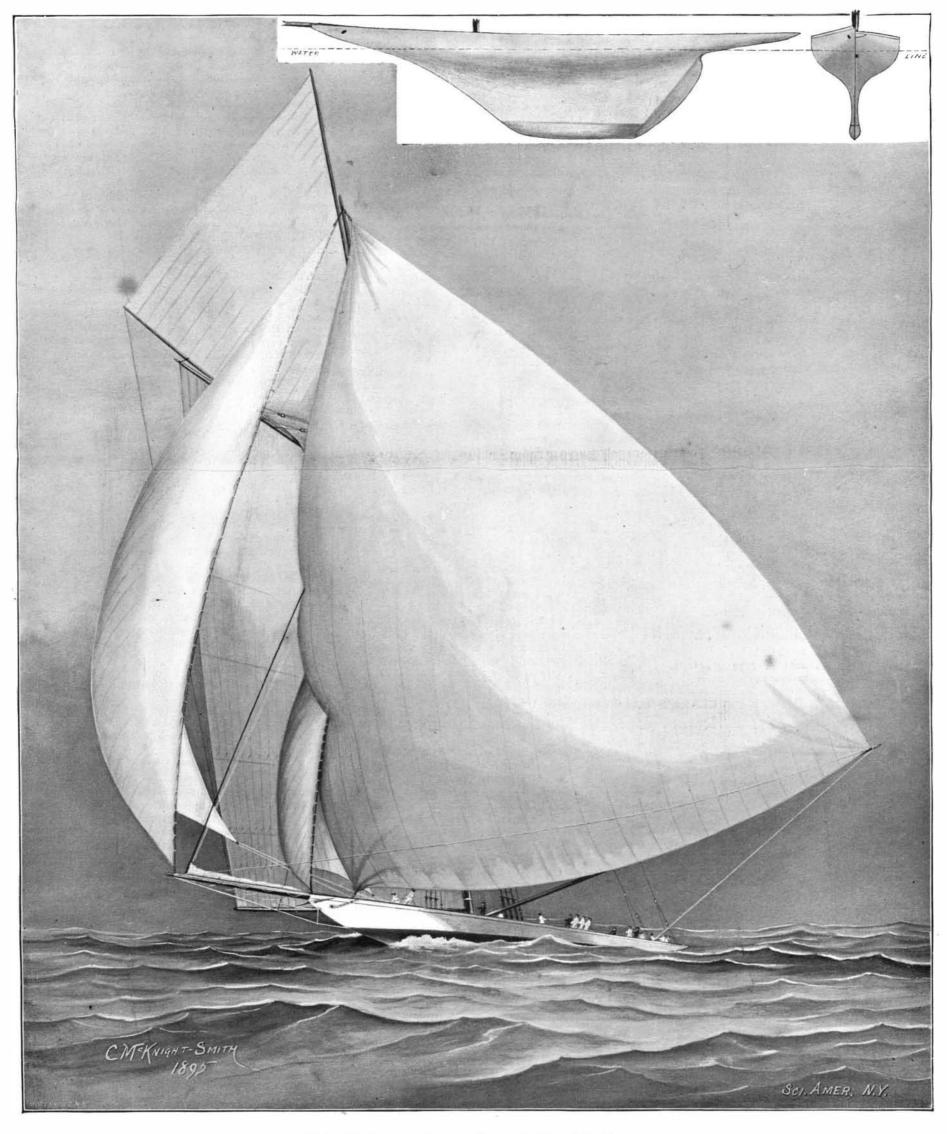
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ELECTRIC LIGHTING AND HEATING.

The tendency of the education of the scientist and engineer is to develop in his mind a dislike for the waste of energy. One of the favorite aims of the steam engineer is to lower the pounds of coal burned: per horse power hour. The greatest rivalry exists among the builders and designers of pumps—each one, striving to produce a pumping engine of more efficiency or giving higher duty than his rivals. In this and similar races for simple fuel efficiency the question of capitalization is apt to be overlooked. Many an instance of a high duty machine might be found where the interest charges greatly overbalanced the fuel econo- made to lighten the construction of the car body and my. A low duty machine is often the cheapest to run.

