts of a building to be warmed, and the corresponding return risers and mains for the return of condensation to the boiler; relief pipes for relieving the mains and risers of the water of condensation, and for equalizing the pressure throughout the apparatus; radiators for the several rooms to be warmed, with their necessary valves and connec-tions.-Master Steam Fitter.

Professor E. E. Barnard, of the Lick Observatory, recently gave a lecture on astronomy in San Francisco, which is spoken of by the Scientific and Mining Press as having been interesting. Many stereopticon illustrations were shown. Professor Barnard said that photography had enabled the astronomers of to-day to see that of which their brethren of a few years ago had never dreamed. Even the trained eye of the most eminent astronomer begins to grow tired after looking through a telescope a minute, and after that his vision becomes less acute. Any object that he fails to notice in that short time passes by unseen. The plate in a camera, however, may be left exposed for hours, during which time even the faintest star will have left at least some slight trace.
About sixty stereopticon views were presented, showing some of the most interesting of the heavenly bodies under varying conditions. In a photograph of the moon's surface could be seen the dark areas called seas and the vast lunar craters.
A picture of the sun's disk revealed a sun spot said to be three times as large as the earth. Ragged-looking holes that looked as if they had been made by a tremendous explosion were plainly visible, and were said to be shattered places in the sun's atmosphere.
Two drawings of the planet Mars were particularly interesting. It will be remembered that this brilliant neighbor of ours is about $35,000,000$ miles distant from the earth, and therefore the difficulty of obtaining an accurate representation of it may be imagined. The planet as a whole is of an ocher cast, but the trained eye of the astronomer detects little green spots, believed to be water, and others supposed to be land. At the poles are white spots, evidently iceand snow. This white region diminishes in density as it approaches the equator, and finally disappears altogether. Professor Barnard said that these spots increase in extent as the planet moves away from the sun and the temperature presumably grows colder, thus tending to substantiate the theory that the poles of Mars are surrounded by ice and snow, as are those of the earth.
The streak across the sky commonly known as the Milky Way becomes a thing of beauty when reproduced on canvas by means of a camera. The clouds of countless stars, each one a great sun in itself, assume an added brilliancy that one would hardly suppose exists when looking at them with the naked eye. It requires four hours for this collection of heavenly sparklers to make an impression on the supersensitive plate of a camera, and during all this time the camera is moved by clockwork to keep pace with the stars as they seem to be winging their tireless way through space. The great comet of 1882, which startled all the world with its long tail, was reproduced with startling effect. This comet has a tail $100,000,000$ miles long, and will not be again visible to the inhabitants of the earth until 800 years have passed away.

## Good Lemonade.

For a quart I take the juice of three lemons, using the rind of one of them. I am careful to peel the rind very thin, getting just the yellow outside; this I cut into pieces and put with the juice and powdered sugar, of which I use two ounces to the quart, in a jug or jar with a cover. When the water is just at the tea point I pour it over the lemon and sugar, cover at once and let it get cold. Try this way once, and you once and let it get cold. Try this
will never make it any other way.
the traveling garbage burner of chicago.
The disposal of garbage and other refuse from the household is the most serious hygienic question that municipal governments have to deal with, as the health of a city depends to a large extent upon the efficiency of the street cleaning department. The most common method of removing garbage is by means of carts that go from house to house gathering whatever refuse there may be until the wagon is loaded, then through the streets with the foul-smelling and disease-breeding load to a distant dump, which, in cities on the sea coast, may be a scow, but which in most cities is more liable to mean a depression in the ground, which is filled with this putrid matter and left to contaminate the whole region.
An effectual way to dispose of garbage is to burn it, and this can be accomplished either by the use of stationary or by portable crematories. One great hindrance to a satisfactory and economic system of collecting and destroying it is the fact that to the garbage are added ashes, old shoes, bottles, tin cans, paper paper and household refuse of all kinds.
The city of Chicago has taken hold of this matter

On the top is a receiving box into which the garbage is thrown and where it is subjected to sufficient heat to drive out most of its moisture. When the box is filled a rod attached to the sliding bottom is pulled out and the contents dropped into the furnace, where the intense heat incinerates it instantly. While this burn ing process is going on an attendant pushes the burnng mass into a forward compartment, which contains an inclined grate, in order to keep the consuming capacity of the furnace up to its highest mark. The fire is maintained by the use of crude petroleum. Two cans designed to hold this fuel are used; one is on the rear end, immediately over the furnace doors, and the other is forward. The flow of this fuel is easily regu lated by a stopcock, so that if the fire becomes low it can be enkindled almost instantly, making the crema tory a roaring furnace. Frequently, when in operation, the smokestack reaches a white heat, so intense is the heat generated. The capacity of this furnace is enormous, and ordinary garbage disappears in it like

Only the garbage proper is fed into the receiving
Only the garbage proper is fed into the receiving
casions when thirty blocks have been covered. This means a large amount of work in a city like Chicago, where in most instances eight blocks equal a mile. When the crematory and tender have been through an alleyway the transformation is surprising, as the place has been cleaned of disease-breeding refuse and other litter. It is estimated that this outfit of traveling crematory and wagon will take the place of fifteen to twenty ordinary garbage wagons, and it has a special advantage over them in that everything subject to decay is burned on the spot where it is gathered and foul odors are not stirred up and carried through busy streets, risking the spread of disease. Whatever noxious gases arise from the smokestack are soon dissipated, and the crematory, after disposing of the garbage on one block, moves along to the next, so that there is not a constant stream of such gases being poured out from one source as would be the case in a tationary furnace.
No comparison of this system of disposing of garbage over the garbage cart system has been made to a sufficient extent to admit of giving any definite figures, but enough has been learned to lead the street clean-


THE TRAVELING GARBAGE BURNER OF CHICAGO.
with much vigor and has tried both stationary and material is fed into the rear door immediately into the portable crematories. Superintendent Welles, of the street cleaning department, was not satisfied with the results obtained; so devised a crematory of his own, which is shown in the accompanying illustration, as it appears in actual work in an alleyway on the west side of Chicago. It is a very simple affair and made solely for service, all regard for appearance being thrown aside. This crematory has produced decidedly satisfactory results, and Mr. Welles regards it as the most successful one that has yet been produced, all things considered.

The crematory weighs 7,700 pounds and is drawn by a pair of horses. It comprises a cylinder eight feet long and four feet in diameter, made of ordinary boiler iron covered with abestos. A tall smokestack in front completes it, the whole being mounted on wheels. The general appearance of the crematory is not much unlike a traction engine. The cylinder is divided longitudinally into three compartments, two of which can be seen in the illustration, half of the double door to each being open. The upper compartment is the furnace proper and the lower one is the ash pit. In the forward part of the cylinder is a third compartment, the grate of which is inclined toward the front end.
fire. One man is represented in the illustration as about to throw a shovelful of paper into the furnace, while another has just removed a shovelful of garbage from the garbage box, preparatory to throwing it into the receiving box. The man at the right with the rake in his hands assists in separating ashes from the garbage proper, and rakes up into piles whatever cannot be burned ready for the wagon that follows the crematory to gather up. Most of the allevways in Chicago are paved with wooden blocks, and, in order to prevent any danger of their being set on fire from hot coals, a sheet iron apron, as shown in the picture is stretched under the furnace door togatherall falling embers.
The crematory is followed by a wagon which gathers up ashes, bottles, tin cans, and other refuse that cannot be consumed. Four or five times in the course of a day the ashes are drawn from the crematory in order to give it good draught, but this little residuum takes a very small fraction of the space that the burned garbage occupied, and all disease-breeding germs are consumed. The ordinary day's work of this traveling crematory, and the two refuse carts which follow it, crematory, and the two refuse carts which follow it,
is twenty-three blocks, although there have been oc-
ing department of Chicago to believe that the portable crematory is vastly more efficient than anything that has yet been attempted in that city and is less expen sive. It is estimated the cost of the crematory and men to manage it and two teams to remove the ashes and other refuse is less than $\$ 20$ a day.

## Avalanches Produced by Railways.

A correspondent to the London Times records a curious and altogether unexpected result of the tunneling operations in the St . Gothard is a lawsuit instituted by the inhabitants of the adjacent valleys. They sue the federal government for damages caused by the great increase of avalanches which constantly th under down the mountain side, produced, it is presumed, by the explosions of dynamite more than by the vibrations of passing trains in the lower tunnels of the rail way. Many witnesses, who have lived in the neighborhood since the early part of the century, will swear to the greatly augmented number and force of the avalanches that now constantly sweep destruction down the mountain. The first hearing of this novel case was lately heard before the federal judges assembled at Bellinzona. We believe there is no instance in this country of an avalanche produced by railway service.

La Navarre, New French Passenger Steamer.
La Navarre was launched from the yard at Penhoet St. Nazaire, and is built of steel. Engineering says she is divided into fifteen compartments by thirteen transverse bulkheads, and a longitudinal bulkhead in the engine room. There are four complete decks; the promenade deck extends half the length of the vessel. promenade deck extends half the length of the vessel.
The vessel is 494 feet in length and 49 feet 3 inches The vessel is 494 feet in length and 49 feet 3 inche
beam, with a depth of about 37 feet. Her displace beam, with a depth of abo
ment is 8,922 tons at a ment is 8,922 tons at a
loaded draught of 22 feet 8 inches. The vessel is, of course, propelled by twin screws, driven by triple expansion encines Fach expansion engines. Each power, showing a total power of 7,500, with 90 revolutions a minute. The cylinders are $311 / 2$ inches, $501 / 4$ inches, and $821 / 2$ inches in diameter, with a stroke of $521 / 2$ inches. Each engine has its own condenser, 14 feet 1 inch long, 6 feet broad, and 10 feet 10 inches high. The total length of the tubes is upward of 27 miles. The boilers are double ended, four in number, and having a total of twenty-four furnaces of a diameter of 47 inches. There are four ventilating fans for forced draught. The propellers are of gun metal and their diameter is 15 feet 4 inches. The funnels, two in number, are elliptical, the greater diameter being 8 feet 10 inches, and the lesser 5 feet 3


FRONT END OF THE BURT LOCOMOTIVE, SHOWING FLANGED WHEELS.

THE BURT WOODEN RAILWAY, CALIFORNIA.
Mr. John James Burt, originally a lawyer, owns a valuable marble quarry and lime kilns at Cienega, about 12 miles from Tres Pinos. Four kilns and forty men are employed producing lime. To carry the lime to the main railroad line, Mr. Burt has built a wooden railway about 12 miles long, which connects with the railway about 12 miles long, which connects with the terminus of a bra 4 by 6 inches square, and about 2 feet apart. On these the longitudinal wooden sleepers are laid, made of 3 by 4 inch scanting, each rail consisting of three pieces laid side by side, and forming a continuous wooden floor pathway 24 inches broad, except that a narrow slot is left in the cen ter of the floor. On this floor the engine and cars travel, being carried by road centrally flanged rollers or wheels, marked A A in the cut of the fron end of the engine. These ollers are a little over 24 inches long and are pro vided with a central flange which enters the slot be tween the rails and pre vents the engine from leaving the track. A recent patent of Mr. Burt's provides for making the rollers in two halves, half of the flange being cast on each section. The sections are then mounted so as to rotate independently of inches. She is furnished with two masts, and these Bordeaux and Cette was utilized, the left hand track|each other. This is to secure ease in turning curves do not carry yards. Accommodation is afforded for serving for the trains coming from the latter town, The road is a private one, its rights being granted by 250 saloon, 54 second and 74 third class passengers. In while on the right hand track the trains run in the op- the county supervisor. Considerable grades exist on addition to this. on the lower deck no less than 600 emigrants can be berthed. For the purpose of the proper separation of the sexes, these are carried in three separate divisions. The first class passengers are of course amidships. The dining saloon on the upper deck will seat 152 persons at one time. There are small tables at the sides for private parties, as well as the long tables in the middle of the room. This room is 66 feet long and 32 feet 9 inches broad. The salon de conversation, or, as the Americans will doubtless call it, "the social hall," is about 40 feet long, and is lighted by a dome as well as by the usual side port holes. The decoration of this room has been particularly at tended to, and the walls are paneled with mar queterie. The usual smoke rooms, barber's shop, and bath rooms are not íorgotten. On the main deck are the children's dining saloon forward, and the saloon forward, and the second class passengers dining saloon aft. The cabins de luxe and family cabins are on the promenade deck. La Navarre is lighted throughout by electricity, there being 742 lights on board. There is also a refrigerating apparatus on the Fixary system for the manufacture of ice and for the preservation of the fresh provisions. This vessel is capable of being used as an auxiliary in time of war. La Navarre attained a speed of 18 knots on trial without being forced.

## A. Work on the Railway Exhir.

Our readers know how interesting a railway exhibit was presented at the World's Columbian Exposition. Mr. J. J. Pangborn, United States Honorary Commissioner, is preparing to issue an edition de luxe of a book devoted to this subject. In size it will be a large octavo, and is to be sumptuously printed and illustrated. The use of color in the cuts adds greatly to the' appearance of the book and it will meet with a warm reception at the hands of those who appreciate an interesting subject so care fully and expensively presented. It is to cover the en
tire period of development of the locomotive and railway; it will have one hundred and fifty-three color plates, and the same number of single color plates. There will be 160 pages, printed on hand-made paper

Some int Magnetization of Steel Rails.
Some interesting experiments have been carried out by M. Vinot, a French engineer, in regard to the mag
while on the right hand track the trains run in the op-
posite direction. On the experimental station chosen the rails were laid in a direction at right angles to the magnetic meridian, or in other words, from west to east, and it was found that when a pocket compass was placed on one of the joints in the left hand track, the needle pointed exactly in the direction of the line of rails, the north pole being turned toward the town rails, the north pole being turned toward the town
of Cette. With the same compass similarly placed on the right hand track, the needle again pointed in the direction of the line of the rails, but the the road, which are readily overcome. One of our views shows the engine with one of the freight cars, Mr. Burt standing on the forward end. Another en graving (see next page) shows the lines of rail passing over a trestle and extending back into the country. The arrangement of the wheels with their central flanges is shown in the view of the front end of the boiler. The system is a novel one and has features which might make it of very great utility in some re gions of the country. It may be accepted by our readers as a further contribution to the history of rail


THE BURT LOCOMOTIVE ENGINE AND FREIGHT CAR

The secret of this singular phenomenon was conclusively demonstrated. The distances allowed for expansion between rail ends varied from about one-tenth to one-half inch, producing a very perceptible shock on the passage of trains, from the respective depressions and elevations of the ends of the rails and their influence on the car wheels, and these shocks, it was found, developed a south polarity in those rail ends in which the concussion took place.
which formed the subject of an article in a recent Scientific American.
The marble quarry of J. J. Burt, Esq., is situated in the hills at Cienega, about twelve miles from Tres Pinos, and is known as the Cienega Lime and Marble Quarry. It is one of the largest deposits of marble in the State, while none of finer quality can be found anywhere. The locality where this marble is found was purchased by Mr. Burt some years ago. He has been supplying all parts of the State with lime for some six years, and it is of such superior quality that it brings 25 cents more per barrel than any other on the market.
The mountains containing this valuable marble are 1,500 feet high and run some six miles back. This marble can be seen cropping out in every direction. In fact, there is no end to it. A remarkable fact in this connection is that the present workings are in a canyon, on the opposite side of which from the marble ledges is a vast de-

## posit of granite of good quality. Thus the two valu-

 able building stones may be quarried out at one and the same time. There is a very large area of both marble and granite, comprising several hundred acres. Fo say there are a thousand fortunes in this property is putting it mildly.Mr. Burt, up to the time of his purchasing this valuable property, was a leading lawyer in San Jose, but finding his health giving out, he decided to make
a change and find some way to busy himself; he has given up all other engagements and located at the quarry for the purpose of introducing it into the market in the way of monuments, statuary and contracting with builders to furnish it for ornamental purposes.
We are indebted to Mr. J. M. Pickett, of Hollister, Cal., for a set of admirable photographs of the Burt railway. From these our engravings were prepared.

## To Trade Mark Appeals.

It has been settled by a decision of the Court of Appeals of the District of Columbia that appeal does not lie to it from the Commissioner of Patents in trade mark disputes. This is an important decision. Dis putes between trade mark claimants are commonly re ferred to as "interferences" in trade marks. Under the law establishing the Court of Appeals of the Distric of Columbia it is provided that any party aggrieved by a decision of the Commissioner of Patents in any in terference case may appeal therefrom to the said court In dismissing the appeal the court held that the word "interference," as used in the act establishing the court, applied only to patent cases or applications therefor and not to trade mark disputes.

## Source of the Mackenzie River

The great Mackenzie River, the mightiest stream on the American continent, excepting only the Mississippi, has never been traced to its head, and up to the present time the source from which it issues has only been known from Indian report. The mystery has, however, now been solved by R. G. McConnell, of the Dominion Geological Survey, who has just re ${ }^{-}$ turned from a four months' exploration trip in those regions.
Mr. McConnell arrived in British Columbia from Otta wa in June and started out on his trip from Quesnelle on the 9th of that month. That at least may be said to be the commencement of his trip, as on that day he left civilization behind. The party numbered six in all, and consisted of himself, his assistant, Mr. Russell, who, by the way, is one of the leading hockey players of Canada, two whites he got at Quesnelle and two Indians. From Quesnelle the party proceeded in canoes up the Fraser to Giscome Portage. This is seven and a half miles long, and after crossing it they proceeded down Crooked River to Fort McLeod. Their route then lay down Parsnip River to the forks, where Findlay River meets the Parsnip and gives birth to Peace River.

On reaching Findlay River Mr. McConnell really commenced his summer's work, as the chief object of his trip was to explore that river and, if possible, the Omineca also. Mr. McConnell accordingly went up Findlay River to its junction with the Omineca, and followed the latter river to its head, returning down it again to the same spot. This river is easily navigable on the upper portion, but in the first thirty miles it falls over 500 feet, and is consequently extremely rapid and difficult to ascend. Mr. McConnell then proceeded up the Findlay River.
Whites had been up to the Omineca River previous to him, as at one time that was a famous gold country, but Mr. McConnell and his party were the first whites to ever ascend the Findlay River to its head. The river is about 250 miles long and is navigable for the greater portion of the way in canoes, though owing to the rapids the party had to proceed the last fifty miles on foot, an arduous task, owing to the roughness of the country. The country is very mountainous, and though at the lower part of the river the valley is six miles wide, the mountains come right down to the water's edge in the upper portion.