In electric heating, which is one of the latest developments of electricity, good instances of a similar condition of things can be found. Electricity has been successfully applied to the production of light, and its most inefficient role in this direction, and one involving the largest amount of copper in the conductors, has proved most acceptable to the public. The incandescent lamp, on account of its attractive appearance, its ease of installation, its steadiness and its healthfulness, as it does not contaminate the air, has proved a most serious competitor with gas. Yet the inefficiency of the comparatively low potential incandescent lamp is almost startling when compared with the economy scientific economist in the idea of delivering electric energy with an initial potential of little over two hundred volts. But the public likes the incandes- man. cent lamp, admires it when mounted on beautiful electrollers, is willing to make it softer to the eves by screening it with ground or cut glass and sees no enormity in wasting eighty or ninety per cent of it by the last named processes. The incandescent lamp has been accepted by the public, and the expenditure of a horse power for the maintenance at low white heat of a yard or two of fine carbon filament is good practice, if it is poor theory. The engineer makes an error if too theoretical—he must remember that he is catering to the affairs of practical everyday life, and fuel economy or pure efficiency may be absolutely unpopular. The human element must be taken into account.

Electric heating is now coming to the front, and for certain cases has become a possibility, because of the low economy which seems necessarily inherent in domestic processes. It has to compete with heat most wastefully applied; otherwise it would be out of the question, except as a matter of luxury. But when to the low economy of the kitchen fire, which is its competitor, there is added it own extreme convenience and cleanliness, it will be seen that a very good case is made out for the employment of the electric current.

The general aspect of the case is thus put by its advocates. In the electric station energy is generated with an efficiency of about six per cent. When this energy is applied in cooking operations great economy results, and but little of the six per cent is lost. Thus, if water is to be boiled, a heating coil in direct contact with the water will utilize nearly all the energy except that represented by the difference between the average temperature of the water and that of the air. In broiling or baking by the use of scientifically designed heaters, a very high percentage of the electric energy can be utilized. The low economy of the generation of the electric energy is compensated for in the comparative sense by the low economy of cooking with coal. To boil a kettle of water or to properly broil a few chops any quantity of fuel may be heaped upon a fire, and after the work is done the fuel may burn on for hours doing nothing. But the electric current is turned on only as wanted. The instant the cooking is accomplished it is turned off, and all expenditure ceases. It is calculated that a cooking fire may only utilize one or two per cent of the heat produced while cooking is going on. When the cooking ceases, all goes to waste.

Electric heating has to contend with one great obstacle—the low efficiency of the steam plant; and its in household operations.

In the field of heating the adaptability si mpliing apparatus are full of most suggestive suggestions. From a radiator for heating a room to an electric curling tongs all are figured. There is something wonderfully attractive in starting a stove by turning a switch. The stove may stand on a table, to be set aside when its work is done.

of. A kettle can be boiled in a parlor without any flame or danger from alcohol explosion.

As regards heating on the large scale, as of rooms

Opening of the Metropolitan Elevated Railroad,

The Metropolitan Elevated Railroad, the first electric elevated road in Chicago, was formally opened on April 17. The motor cars, which were built for the company by the Barney & Smith Car Company, of Dayton, Ohio, necessarily differ in many respects from those ordinarily used either on surface or elevated roads. The principal feature of the car is the steel sub-frame, which was added to enable the car to pull six loaded, forty-foot trailers, and also to get sufficient weight for traction; for the latter reason no attempt has been

The car weighs nearly 40,000 pounds without electric apparatus of any kind. The body is 40 feet long. while the steel frame is 47 feet 3 inches. The entire height from rail to roof is 12 feet 10 inches, the width at the sill is 8 feet 7 inches, and that at the eaves is 8 feet 11 inches.

The end sills are of oak, and the six longitudinal sills and stringers are of long leaf yellow pine. The end frames have iron plates at the sill and uprights to prevent telescoping in case of collision.

There is a motorman's cab at each end, diagonally opposite each other, extending out on the platform as far as the end of the hood. The entrance doors of the arc lamp. There is something repugnant to the arc, therefore, next to the corner posts, and slide back into the cabs. As the front door is always to be kept fastened, this will not inconvenience the motor-

> The cars are handsomely finished within in quartered oak, and are lighted by incandescent lamps placed directly above the seats. Electric heaters will be used in the winter. They are also equipped with quickacting air brakes, the air being carried in storage tanks under each car.

> The first train to carry other persons than officials made its trip successfully over the Metropolitan "L" road on the 17th ult. The northwest branch of the road is complete to Wicker Park, and to this point the special Pullman train was run. The run from Canal Street to Paulina Street was made in five minutes. There the main line of the road, which carries four tracks, ends, and the Garfield Park. Douglas Park and Logan Square lines begin. The Garfield Park line extends to Forty-eighth Street. The Douglas Park line extends from the terminal of the main line south to Twenty-first Street, and thence past Douglas Park to Central Avenue. This branch is not yet completed. The Logan Square line extends from the terminal of the main line north to Milwaukee Avenue and Division Street, and thence northwest, parallel with Milwau $kee\,Avenue,\,to\,Logan\,Square.\,\,The\,Humbol\,\rlap{d}t\,Park\,line$ branches off the Logan Square line at Robey Street and North Avenue, and will extend west to Crawford Avenue when completed. The Logan Square line penetrates one of the most densely populated districts of the west side and will draw its patronage largely from the Polish quarter.

> These various lines contain miles of track as follows: Main line, 1'8 miles; Garfield Park line, 4'2 miles; Douglas Park line, 3.7 miles; Logan Square line, 4.49 miles; Humboldt Park line, 2.13 miles. The various lines contain forty-three stations.

> The Metropolitan line will run 155 cars—100 passengers and 55 motors.

There are two impressive pieces of engineering—one the bridge on the Logan Square line, which carries the elevated tracks over the Northwestern Railway tracks and has a span of 250 feet. The method by which the Metropolitan tracks are carried over the Lake Street "L" tracks also presents an interesting feature of engineering.

Meal of Sunflower Cake.

Sunflower cake has been found, especially in Russia, one of the best auxiliary cattle foods. As early as the vear 1866 about 100,000 centners of sunflower oil (oil of the seeds of Helianthus annuus) were manufactured in utilization is only possible because of the waste of fuel Russia, and its amount has increased year by year, it being esteemed as a very palatable alimentary oil. The oil was formerly obtained by hydraulic means; city of application of electricity may give it great suc-residual cake is harder than any other variety of oil cess. The catalogues of the suppliers of electric heat-cake, and for this reason apparently it has not found a wider application. Denmark and the northern countries import large quantities annually, as do also the eastern provinces of Germany, and the problem of its disintegration has been successfully solved by several manufacturers there. It is still unknown in Southern and Western Germany; now, however, that it is put on There are no products of combustion to be disposed the market in the form of meal it will doubtless soon find general application, suited, as it is, both on account of its composition and pleasant taste, for fattening cattle. The percentage of proteid varies between about

[FROM THE WESTERN UNIVERSITY COURANT.] Spectroscopic Observations of Saturn at the Allegheny Observatory.

that a brief glance at the previous history of the subject would be of interest as an introduction; such a | of Saturn's rings is quite readily attained. review is, indeed, necessary, in order that the reader may correctly understand the significance of the results which have been obtained at this place.

The hypothesis that the ring of Saturn is nothing more or less than a multitude of small bodies, revolving around the planet in circular orbits, is a very old one. It was suggested by Roberval in the seventeenth century, and was revived by Jacques Cassini in 1715, but in those days of course it had no better basis than mere speculation. These suggestions were forgotten, treatment, as its occurrence is not generally known to and when the great mathematician Laplace took up the question he regarded the rings as solid bodies. He arrived at the result that such rings could not exist in beater. A case of this formation was brought before their actual form unless they were unsymmetrically weighted, and left the problem in this unsatisfactory state. At a later date Professor Peirce, of Harvard, showed that the rings could not be solid, and regarded them as composed of some fluid denser than water. Finally, the English physicist Clerk Maxwell discussed the whole matter thoroughly in a prize essay submitted to the University of Cambridge in 1857, and showimpossible unless they were made up of separate bodies of no great size—"a shower of brickbats," he was in the habit of calling them.