At its mouth the Findlay is about as wide as the Fraser at Quesnelle. It is not very deep, except in the canons, where the current is very strong, and, owing to the numerous rapids and eddies, progress is very slow. At the head of Findlay River is a lake known in the Indian tongue as Lake Fehutade, which, being interpreted, means "narrow waters between mountains." This lake is the real source of the Mackenzie River. It is between twenty-five and thirty miles long and not
more than a quarter of a mile wide, and is inclosed by high mountains.
Around the edge of the lake are glaciers, and the scene is a very pretty one. The mountains rise 5,000 to 6,000 feet above the lake, while they are some 9,000 feet above the level of the sea. After exploring the lake Mr. McConnell started on his homeward journey about the end of August, and it was none too soon, as ice began to form on the river, and while on the Parsnip the party experienced a snowstorm.-Vancouver News Advertiser.

## olidified Petroleum.

The method of making fuel bricks of crude petroleum adopted by Engineer Maestracci, of the Italian navy is given as follows by the Revue Scientifique: The bricks are of similar form and size to the coal briquet es extensively used in France and Germany. The nixture is made in the proportion of 1 liter of petroleum, 10 per cent of resin, 150 grammes of powdered soap and 333 grammes of caustic soda. The mixture is heated and stirred at the same time; solidification begins in about 10 minutes, and the operation must then be carefully watched. If there is a tendency to remain liquid, a little more soda is added. The mixture is stirred until the mass becomes nearly solid. The thick paste is then poured into the moulds, which are placed for 10 or 15 minutes in a drying stove. The briquettes are then cooled and are ready for use in ew hours.
Signor Maestracci recommends the addition of 20
per cent of wood sawdust and 20 per cent of clay or
and slimy substances which are, perhaps, derived from the shell or joints of the cane. These impurities can be removed to a surprising extent by simply allowing them to subside in the cold, limed jnice. If the raw juice is heated, these impurities dissolve in the juice nd cannot then be removed
There are also impurities in sorghum juice which are soluble in the raw juice, but which become insoluble when the juice is heated. These form scums and sediment, and can be removed best by hot clarification.

It appears that a much better clarification of sorghum juice can be had by performing a double clarificaion, by liming cold juice, settling the impurities and decanting the juice, by heating the partially clarified juice, adding phosphoric acid, again settling the impurities and again decanting the juice.
This method has been used in Kansas for two seaons. With unstripped cane, that is leaves and cane milled together, and with open steam evaporators or with fire pans, it has given brighter and better sirup, with higher purity, than has yet been had in sorghum diffusion sugar houses.
In these days, when the tendency is distinctly toward larger and yet larger sugar houses, it may seem absurd to mention small mills, but the sorghum industry is obviously compelled to study all means for $\dot{a} d$ vance. The conditions in Kansas are not altogethe the same as those in other sugar-producing countries That State has a scattered population, too distant rom sugar factories to be benefited by them, the greater number engaged in agriculture, owning land and stock, preferring to labor at home, willing to labork harder, more hou to and more cheaply for themselves than for others t is quite possible that they can grow cane cheap ly and utilize the seed, and manufacture the cane in mall mills and make con siderable quantities of crude sugar and molasse or their own use, and it is not impossible that sirup produced in many little mills may increas he outturn of sugar from complete sugar houses.The Louisiana Planter.

The New Railway Tun-
Remarkably good work in hard rock tunnel driv ing is now being done on the Palisades tunnel of the New York, Susquehanna \& Western Railroad, nea New York. This work has been under way about year, and it is expected that the tunnel will be completed early in 1894 During the past month the contractors, Messrs Broadhead \& Hickey drove on the east end of

## THE BURT WOODEN RAILWAY, CALIFORNIA.

sand, which will make the briquettes cheaper and more solid. In trials made at Marseilles on several tugboats the petroleum briquettes furnished about three times as much heat as coal briquettes of the same size. They were burned in the ordinary boiler furnace without any special preparation, and gave out very little smoke, leaving also little or no ash. The advantages claimed for the petroleum briquettes for marine use are the absence of smoke and a large reduction in bulk of fuel whịch must be carried as compared with coal, while the risks attending the carrying of liquid fuel are avoided.

Clarification of Sorghum Juice.
Analysis shows that the difficulty in securing a good yield of sorghum sugar is not caused by a deficiency of sugar in the juice, for it is now easy to produce sorghum cane which has, as a general average, 12 to 14 per cent. of crystallizable sugar in the juice. Sugar canes and sugar beets whose juice contains no more sugar give satisfactory yields.
The difficulty in sorghum manufacture is not in the excessive cost of cane which contains 12 to 14 per cent of sugar, for such cane is produced with much less labor in planting, cultivation or harvesting than sugar cane or beets having the same percentage of ugar.
The difficulty is caused by imperfect separation of mpurities which are peculiar to sorghum juice, and it follows that when a good clarification can be had the ifficulty will vanish.
There are impurities in sorghum juice which can be removed best by cold clarification. Starch is found in considerable quantity in sorghum juice, and gummy
the tunnel, which is in charge of Mr. P. F. McLaughin, 161 feet of headin: and 186 feet of bench, all double track tunnel, dimensions 27 feet by 21 feet. The record in the heading is especially remark able, owing to the fact that the work was done by night shift only, that is only one shift in twenty-four hours. This plan was first introduced by $\mathbf{M r}$. McLaughlin, and has proved so successful that it has since been adopted elsewhere. One of the main advantages of the single shift is that, after the drilling and firing, which takes place early in the morning, common muckers are put to work in the heading to get rid of the broken stone, and the man in charge of these muckers sees that the columns are put up and the drills in place for the runners to begin drill work again on the following night. The rock encountered is the well known Jersey trap, known to be one of the hardest rocks in existence. This good work has been done with four Ingersoll-Sergeant F-2 drills in the heading and six on the bench.

## Election or a New President sitzer

The new president of Switzerland, recently elected, is Emil Frey, who emigrated to this country, and in 1861 was a farm hand in Illinois. When the war broke out he enlisted as a private in the Union army, and faithfully served until the close of hostilities, having participated in several of the principal battles, and endured imprisonment in Libby and other Southern prisons. After the war he returned to Switzerland, where his excellent education, vigorous and useful career as a journalist, soon brought him to the front among the public men of his country, and now he has received the high honor of election to the presidency.

## RECENTLY PATENTED INVENTIONS.

 Engineering.Bridge Construction.-Bernard M. Kash, Joplin, Mo. This inventor has provided a method of constructing supports for oridges, consisting
of lowering into the water a pile made up of sections, driving the pile into the bed, lowering an anchor over the pile, locking it to an engagement with the bed and with the pile, and driving the anchor to a firm seat in its bed. This foundation may be erected in a quick, convenien
and durable manner in deep water, and made capable o and durable mann

## Railway Appliances.

Train Pipe Coupling. - Zachariah . Lightner, Darby, Pa. This invention is intended provide a coupling for air brake or other train pipes s
that the connection may be made without the necessit of going between the cars. A coupling pipe is placed in the coupling head of one of the cars, and this coupling is arranged so as to engage in the coupling head of anothe car. The momentum of the approaching car causes a bumping of the heads, which are yieldingly mounted so
that the parts are not broken, but still the connection be that the parts are not broken, but still the connection be-
tween the pipes will be made. Connection between the tween the pipes will be made. Connection between th
train pipe and the coupling is made by means of hose.
Elevated Railway Brake.-Watson L. Reynolds, Jersey City, N. J. :The brake shoes, accord ing to this nvention, are arranged in pairs, pivotally supported from a common rock shaft and spaced apart to
embrace a track rail, with means for rocking the shaft embrace a track rail, with means for rocking the shaft,
the rocking of the brake shoe shaft serving to apply and the rocking of the brake shoe shaft serving to apply and
release the brakes. A plate spring bears by its ends on release the brakes. A plate spring bears by its ends on
the back of the shoe, affording an improved gripping action on the track rails.
Cinder and Dust Blind.-George W. Bohde, New York City. This is a readily applied de vice, inexpensive, and adapted to fold up in very smal
compass when desired, or to project outward to any ne compass when desired, or to project outward to any ne-
cessary distance to form a perfect shield for the window. It comprises a longitudinally recessed post, a recessed
stile, and slats pivoted in the recesses of the stile and post and adapted to lie in such recesses, there being
Brake Rod Fork.-George W. Kelly Marquette, Michigan. This improvement is especiall adapted for use in connection with the brake rods of railway or street cars. The fork and stem are passed
through body of the fork and headed between the tines. through body of the fork and headed between the tines.
When the fork or jaw is to be used in connection with the top and bottom brake rods, the shank may

## Mechanical.

Wagon Tongue Support.-John F. Tiner, Sutherland Springs, Texas. This novel device spring is coiled; at either end of the spring is a ratchet has a tendency fo hold up the tongue through the medium of the chain and wheels. This invention does not interfere with the ordinary running gear and take
Gate.-Jacob E. Knapp, Brownsville Oregon. The object of this invention is to provide a
gate swinging from its center through the manipulation of levers. The gate is lifted vertically at the same tim it swings open. After the person has passed through th other lever is depressed and the gate swings back to it
normal position. The mechanism can be applied to normal position. The mech
either a single or double gate.
Motor for Clocks.-Sigismund B. Wortmann, of New York City. This invention is a mo tor of the gravity type, adapted for the propulsion of
clock mechanism without employing the aid of springs clock mechanism without employing the aid of springs, master gear by means of a weighted lever secured to the shaft of the master wheel.
Wagon Jack. - John F. McDaniel, Syracuse, Kan. The object of this invention is to pro-
vide a simple durable wagon jack capable of convenient manipulation. A feature of the invention is a locking device for the lifting lever, which will act automatically device for the lifting lever, which will act automatically
to hold the lifting bar of the jack in whatever position it may be placed, and further to provide a means where-
by the locking device may be readily disengaged from by the locking device may be re
the lift lever whenever required.

La jd Roller.-David A. Grant, Raleigh, Canada. This invention relates to an improv ment in land rollers by which a number of rollers ma be coupled together and used as one, the rollers having a common frame. The roller may be used on rough or
undulating ground and is also provided with scrapers for undulating ground and is also provided with scrapers fo of independent manipulation, the driver of the rolle being able to bring all the scrapers into requisition any one of them, as occasion may demand.
Chuck for Screw Machines.-Edwin E. Saum and Frederick E. Blackman, Stamford
Conn. This is a chuck more especially designed for us Conn. This is a chuck more especially designed for use
in connection with milling machines, to conveniently and rapidly mill pins, screws, ecc. The construction is such that the articles to be operated on can be placed very
close together, so as to make the cut formed by the cutclose together, so as to make the cut formed by the cut-
ter practically continuous. The device is very simple and durable in construction

Spring Locking Nut.-Charles P. Dorr, Ellsworth, Me. This nut has a thickened central body adapted to receive a bolt and reduced spring arms
thereon extending laterally and returned on themselves, the returned membersextendiag beyond the plane of one face of the nut. The soring arms are adapted to press against an object through which the bolt of the nut extends, so as to take up all slack and prevent the nut
from getting loose.

Lifting Jack - Charles W. Ball, Commerce, Texas. This is a wagon jack of simple and dura-
ble construction, and one which permits of conveniently raising the rear or front axle without shifting the hoist-

Paper Holder.-William P. Stibbs, Belleville, N. J. The object of this invention is to provide a paper holder adapted to receive papers or small
parcels. When the holder is raised slightly and the paper or parcel is about to be inserted, an alarm is ounded by an electric bell connected with the holder of the arm of the holder is raised sufficiently to allow of the insertion of the paper, the contact is broken and
the alarm ceases. Thus the persons in the house are notified when the paper or package is inserted. When it is removed the same action takes place, the bell r
just before the holder reaches the normal position.
Telephone Inventions. - Eloy Nonega, Mexico, Mex. The first invention is a microphonection with heavy currents with especial view to workng over long distances. It is constructed so that it will
emain in adjustment and work uniformly under all onditions. The primary circutt is through carbon bar attached to the diaphragm, and through a series of tering cavities in the bars attached to the diaphragm. These bars are pressed by a spring through the medium of a body of absorbent elastic material. The carbon
lectrodes used in this instrument are made of a new compound of charcoal, coke, and boric acid-sometimes withthe addition of graphite. The second invention is also a transmitter, in which the carbon electrodes are delicate adjustment of the carbons and a more effective action. In this instrument the diaphragm carries two provided with soft iron armatures. A carbon cylinder net located near these armatures holds the carbon cyl inders in electrical contract with the carbon blocks carried by the diaphragm.
Automatic Telephone Exchange rssem. - John Serdinko, New Braunfels, Texas. Com-
bined with a number of sending instruments adapted to send positive and negative impulses, a central registering device for each instrument, are a switch, a magnet and vibrating lever, other novel features of arrangemen nabling the instruments to be connected by a single wire, dispensing with the use of an operator at the cen ral station. Automatic means are also provided fo registering the messages sent by each subscriber, with an scriber may connect with any other.
Support for Trolley Wire.-James E. Walker, Denver, Col. This support is formed of a threaded socket for attachment to the insulator, and a removable clamping piece attached to the main piece by means of screws, wse of solder, thereby prolonging he life of the trolley wire, and it is smooth and noise less.

## Agricultural.

Cultivator.-Andreas Mattijetz, Gidaings, Texas. Iu this machine all the plow shanks ar adjustable to or from the center line of the frame in f plants. The lateral adjustability of the plows upo of plants. The lateral adjustabiinty of the plows upon
the standards is also provided for, means being provided for maintaining both the standards and the plows in
whatever position they may have been placed. The whatever position they may have been placed. The
machine is very light, has an easy draught, and is espe cially adapted for the cultivation of stump fields.

## Miscellaneous

Dust Pan.-George B. Sarchet, Butte, Montana. The frame of this pan has a depressed circuseat, with an inlet leading to and from the seat, in dapted to recister with having an opening in one side struction is simple and durable, and such a dust pan is dapted to readily gather up and retain the sweepings in
Show Case.-Gustave J. Meyer, St. Louis, Mo. This case has sectional glass walls, with lass door in each section, there being also horizonta to form compartments located one above the other The case is preferably made in pyramidal form, the compartments increasing in size toward the top, and in it ollow base is a drawer.
Shoe Fastening. - Henry Vachon, Golden, Canada. This is a lace fastening comprising its edges from and covering the fly and provided on its under side with a central longitudinal series of paralle transverse hooks, each hook comprising oppositely facing
parallel members, while the lacing is rove back and orth through the fly and tongue hooks. Each hook is formed of a single piece of wire and has a spring hook The fastening is quickly made co secure
foot, and gives a nice fit over the instep.
Hook and Eye.-John D. R. Lamson Toledo, Ohio. The hook, according to this improve ment, has its inturned end adapted to form a snap, ard the bow being slightly larger and the side slightly small the bow being slightly larger and the side slightly smalling into the hook, whereby the bow of the eye may b snapped into the hook, and its side may be slipped out when the side is tu
Wire Fence.-Oscar C. and Pierse B Moreland, Henderson, Ky. An economical tie or binder inventors, consisting of a single piece of wire having its opposite ends secured to a common strand of the fence yond the strands on opposite sides and passed rear ardily over, while the middle portion is passed in fron
Hoof Weight. - William Hamilton, Bedford, Iowa. This invention provides a toe or side
weight which will adjust itself to the inclination of the weight which will adjust itself to the inclination of the
hoof to which it is applied, and be self-locking, while
is of simple, durable, and inexpensive construction. In
using this improvement a comparatively small portion using this improvement a comparatively small portion
only of the hoof need be removed, and there is no possibility of the weight leaving the hoof.
Forceps. - Michael McNalley, St. Louis, Mo. This is an improvement in implemen utilized in veterinary practice for withdrawing teeth of
animals, or cutting or trimming them. The two jaws of the forceps may be gradually and equally drawn together to produce a cutting action when required, or the may be quickly closed to effectively clamp
The implement is very light and easily handled.

Lamp Chimney Cleaner.-Mary F. Hotham, Hillside, Pa. Secured to a handle are two or more U shaped fabric-retaining bars, which are secured a bars, pieces of movable cleaning fabric are fastened and new pieces can be easily inserted when they are worn Cinder Shovel.-Samuel J. Besthoff, ew York City. This invention consists of a shove having $U$ shaped tines composed of wire or metal rods and is adapted to remove cinders from grates, etc. The coal and cinders, allowing the dust and ashes to drop in condition to be assorted if desired
Siphon Motor.-Frederic Wm. Reinardt, Memphis, Tenn. This motor is adapted for fur ishing small power. The motive pow anded from utlet leg of the siphon. As the water passes from the inlet leg through the outlet leg it causes the wheel to revolve and
Watch Balance.-George H. Smith, achment for balance wheels whereby the rate of vibra tion will be changed without shifting the screws in the balance. The balance has iongitudinally slotted arms in
which are placed sliding weights, screws passing through which are placed sliding weights, screws passing through
the slots and through holes in the weights to shift the the slots and through holes in the weights to shift the
weights along the slots. The changing of the rate of e watch may thus be effected by moving the weights oing away with the usual met
Note,-Copies of
fornished by Munn abo patents will be send name
of this pape