It was indeed proved before Maxwell's time, by Edouard Roche, of Montpellier, that a body of considerable size cannot revolve within a certain limiting tion. The raw material that gave rise to the formadistance of a planet, as it would be torn to pieces by tion of this substance had been previously treated the strain due to unequal attraction, but Roche's investigations were long overlooked. In the case of Saturn this "Roche's limit," as it is now called, is just rite solution at 32 degrees C. The wax does not make outside the ring, and hence it follows that the ring its appearance until the bleached material is disintemust be made up of separate small bodies.

Thus it will be seen that the accepted hypothesis rested on a mathematical demonstration that no other This in time builds itself up on the sides of the beater. constitution of the ring is possible according to the The characteristic sweetish odor of the isolated wax laws of mechanics, and although the mathematical proofs are conclusive to those capable of appreciating them, a proof by direct observation was regarded as having so much importance that the results obtained at the Allegheny Observatory attracted the widest

If there were any spots on the ring, the matter would have been settled long ago; but there are none, and the motion of the ring was measured at Allegheny for noticed in the raw material until after the warm the first time by means of a spectroscope. According to a well-known optical principle, a line in the spectrum of a heavenly body is displaced toward the violet if the body is approaching the earth and toward the red if the body is receding. Now, as Saturn's ring rotates, one side is continually moving toward the earth and the other side away from it. Hence the lines in the spectra of opposite sides of the ring are displaced in opposite directions, and by photographing the spectrum, and measuring the displacement on the photograph, we can determine the velocity in of sight, and by photographing its spectrum on the same plate, without disturbing the apparatus, we have a starting point from which the displacements can be reckoned.

But this is not all; the velocity of different parts of the ring will differ according to the way the ring is which was found, on extraction with ether, to contain bases with eternal snow? What can we ever hope to made up. A satellite must move in obedience to Kepler's third law, and a consequence of this law is, that the velocity of the satellite varies inversely as the square root of its distance from the center of the planet; the nearer a satellite is to the planet, the faster it moves. It is easy to calculate that, if the ring is made up of satellites, its inner edge must move at the rate of 13.06 miles per second and its outer edge at the rate of 10.65 miles. If, on the contrary, the ring is solid, its outer edge must move faster than its inner edge, just as the tire of a wagon wheel moves faster than a point nearer the hub. The outer edge would in fact move more rapidly by about five miles per second.

Now let us see what the photographs say. Here are the main results obtained from the measurement of two different plates:

Velocity of the middle part of ring, 11.2 miles per second.

Velocity of inner edge greater than outer edge, 2 to 3 miles per second.

Comparing these figures with those given further above, we recognize that the photographs contain a proof that the ring is made up of independent bodies, revolving as satellites.

Perhaps I need hardly say that such results are not obtained as easily as they are described. Some idea of the delicacy of the observations can be formed when I state that a velocity of one mile per second causes a displacement on these plates of only one twenty-five thousandth part of an inch, and that the image of Technical High School in Berlin, Charlottenburg.

Saturn, which the telescope casts on the slit of the an oxidizer. It changes hypo quickly to the harmless spectroscope, must not move much more than one tetrathionate of soda (tetrathionic acid and soda base), three thousandth of an inch during the long exposure liberates iodine from iodide of potassium solutions, es-In giving below, at the request of the editor of the of two hours. The plates are measured under a pecially in the presence of acid, while in alkali solu-Courant, an account of some recent observations of microscope, and while it is impossible to be certain of tions (hypo-soda) the free alkalies materially accelerate Saturn at the Allegheny Observatory, I have thought the fraction of an inch, an accuracy sufficient to decide; the oxidizing effect. The hard salt proved stable. We in favor of the meteoric hypothesis of the constitution performed the washing as follows:

JAMES E. KEELER.

A Wax Found in Cotton and Linen Fiber. BY CLAYTON BEADLE.

It is occasionally observed that the iron walls of a beater in which cotton and linen pulp is disintegrated become coated with a film, which protects the iron against the action of the bleach, etc. It appears that this film is not formed under ordinary conditions of paper makers. This wax-like film, when of sufficient thickness, can be readily scraped from the sides of the my notice about two years ago. The formation of this film was so rapid as to cause inconvenience, and to necessitate constant scraping of the sides of the beaters, lest portions should detach themselves and form yellow spots in the pulp.

I examined samples of this substance taken at different times, and found that it consisted of alumina, iron and lime salts, mixed with a substance soluble in ether. ed mathematically that the rings could be neither The latter substance has a sweetish smell and genersolid nor liquid, and that stable equilibrium would be ally resembles beeswax. It has a saponification equivalent (p.c.) of 1946 (KOH), and a very definite melting point of 47.5 degrees C.

> The wax on saponification gave 91.04 per cent insoluble fat acids. Samples were taken and examined at different times, and were found of constant composiunder pressure in a 3½ per cent solution of NaOH, and afterward thoroughly bleached in calcium hypochlograted. At the back of the beater roll a thin film may sometimes be seen on the surface of the water. can be traced back often to the bleached material. which sometimes smells strongly.

I think there is evidence that this substance does not exist in the raw fiber, but is formed in the cell wall during treatment. It is hardly probable that this substance, which is readily dissolved by soda, should survive the treatment with alkali under pressure. The odor which is characteristic of this substance is not bleaching, and appears to be more developed after the Mountains, and remember how famous, all over the bleached material is allowed to lie heaped up in a dense condition for some time. By altering the mode of bleaching of the raw materials, the occurrence of turist and the horticulturist, as well as the miner, it is this waxy substance can be prevented. I found in one interesting to read what so intelligent a statesman as batch of cotton fiber, that smelt strongly of the waxy substance, that the alcoholic extract amounted to 287 and to know that his views were shared by many other per cent, and, when treated with ether afterward, the ethereal extract amounted to 0.73 per cent.

mechanical one, and is probably due to the fact that established between Missouri and the Pacific coast, miles per second. The moon has no motion in the line it intimately penetrates in the fiber. The knives of Webster said: "What do we want with this vast the beater roll, which tear the ultimate fiber asunder, worthless area, this region of savages and wild beasts, release the wax, which floats on the surface as a fine of deserts, of shifting sands and whirlwinds of dust, film, and quickly builds itself up on the metallic sur- of cactus and prairie dogs? To what use could we face with which it comes in contact. I succeeded in ever hope to put these great deserts, or these endless at one time collecting about 50 lb. of the deposit, mountain ranges, impenetrable, and covered to their 77.54 per cent of wax.—Chem. News.

Anthion-A New Agent for Quickly Washing the Hypo from Prints.*

We have in the preceding number, under the nearer Boston than it is to-day. heading of "Novelties," already made mention of a stuff which we have several times tested as a destroyer which enabled us to shorten the washing of hypo, and process of prints and plates from one hour to forty minutes.

As our tests date back several months, we are convinced that pictures and plates thus treated are as permanent as those washed in the usual way.

It is self-understood that the saving of time is of quick work is required and where facilities and time are scarce. Especially amateurs who are deficient in patience will welcome this preparation. Of course, mistakes in its use will be made, but the test which is prescribed, and which always should be applied. points out such mistakes. Anthion is a white powder which but sparsely dissolves in water. One part requires 100 parts of water for solution. Warm water is recommended. We prefer to use solutions of 1:200; these will keep about four weeks. The sample placed at our disposal was a persulphate, KSO4, and acted as

* Communication from the Photo-chemical Laboratory of the Royal

- A. Gelatine Plates.—1. The fixed plate, 13 by 18 cm., was placed for five minutes in about 500 c. cm. of water (more does no harm), shaking or rocking the dish repeatedly.
- 2. The plate thus rinsed was now put into a dish containing from 200 to 250 c. cm. solution of anthion 1:200 for five minutes, rocking again.
- 3. From this solution it was passed back to the first dish, which had been rinsed and filled with fresh water, rocking several times.
- 4. The plate is now passed back into dish No. 2, which had been rinsed and filled with fresh anthion solution as in 2 and 3.