## SCIENTIFIC AMERICAN

## BUILDING EDITION

 DECEMBER, 1893.-(No.98.) TABLE OF CONTEN'TS. Elegant plate in colors showing a colonial residenceat Stamford, Conn., recently erected for C.
Cooper Clark, Esq., at a cost of $\$ 9,500$ complete. Floor plans and two perspeetive elevations. An excellent design. Mr. Augustus Howe, architect,
New York.
Plate in colors showing the residence of Thomas c. Wordin, Esq., at Bridgeport, Conn. Two perplete. A very attract ve Queen Anne design.
Henry A. Lambert, architect, Bridgeport, Conn. A dwelling erected for Edward W. Alling, Esq., at New Haven, Conn. Perspective and interior view
and floor plans. An excellent design. Cost $\$ 4,500$ complete. Messrs. Stilson \& Brown, architects New Haven, Conn
A very attractive residence recently erected for R.
Burton, Esq., at Hartford, Conn., at a Burton, Esq., at Hartford, Conn., at a cost of
$\$ 7,800$ complete. Floor plans, perspective view etc. Mr. Henry D. Hooker, architect, New York. An excellent design.
5. Engravings and floor plans of a suburban residence erected for H. McKay, Esq., at Boston, Mass., at cost of $\$ 2,400$ complete. Mr. Austin W. Pease,
architect, Boston, Mass. A very attractive design. architect, Boston, Mass. A very attractive design. A dwelling recently erected for P. H. Lucas, Esq., at
Chester Hill, Mt. Vernon, N. Y., at a cost of Chester Hill, Mt. Vernon, N. Y., at a cost of
$\$ 7,000$. Floor plans and perspective elevation, also Mt. Vernon, N. Y.
A cottage at Mystic, Conn., erected at a cost of $\$ 3,000$
complete. Elevation and floor plans and an incomplete. Elevation and floor plans and an interior view. Mr
8. A dwelling recently completed at Stamford, Conn., at a cost of $\$ 3,500$ complete. A picturesque design. Two perspective views and floor plat
ects, New York.
ers.-How to catch contracts.-Hints to readers.The latest and best designsfor houses.-Labor Day -Tests of paving materials.-The World's Columbian Exposition, a general view.-The builders'
friend.-A durable and ornamental roof, illustrat-ed.-An improved woodworking machine, illus-rated.-The Pasteur filter, illustrated. -The Roch ester parlor heater and improved oil stove. illustrat passenger elevator at the Exposition, illustrated.Woodworking machnery at the Fair.-A new tresses, pillows, cushions, etc., shown at the Expoition, illustrated.
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Wanted-Light machinery or specialties to build. P Pipe frame truck baskets, steel and wooden trucks tc. L. M. Moore, Rochester. N. Y. See page 399. Steam Hammers, 1mproved Hydraulic Jacks, and Tube
Expanders. R. Dudgeon. 24 Columbia St., New York. Expanders. R. Dudgeon. 24 Columbia St., New York.
Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York Metal spinning, nickel plating, brass castings, experi Centrifugal Pumps. Capacity, 100 to 40,000 gals. per Guild \& Garrison, Brooklyn, N. P., manufacture steam acid blowers, filter press pumps, etc.
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References to former articles or answers should
give date of paper and page or number of question. give date of paper and page or number of question
Inquiries not answere in reasonabe time should
be repeated ; correspondents will bear in mind tha some answers require not a little research, and,
though we endeavor to repply to all either by letter
or in this department each must take his turn
Buy ers wishing to purchase any article not advertised houses manufacturing or carrying the same.
Special witters of nith or
personal rather than general interest cannot be expected without remuneration.
Scientific Amerrican Supple Sents referred
to may be had at the oftice. Price 10 cents each. Books
Miner Miner.
marked ser sabeled.
(5577) J. C. A. asks: 1. What makes the draught in a chimney, and why has a tall one more weight or specific gravity of the hot air inside and th cold air outside makes the chimney draw. This is readily illustrated in observing the upward flow of hot air cur-
rents around a stovepipe or the ascent of fire balloons. rents around a stovepipe or the ascent of fire balloons,
The higher chimney, having the greater volume of heated The higher chimney, having the greater volume of heated
air and gases, has the stronger draught.
2. A says that air and gaces, has the stronger draught. 2. A says that
a sounding lead will not sink beyond a certain depth, owing to the compression of the water. B says it wil A. B is correct. Everything that will sink at moderat depths will go to the bottom of the deepest ocean.
(5578) J. E. P. asks for a receipt for casehardening that will harden about one thirty-second of an be case-hard oicycle beangs. A. Pack with hoof shavings that have been charred and pulveriz ed. Heat at a low red for half an hour or more, the
(5579) L. L. G. and R. S. H. ask: Why isnot length a speed factor in steam vessels as well as in sailing vessels? Take for instance the Feiseen and the new cruiser Columbia, both built for speed. Take also the yachts Queen Mab and Valkyrie, built also for speed.
Asit is possible for the Feiseen to develop as much speed As it is possible for the Feiseen to develop as much speed
as the Columbia, why is it not possible for the Queen as the Columbia, why is it not possible for the Quee
Mab to develop as much as the Valkyrie? A. Length is a speed factor, as it enables greater power to be carrie in proportion to the midship area in steam vessels an
more sail in sailing vessels, as illustrated in the large four masted clippers and schooners. In both classes of vessels the conditions of relative dimensions and power are hampered by the required duty other than speed, and with racing yachts length is regulated by yachting rules.
The models are now so nearly perfect that for matched The models are now so nearly perfect that for matched
boats the difference in speed may be entirely due to exboats the difference in s.
centricities of the wind.
(5580) R. F. C. writes: 1. Is there any means by which I can produce a thin stream of electri light between two points about one-half inch apart, the
light to be steady (not like the spark of an induction coil) with an intense heating power; it is the heat that $I$ wish to use. Also is it impossible for me to use it if it produced in a vacuum? A. You can do this with the as a heating appliance. For this see No. 840. We have others on electric welding by other A. It produces about the most intense heat that can be produced by man. 3. I built a small direct carrent. 20 lamp, 16 candle oower, 52 volt dynamo, which we have
copper that the brushes are composed of dropped down and touched the bed of the machine, there was an intense
flash of fire and all the lights went out. flash of fire and all the lights went out. What was the
cause? Was the machine short-circuited or not? A. It is undoubtedly a case of short-circuiting. The piece of copper must have connected the two terminals in some way. Possily its brush was connected to the other ter-
minal; posibly the field is in contact with a bare spot of its winding.
(5581) E. C. B. says : I have a damaged mirror and want to cover up several blotches. Can you give me directions for doing te? A. Remove the siver-
ing from the glass around the scratch, so that the clear
space will he about a a quarter of an inch wide. Thorspace will be about a quarter of an inch wide. Thor-
oughly clean the clear space with a clean cloth and oughly clean the clear space with a clean cloth and
alcohol. Near the edge of a broken piece of looking glass mark out a plece of silvering a little larger than the clear space on the mirror to be repaired. Now place a
very minute drop of mercury on the center of the patch and allow it to remain for a few minutes, clear away the silvering around the path, and slide the latter from
the cluss Pase it over the clear spot on the mirror, and the glass. Place it over the clear spot on the mirror, and
gently press it down with a tuft of cotton. This is a dificult operation, and we would advise a little practice before trying it on a large mirror
(5582) J. B. J. asks: Is vaccination hereditary, so as to render it unneceessary fora descendant
of a person who has been vaccinated to be vaccinated ? When did vaccination first originate? Does vaccination undermine the phssical condition or reduce the average lenoth of life of mankind ? A. Vaccination is not
hereditary, nor is st safe for the person vaccinated for a hereditary, nor is it sate for the person vaccinated for a
longer period than seven years. It seems to have no
effect life. It was discovered by Dr. Jenner more than 100 years ago. See an interesting account of its discovery and early
No. 709 .
(5583) A. V. E. B. writes: In the recent international race the English claim that a boat built to
race for the America cup, in so far as it has a transatlantic voyage to make, cannot be a mere racing machine. Would you please state if, in your judgment, this is a
factor worth considering in deciding about the relative factor worth considering in deciding about the relative
merits of the racing boats of the two countries or of the merits of the racing boats of the two countries or of the
two kinds of boats-keel and centerboard? Do you contwo kinds of baats-keel and centerboard? Do yon con-
sider it neecessary, as naval architects on the other side hold, that in designing a boat to contest for the cup any fere with fast sailing? A. It is well known by naval architects and expert builders of racing yachts that all the American contestants in the international races have
been as good sea boats as their adversaries, and not been as good sea boats as their adversaries, and not
merely racing machines. If ever the cup goes back to England, it will find the centerboard racers equal to the
(5584) A. K. writes : I wish to light a
one candle power incandescent lamp at intervals which one candle power incandescent lamp at intervals which
will not aggregate more than twenty minutes per day. Can you namelan inexpensive non-freezable battery for
operating same, one that will remain charged for a conoperating same, one that will remain charged for a con-
siderable length of time? A. We advise you to use a siderable ength of time? A. We advise
dry battery. One or two cells should suffice.
(5585) T. J. P. asks in what manner a gold chain that has been dropped into the fire and burned
black can be restored to its original color. A. Heat in black can be restored to its original color. A. Heat in
diutut nitric acid until the desired color is reached. Possibly immersion in ammonia water will answ
(5586) W. H. R. asks for a preparation which can be applied to tan shoes to render them water-
proof without changing the color. A. Beeswax, 1 part; oil of turpentine, 4 parts. Apply with a cloth and polish with Canton flannel.
(5587) H. R. T. asks: When was the triple propeller first attached to vessels 9 A. Triple
screws have been in use in a few naval vessels of France.
 triple screws and the trial of the Columbia in Scien
American Supriement, No. 935,10 cents mailed.
(5588) S. B. W. asks: What per cent power is changed into electricity by the most improved dynamo? A. Ninety per cent of the indicated power of
the engine is claimed to be the energy of the electric corthe engine is claimed to be the energy of the electric cur-
rent in horse power. And if again transformed into effective power by
to be 81 per cent.
(5589) V. S. W. says: We have recently built a amall standpipe, 10 feet by 60 feet, for water sup
ply and fire protection. We use each week day about 15 feet of water and replace it with water from our deep well, which has a temperature about $55^{\circ}$ Fah. Shall we
be troubled by its freezing, and is it liable to be damaged by ice? It is entirely exposed to the weather. Pipe con-
nections are all from the bottom. A. The standpipe should have a close roof to keep the surface of the water should have a close roof to keep the surface of the
from freezing over and accumulating ice, otherv
protection is needed excect the pipe connections.
(5590) I. I. asks how curling stones are dished out and made true and polished. Also if such
work is donein the United States. I understand they work is done in the United States. I understand they
must all be sent to Scotland. A. Curling stones are blocked out by chiseling in the ordinary method of stone
cutting, then finished and polished in a stone turning cutting, then finished and polished in a stone turning
lathe. Any granite worker having a lathe can make lathe. Any granite worker having a lathe can make
them.
(5591) W J.
(5591) W. J. writes: 1. I have a glass cylinder, which wish to make into a friction machine,
but cannot find out how to drill the holes in the ends. How can I do this in good shapej? A. These can be drilled with a file held in a carpenter's brace. Break
off the end, so as to give a sort of drill point. Lubri-
cate with turpentine and camphor. Or cement a cork cate with turpentine and camphor. Or cement a cork
where the hole is to be, and drill the hole with a copper tube, centered by the cork, and fed withoil and emery. Turn with a brace. 2. Can you tell me how much the castings for Perrette' madle dynamo will cost me? A. I
you make your own model, they should cost from 5 to 10
(5592) A. N.-Theoretically there is no difference between the power of a crank and an eccen-
tric on equal throw. Practically the eccentric is subject
tient.
ient.
(5593) T. T.-The brass wire cloth can be cleaned by scrubbing with a brush, using a solution of brick or pulverized pumice stone with the solution.
(5594) F. D. H. asks for a method of computing the length of a degree of longitude at any point
on the earth's surface, for instance on the Tropic of Cancer or the Arctic Circle. A. Multiply the length of a degree at the equato by the cosine of the required latitude
thus, cosine of the latitude of the tropics $23^{\circ} 27^{\prime}$ is $0 \cdot 91741$ and $60 \times 0.91741=55.0446$, or 55 miles 235 F tos
(5595) R. B. S. asks rule for casting lead sponge used in those storage batteries described in
Scientiric American, No. 21, November 18, 1893. A Keep stirring the lead until it is on the point of solidifylocks and saw up into plates.
(5596) A. R. T. asks: 1. What size should the plates of a atorage battery (two cellis) described
in the Scievirici American some months ago, and how many to run small motor, one-sisteenth horse power, con
tinually $f$ fo six cells of gravity battery? A. Provide at leas two equas feet of positive plate in each cell. Arrange size of plate and number to suit yourself. 2. How often would gravity battery have to be recharged if cells were connected to
the storage cells all the time except when using? the storage cells all the time except when using? A.
About one-tenth ampere current would be taken, which would set free about two grains of metallic copper per hour, so that the batteries would run many days, excee
for local action. 3 . What acid can the plates be placed in to roughen them sufficiently for the application of the red lead? A. Nitric acid diluted 1 acid to 5 water. (5597) O. C. R. asks: What chemical so lution could be used to write on a "blue print " with
perfect white line ? Caustic soda will dissolve the blue perfect white ine?
but the yellow tint of the iron remains in the mark. was given a aolution which produces a perfect white line. It is neither acid nor alkaline. The flame test produces
the violet color of potash, and silver nitrate solutio the violet color of potash, and silver nitrate solution
forms a white precipitate, which is soluble in dilute nitric forms a white precipitate, which is soluble in dilute nitric
acid. Can you give me any information as to what this solution may be? A. Probably binoxalate of potassium
dissolved in water to the strength of 1 ounce of the salt to 4issolved in water to the strength of 1 ounce of the salt to
4 water.
(5598) A. L. W. says: 1 . The film that I use in my camera bothers me badily, on account of its
tendency to curl up very tightly when I wish to print. Please give formula to prevent this curling, and also a ce ment or glue that will stick the film to glass. A. There
is no good remedy for curling. One is to soak the films in a mixture of one-ighth glycerine and seven-eighth water after washing, for a few metwen stiff cardboards
the films she We think ordinary fresh glue, such as Le Page's or Chase's, will answer to fasten film at its edqes to glass,
2. What is the value of the silver on a single-plated tea spoon? A. Perhaps three cents. Dependson how thick the single coating is
(5599) T. R. E.asks: 1. How is a Leyden jar made, and what is it good for? A. In usually is a
glass jar covered for about three-fourths of its height, inside and out, with tin foil. For special purposes, other
constructions are used. It is used to store electricity of very high tension, so as to give shocks and sudden discharges, and is used in much experimental work. 2. ever of an hanal storage hours. I wish to tor run a a lamp one hop
over over one hundred hours. T wish to run a lamp one hour
at a time, three times a week. A. Allow two volts for each couple in the battery, and buy a lamp of the voltage
thus obtained thus obtained. 3. How many candle power lamp shall I get ? A. For two couples you can usea onecandle pow
lamp, for three couples a two candle power lamp. Can I charge the storage with ten cells of telegraph batery which I have, as I live a long way from an electric light plant? A. The ten cell telegraph battery will
chargethree couples. 5. How shall I connect them charge three coupies. 5. How shall I connect them? The
posts are marked P. N. A. Arrange in series and conposts are marked A.N. A. Arrange in series and con-
nect the copper plate terminal of the telegraph battery to the terminal of the red colored plate (marked P.) and the other terminal of the telegraph battery to the gray plate
terminals (marked N.) Go by the color of the plates terminals (marked N.) Go
rather than by the letters
(5600) H. E. W. B. asks: 1. How can I mix sodium with chloride of gold for gilding solutions A. We presume you refer to the donble chloride. It parts gold chloride in water. By evaporation the double salt is obtained. 2. What effect has alum when mixe with saltpeter, common salt, and muriatic acid for color ing gold ? A. It is hard to give a chemical reason. Alum
is very acid in tendency, the acid having rather slight affinity for the base, and in a certain sense it represents an acid in its action. 3. What flux should I use when any way to prevent blowholes in casting gold ? A. Melt with borax and sodium or potassium nitrate. Possibly
annealing is all that is required. 4. Is bisulphide of tin the eame as tin bronze? A. Tin bisulphide is often used as a bronze powder, under the name of mosaic gold.
Bronze powder is often made by secret processes. 5 . How is the vacuum made in the incandescent lamp? is made by air pump. Carbonize filaments by embed redness For pur Sis Supplement, Nos 224 to redness. For pumps see our SuppuExivit, Nos. 224,
569,629, 630, 631,771 . 6. Can more than two messages be sent over the same wire at once? If so, how is it
done? A. Yes. The apparatus is described in the books such as Prescott's "Electric Telegraph," 2 vols.,
price $\$ 7$; Maver's "American Telegraph,", price $\$ 5$; Thorn and Jones' "Telegraphic Connections," price
11.50. 7. How should pneumatic tires be kept throug \$1.50. .7. How should pneumatic tires be kept through
the winter so as to keep them from honeycombing? A.
No special treatment is required No special treatment is required. The
honeycomb if they are of good quality.
(5601) M. McN. asks: What is the rela(ive strength of cast steel forged or cast steel castings? Does the addition of aluminum to castings make the stee
harder or not? Can the steel be cast as hhin as iron? A
tensile breaking strength of from 125 to 150 thousand pounds per square inch. Castings of steel have a very variabiberange of tensile strength, accorang te siape and
size, from 40 to 60 thousand pounds per square inch. The addition of a small percentage of aluminum to low caradi
bon steel for hammer working makes a tougher and
stronger metal, which may vary in tensile strength stronger meta, which may vars in tensie strenth
from 140 to 175 thousand pounds per square inch. With steel castings, a amal percentage of aluminum largely inoveases their strength and folidity, with
(5602) R. F., Decatur, Ill., writes: Our city has put in a filtering plant at the water works, locat ing it on a hill, sonfe 75 feet above the pumping station. We have a pumping engine to take the water from the
river to the filter from which it runs into a reservoir of early same height, and from there through about 500 eet of 16 inch pipe down to another engine at same station, by which it is pumped directly into the city mains,
under an ordinary pressure of about 75 to 80 pounds per under an ordinary pressure of about ut en early 100 pounds
square inch, but which is brought up to when needed for extinguishing fire. The pipe which vill call it it was connected directly to the minin pump and under ordinary service stood all right, but when fire pressure was put on this pipe broke by "water hammer." It
an ordinary cast iron pipe, 16 inches diameter and is an ordinary cast iron pipe, 16 inches diameter and
seven-sixteenths inch thick. A controversy has arisen etween some of our local ameteur engineers as to the best way cut of the dificuly. One party, which we wil come, except by letting the water out into a well or cistern at the bottom of the hill, to be pumped from there nto the mains, or else by putting the main pump on the
till by the reservoir. The first of these all admit would se a great waste of power, to be tolerated only as a temporary makeshift, and the other has some objectionable
features. Another party, whom we will call B, holds that features. Another party, whom we will call B, holds that
neither of these plans is necessary. That as the water neither of these plans is necessary. That as the water
in the suction pipe has a free passage through the pump into the mains at all times (excepting the sligh pressure in the the necessity of raising the valves, the very slightly greater than that in the main pipes, and all that is necessary to overcome the liability of breakage is
make this suction pipe strong enough to safely stand me highest turessure that is ever put on the main pipipes. He holds that this ramming action is really an advantage as tending to give a steadier flow of water into the main by continuing the fiow while the pump is changing
strokes. He holds also that as a water hammer without an outlet is conceded to be almost irresistible, the fact that this pipe stood while the pump was working against ordinary pressure proves conclusively that there is an
outlet, which he claims is suffient to substantiate his theory that the suction pipe is simply too weak to stand the pressure which the water in it has to act against in the mains. Who is right? If neither, please set us right. How thick must a 16 inch cast iron pipe be
stand 100 pounds pressure witha good margin of safety A. The statements of all parties are correct as far as they oo, barring the accidents from a water hammer, which pump to the force main is a dangerous expedient. A 16 inch pipe to be safe at 100 pounds pressure should be
3 inch thick. Such a pipe for your suction would ee very expensive, as the normal pressure in the suction pipe is only 33 pounds per square inch. We advise large
air chambers on both suction and force mains, as near air chambers on bothe suction and force mains, as neaa Seep them charged with air at all times. There can be pump conld be made the sonceof power for the air pump by a side rod and bell crank lever, which can operate small air piston, single acting, of sufficient capacity $t$ supply the amount of air absorbed by the water in the air
chambers. The air pipes should be connected at the chambers. The air pipes should be connected at he pressure air pipe and a stop valve in the low pressure he air in either direction.
(5603) C. H. C. C. asks how to produce he black bronze on brass and iron. A. The black bronze on brass may be made by immersion in a asolution of
10 ounces muriate of arsenic, 2 pints permuriate of iron, 1 pint water. For black bronze on iron by immer iron, 1 pint wa
sion or brush :