When taken from the last water the plate was found free from hypo, and was put away to dry.

Tests.—Put into a clean glass about 10 c. cm. of the last wash water, and add two to three drops of nitrate of silver solution 1:20. A slight formation of chloride of silver will usually be seen. Should this become yellow, then hypo is still present, and process under 2 and 3 must be repeated.

This silver test is absolutely safe.

It must be remembered, however, that chloride of silver changes color in the light, and the test should be made in a weak light.

B. Paper Prints.—These wash out more readily than plates. But they must be kept well separated to admit the liquids from all sides.

Place as in 1 about five just fixed and drained prints, one after the other, in 500 c. cm. water (vide 1), then each separately into the anthion solution (vide 2), and continue as in 3 and 4.

Don't neglect the test.

To make sure that the anthion water did not injure the prints, a picture was cut into halves, one-half soaked in anthion water 1:100, allowing it to dry in. Not the slightest difference could be noticed between the two halves.

For larger plates or prints, of course, correspondingly larger quanties of anthion are required. Five months have failed to show any signs of fading of pictures treated with anthion.

Price of 100 grammes anthion, 1 mk.—Wilson's Photographic Magazine.

Daniel Webster on the Great West.

When we think of the teeming population which now fills many portions of our country west of the Rocky world, is their singular beauty, and their incomparable value to the tourist, the health seeker, the agricul-Daniel Webster thought of them just fifty years ago, prominent public men of the time. In a speech delivered in the United States Senate in 1844, with re-The separation of the wax in the beater is merely a gard to the proposal that a mail service should be do with the western coast, a coast of three thousand miles, rock-bound, cheerless and uninviting, with not a harboronit? What use have we for such a country? Mr. President, I will never vote one cent from the public treasury to place the Pacific coast one inch

Electrolytical Process of Bleaching.

In his recent review on progress in bleaching, in Lehne's Farberzeitung, Dr. Kielmeyer mentions an electrolytical process invented by Dr. Karl Kellner, which, whatever be its practical value, has at least the merit of being original. The necessary apparatus consists of a pair of rollers—the one iron, the other carbon-which, while rotating, are fed with an elecimportance to professional and amateur, both when tric current by contact with wire brushes, and thus converted into the two poles of a battery. The cotton cloth, before passing these rollers, is saturated with brine, and runs in company with an endless felt blanket, also saturated with brine, which is next to the iron roller, and receives the caustic soda formed, to deliver it further on into a tank filled with salt water. The chlorine liberated at the carbon roller accumulates in the cotton fabric. On issuing from between the rollers (whereof there may be several pairs) the cloth remains rolled up for some time, before it is washed, to prolong the bleaching process. Whether the process has already found practical application does not appear in the paragraph referred to.

A HEATING DRUM IN THE SMOKE PIPE.

other room before reaching its connection with the pipe a heating drum such as shown in the accompany-James W. Johnson, of Paullina, Iowa. In the exterior

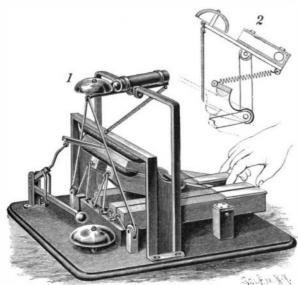


JOHNSON'S HEATING DRUM.

shell of the drum are partitions forming air compartments at the sides, as shown in the broken-away portion of Fig. 1, and there is a central smoke and gas passage crossed by obliquely arranged flues. In the lower head is an opening at one side, as shown in Fig. 2, per mitting the air to enter one of the side compartments, whence it passes through the flues and is heated thereby, finally passing through the perforations in the exterior shell into the room. Fig. 3 represents a cross section of the drum. Gas-tight joints prevent smoke are; and if he can state them with a little degree of vice pipe whenever it may be necessary to repair the and gases from the smoke passage entering either of life, a little approach to eloquence, or a little humor in the air compartments at the sides, and the air passing his style, why, his report will be perfect. through the flues is thoroughly heated before being returned to the room through the perforations.