| Bismuth chloride | t. |
| :---: | :---: |
| Mercury bichloride |  |
| Copper chloride. |  |
| Hydrochloric acid. |  |
| Alcohol |  |
| Wat |  |
| By weight. |  |

Let the liquid dry on the article and immerse in boiling
(5604) J. G. B. asks : Will you be kind enough to tell me how to rid our premises of these bugs.
know of other houses and whole blocks of buildings so infested that people are at their wits' ends to know how
to rid themselves of them as we are. Borax will do to put on pantry shelves, etc., but I need something to cover
the whole kitchen and pantry and dining room floor at night when they come out, and to keep it there; the really are a very great nuisance. Answer by Professor Croton bug or German cockroach (Phyllodromia ger
manica). The main dificulty in ridding houses of thi pest is due to the fact that people do not seem to be will ing to take enough trouble. They wish something which
they can scatter about once and be relieved for all time but, unfortunately, there is nothing which will accomplish the result in this easy way. There is nothing betuse California buhach, a home-grown pyrethrum pow der. This should be puffed from a manall bellows into all after nightfall and the room should then be closed and left until the following morning. In the morning the servant should go over the room with a broom and sweep
up every specimen found upon the floor and burn them. This process should be repeated for two or three night, in succession, and at the end of that time the trouble wil
from one house to another, so that the operation will
(5605) J. H. M. writes : 1. I wish to run three or four 16 candle power incandescentlamps, for about
wwo hours each evening. What kind of resistance lamps would be the best, and how many and what tylye of storage batteries would be the most efficient and yet be cheaply and easily made by an amateur? How many gravity batteries would be necessary to charge the storage
batteries, charging for 10 to 15 hours daily? A. Special low resistance lamps are made for this purpose. By al means buy your battery. For charging you may allow
from ten I have a Dr. Gassner dry battery that is played out. Is there anything that I can put in it to make it work? A.
Sometimes water will get a little moreout of an exhausted Sometimes water will get a little moreout of an exhausted
dry battery. $\quad 3$. Whatis the diameter of a core used in an dry battery. 3. What is the diameter of a core used in an
induction coil 6 inches long? A. About $3 / 4$ inch. 4 . induction coil 1 inches loug? A. About for secondary coil be as good as double silk-covered wire? A. It would probably be alittle greater in diameter and hold be ne
quite as good. 5. How much No. 36 wire would cessara for a coil of the above size? A. No quantity
can be prescribed. See our Suprement, No. 160, for he constructio
(5606) J. M. L., Jr., asks : 1. How may I make a good but inexpensive lacquer for nickel, silver, shellac or sead lac. The great point is to apply it proA finger touch will impair thetal previously warmed. 2. It is said that the plating solutions will soak through earthenware after awhile. Could you give a preparation to prevent this? A. Try melting in parafine, the wood
being absolutely dry. ${ }^{\text {3. About how manny gallons of }}$ being absolutely dry. 3 . About how manny gallons of
nickel solution could I run with a current of 15 amperes nickel solution could I run with a current of 15 amperes
and 5 or 6 volts? A. There is no question of quantity and 5 or 6 volts? A. There is no question of quantity
of solution. Allow at starting 0.1 ampere at 5 volts per cquare inch of cathode, and then reduce to 0.02 , ampere at 3 volts per square inch.
(5607) E. B. T. asks : 1. What is the chemical reaction of the caustis potash battery? A. The
zinc oxidizes and dissolvesin the caustic potash solution. 2. Can it be recharged by reversing the current through A. Yes, but it hardly pays. If it was a Lalande-
Chaperon combination, you would probably fail in oxi dizing the copper depolarizer. 3. Have you ever pub-
lished an article on running a dynamo by windmill power? If so, in what number? A. See the Scientific merican, vol. 63, No. 25. 4. Also the automatic regulation of a dynamo for an unsteady source of power.
You must regulate your power. 5 . What are the requisites of a loud-speaking telephone of the bell type? A. The Edison loud-speaking telephone depends on a distinct principle, the change of coefficient of friction by electrolysis.
(5608) L. C. T. asks : I have six or eight onces of No. 36 bare copper wire, the insulation having induction coil. Would the burning of the insulation affect the quality of the wire in any way? Can you tell me how to construct t a coil, using the bare wirie efor the
secondary coill? A. If your wire is not divided, it can be secondary coil? A. In four wire is not divided, it can be
soed. Test it first with a battery and galvanometer. For used. Test it irst with a battery and galvanometer. For
induction coils we refer you to our Surprement, Nos. 160, 229,569.2. How could I manufacture ice ona a small tale with the least apparatus possible ? A. This cannot se done economically. Small ice-making machines are
sold for the purpose. Address Queen \& Co., Philadelphia, Pa. 3. In charging storage batteries by wind
power, the windmill would not always be running at he same speed; would this make any difference in charging? A. You must have an arrangement for disconnecting the battery when the mill runs too slow. Binders for he Scientific American or Supplement are $\$ 1.50$ (5609) P. L. A. writes: To make artificial ice right in the ice house when the weather is cold
enough, would it do to use a hose from the hydrant, and ake a sprinkler in the ice house, so that when the water is turned on, all surfaces will receive an even thickness
for freezing? Then when the desired thickness for a take has been obtained, and this thickness having frozen solid, what should be used to separate the first layer of ice from the second? Would it be well to use waterproof
 way if it is possible to do so. The weather is generally cold enough for a long period to allow the water to freeze
solid before being bothered with a thaw. A. The filling of the ice house in the manner described is feasibie on a The only inconvenience will be in cutting out the ice in summer, as in freezing the walls of the ice house become solid, which prevents drainage from the hollow central cutting. Means would have to be provided to clear the urface water. We apprehend that the paper will not
avor the cleavage of the ice; the water will soak the

(5610) E. O. B. asks (1) how to make he best composition with which to fill honey-combed cad for the positive and litharge for the negative plates. Mix to a paste with dilute sulphuric acia. 2. | sulphuric acid, 1.170 sp. gr. 3 . How to ascertain the |
| :--- | aximam charging current for the same? A. Charge How to know when the battery is fully charged? Charge until the cell boils. i. e., evolves gas copiously.

(5611) O. C. asks: 1. What book or publication gives the most complete description of the of steel, best temper, shape and proportions to get the greatest attractive force, current to use in charging them, etc.? A. SilvanusThompson's work on electromagnets,
$\$ 1$ by mail contains some information applicable to your $\$ 1$ by mail, contains some information applicable to your
subject. For magnetizing use as strong a current and as subject. For magnetizing use as strong a current and as
many turns In the magnetizing coil as will give maximum mpere turns. Use tool steel drawn to a straw color. See
dso our Suprimment, No. 318. 2. Can you give arule by also our Supplement, No. 318. 2. Can you yivea rule by
which I can calculate the weight of 1 cubic inch of water
under different pressures? I find it stated that 1 cubic $\mid$ Please describe the machine Nikola Tesla uses to produce inch of ifater at $\tau 0^{\circ}$ Fah. under the ordinary atmospheric
pressure weighs 0.578 ounce. What is the weight of ame when under a pressure of 75 pounds as indicated by a Crosby water gauge? A. Water is very cated by a Crosby water gauge? A. Water is very
slightly compressible. For one atmosphere of pressure ( 14.7 pounds), it is compressed 0.00005 of it original volume. For 75 pounds above the atmosphere therefore unce instead of 0.578 ounce. The above rule is approxi mately correct
(5612) E. G. R. asks : 1. Will the No. 2 water motor described in Scien tific American of Octoin "Experimental Science"? A. Yes, if there is sufficient head of water. 2. How large a lamp would the above dynamo run when the field magnets are separately excited with six or eight Bunsen cells? A. Three to five six-candle power lamps, without any celis; with the celle
twice as many, especially if you use a drum armature When field magnets are separately excited as above ould the dynamo charge two storage cells? A. Yes. What horse power has the No. 2 water motor? A. Address the manufacturers for particulars.
(5613) F. E. K. asks : 1. Can a plastered wall in a house be blackened so as to be used as a crayon paint it? A. For a wall blackboard: to 1 pint shellac varnish add 6 drachms lampblack, 1 drachm of altra marine blue, 3 ounces ground pumice stone, 2 ounce rottenstone ground. If not thin enough to spread easily with a brush, add enough alcohol; two or three coats wil City from tha plastered wal. 2. How far is New York City from the deep ocean, and the length of Broadway in the same city? A. About 12 miles in a direct line. Broadway is about 5 miles long. 3 . A. The capstone of the Washington monument weigh 3,300 pounds. See Scientific American Supplement No. 476, for an interesting account of its setting. 4 What is the size of the smallest boat that has crossed the
(561) H. A. B. asks 1. What
(5614) H. L. B. asks : 1. What is the afe carrying capacity in amperes of a copper wire, No 4 gauge, B. and S. and how is the carrying capacity of any wire to be found? A. 64 amperes. See Sloane's
"Arithmetic of Electricity." Allow 2,000 amperes per square inch of section. 2. Is there any book publishe We can supply Badt or Davis on "Electric Wiring," A each by mail. 3. Is there any instrument on the marke or recording the height of water in a tank located som distance from the station supplying it ? Could not a com mon low pressure water gauge be used? A. A pressure gauge could be connected to do this.
(5615) A. E. N. writes: In the Scien Ific American Supplements already received from advised for the generation of ozone by electricity. But having better opportunities to use other sources of elec battery or a magneto-electric machine could be substi trength of a Wimshurst electric machine (taking as tandard the Daniell cell=about 1 volt) compared to ther electric machines, viz., 1 , Daniell battery; 2, Davi \& Kidder magneto-electric machine; 3, Gaiffe's pocke electro-medical machine? A. It may run up into mil ions of volts. The electro-medical machines prob
(5616) W. F. R. writes : 1. Have you any iterature relating to the manufacture of copper oxid plates as used in Edison Lalande battery? A. We have
no literature on this. We could supply you with the patents at 25 cents each. 2. Can you inform me as to the best and cheapest method of preparing copper oxide . Do you think it would be possible for me to make ox of blacklead for heating above plates? If so, ho should I proceed to prepare such a crucible? A. Use water.
$(5617)$
(5617) T. G. S.-The photograph sent by you shows a fresh water lizard, probably Triton tigrinus, Green. It is an aquatic species not rare, and
well known. The horns you mention are branchial appendages which grow out and are shed. See N. Y. Na tural History Survey, Zoology, Fishes and Reptiles, pa 83; in illustrations, plate 15, Fig. 32.
(5618) C. C. N. writes: How many stor age batteries of a given size would it take to run a 4 them with a 10 horse power dynamo, and also a 2 harge power dynamo? How long would it take to discharge ning? A. You may allow 425 cells to run the motor 10 hours. It will take four and a quarter times and twenty five times the period of running to charge with the 10 horse power and 2 horse power dynamos respectively. will very slowly lose its charge when not working.
(5619) A. R. K. asks : 1. What do elec tricians call a multiplier, and in what capacity is it used A. A galvanometer is sometimes called a multiplier. ficiency of a dynamo from 75 to 100 per cent? A. No This would be in the line of perpetual motion. There is
room, however, for inventions in increasing the efficient of dynamos.
(5620) H. S. S. asks for (1) a recipe for a tin electroplating solution for plating on copper. A. We Tin by Simple Immersion or Diperies : "Depos and Tin by Simple Immersion or Dipping.-For this purpose ing water; in this solution small brass or copper articles such as brass pins for example, are placed between sired result is tin and the liquid is boiled until the detin upon the brass or copper surfaces. Ordinary bras pins are coated in this way. A little chloride of tin may articles are afterward washed in clean water and. The ened by being shaken in a leathern bag with bran." 2 .
igh alternating currents. What is its armature mad 11, and 13, vol. 66; also Supplement, Nos. 792, 902 831, 692, 847, 855. 3. What is the highest number alternations in a magneto-dynamo, such as is used for shocking purposes? A. From a few hundred up to two thousand or more a minute. There is no "highest number." 4. Suppose an electric battery be made by making a lead tray $6 \times 6$ and 4 inches deep. In the bottom is put sulphate of copper 1 inch deep, and over that 1 inch saw dust. A zinc plate on the sawdust as positive pole water. What voltage and amperage would it give Would it give continuous current? How long would uch a battery last (if used every day of twenty-four ours) before becoming exhausted? A. About one volt. The continuous current will be, perhaps, half an ampere. Its period of running would depend on the resistnce of the outer circuit. 5. Will a bichromate battery, with porous cup filled with bichromate potash and out in one solution bichromate battery? A. It mightrun but would give a far less total of electric energy
(5621) A. H. writes: 1. One of my zincs a Daniell gravity cell has been almost destroyed, while he other two are no che jars for the least. There has during this time the zincs were covered with a copperlike substance, which had formed while the battery was in action. How was it that one zinc was destroyed and the ther two were not affected? A. It seems probable that the destroyed zinc was more attacked than the others before you laid up the battery. Corrosion would be slow, if he zinc was not in the solution. 2 . How much wire on the field magnets of the hand power dynamo, No. 161,
and also how many feet on the armature, as near as you n judge? A. Five pounds wire for magnets, 100 feet or armature; if drum wound, about 200 feet. 3. Do not the ushes have to touch one commutator segme leaves the other? A. No. 4. Can a Porter's motor, No 1 , be used as a dynamo? A. You will not get much re alt, we think. We have no figures as to its voltage and amperage.
(5622) N. T. asks: Of the various kinds batteries, such as storage cell and plunge, which he strongest? A. Storage batteries are far the strongt. How to make them is told in Supplement, No. 845. Other batteries, 157, 158, 159, and 792. Also see storage batteries in Supple
can supply for 10 cents each.
(5623) E. A. E. writes: I would like to build an induction coil that will produce a 4 or 5 inch park. Can I follow directions as given in Supplement, No. 160, and are there any changes I can make that will be
benefit to it ? What is the object of the insulation of resin and wax between the two sections of the secondary coil? Also, have you any books or papers from which I can get information on this subject? A. You will find it quite difficult to make a successful 5 inch spark inducion coil. The object of the disk is to separate portions f the secondary which differ greatly in reative potential. or a large coil, 6 or 8 such disks should be used. For CIENTIEIC AMEPICAN, No 14, vol 66 , all of which we an supply for 30 cents. Also, "Induction Coils-How Made and How Used," price 50 cents; also Bonney's "Induction Coils," price $\$ 1$ mailed.

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## 

 Animal trap, M. Carpenter.:
Baling press, J. A. Mealer.:.
Beling press J. .. Sanders..
Balloon,J. A. Sumovki.


Bath room standing platform, J. Dellar............
Battery. see Electric battery
Batery
Llog rids. machine for making storage, R. M






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Coke. oven for the manu. ana ture or, ii. v. Smith.
Combustion apparatus, A. Bryee..............

















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 No. 186,787, granted to Alexander Graham Bell, January 30. 1877, the scope of which has been defined by the Supreme Court ofthe United States in the following terms "The patent itself is for the mechan ical structure of an electric telephone to be used to produce the electrical action on which the first patent rests. The third claim is for the use in such instruments of a diaphragm, made of a plate of iron or steel, or other material capable of in ductive action; the fifth, of a permanent
magnet constructed as described, with a magnet constructed as described, with a
coil upon the end or ends nearest the coil upon the end or ends nearest the
plate: the sixth, of a sounding box as deplate; the sixth, of a sounding box as de
scribed; the seventh, of a speaking or hearing tube as described for conveying the sounds: and the eighth, of a perma nent magnet and plate combined. The claim is not for these several things in and of themselves. but for an electric telephone in the construction of which these
things or any of them are used." Thing any of them ave
This Company also owns Letters Pa tent No. 463,569, granted to Emile Beriner, November 17. 1891, for a Combined
Telegraph and Telephone; and controls Letters Patent No. 474,231, granted to Thomas A. Edison, May 3, 1892, for a Speaking Telegraph, which cover fundamental inventions and embrace all forms bon telephones.


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