TO FACILITATE ATTAINING CORRECT TOUCH ON THE PIANO.

An instrument designed to facilitate the systematic development of finger technic, affording also an improved exercising device for beginners on the piano, is represented in the accompanying illustration, and has been patented by Mr. Oscar Felden, of No. 707 Hamilton Street, Houston, Texas. It comprises a series of mute keys and two bells or sounding devices of differ-



played one of the bells will be sounded. The keys, pivoted in a suitable frame, have at their rear ends filled it with wisdom and success and force. Yet at eyes through which extends a cord, the cord also passing through eyes on a fixed transverse beam and ter as well as of talent. A fellow that is practicing arts around pulleys at its end, and thence connecting with of deception may last a little while, but he cannot last the rear end of a lever fulcrumed on the frame, the lever having at its front end a tube closed at one end, staying power; and the staying power is not merely a ball resting normally at the closed end of the tube, as shown in Fig. 2. At the rear end of the lever, facing the open end of the tube, is a bell, a spring normally holding the lever in its inclined position, but when the player holds down a key too long, and until after the second key is pressed to the bottom, a pull have occurred of all sorts, political, scientific, and nonis exerted upon the cord which causes the lever to sensical. What a wonder, what a marvel it is, that swing up, as shown in Fig. 1, the ball then rolling here, for one or two cents, you buy a history of the enalong the tube and sounding the bell. Over the rear tire globe of the day before! ends of the keys is fulcrumed another lever, having at *From a lecture delivered to the students of Union College by Charles its under side a cushioned rail normally resting on the A. Dana, editor of the New York Sun, and printed in McClure's Magazine keys, whereby the lever is swung upward when either for May.

of the keys is pressed, and on the rear end of this lever In many cases where the pipe or smoke flue from is an eye engaged by an arm fulcrumed in a bracket, a furnace, stove, or range, may be passed through an- the arm being connected by a loop with a striker the characteristics of a pneumatic tire, but which is adapted to sound another bell. With the correct not inflated, and which it is purposed shall be far more chimney, it will be possible to heat the second room, touch, neither of the two bells will be sounded, the durable than the ordinary rubber tire. It is made of at least to a very material extent, by placing in the time it takes the ball to roll through the tube being spring wire, in sections or as a series of continuous or the time allowed to raise the finger which strikes the ing illustration. It is a patented improvement of Mr. first key, but if the player does not hold the key down until the second key is struck, an interval occurs between the two tones and the pivoted arm then actuates the sounder to strike the second bell. The device rath, of St. John, Kansas. Fig. 1 shows the preferred is thus designed to facilitate the acquirement of a cor- form of construction, Figs. 2 and 3 being sectional rect legato style of playing, or the holding of the sound of one tone to the exact instant that the next are held firmly and compactly in position by a tie rod tone commences to sound, for by the pressing upon the or wire of suitable size, located in a central recess in second key when the first is still held down one of the the outer surface of the tire. If found desirable in bells is sounded, and by allowing an interval between the touch upon successive keys the other bell will be sounded.

Making a Newspaper.*

In a large newspaper office, as in the Tribune in New York, for example, where there may be one hundred men who are attached to the paper as writers, as correspondents, as reporters, and to the strictly editorial department, out of this one hundred, sixty or seventy will be reporters, that is, men who are sent out when any event of interest occurs, when a bank breaks, when a great fire takes place, when there is an earthquake, to inquire into the facts and collect information. and to put that information into form, so that it can be printed the next day. That is one of the most important branches of the profession, and it is paid very liberally, I am glad to say. For instance, I know many reporters who earn ten or fifteen dollars a day, and some who earn more. They have constant employment, and their labor is entirely agreeable to themselves. That is one of the first things, when a young man comes for employment, and you take him on and give him a chance, that he is set to do. There, you see, all this culture that we have been considering is at valve casing, and provided with a service valve and an once brought into action. He must learn accurately auxiliary cut-off valve, both moving with the stem, to the facts, and he must state them exactly as they permit of readily shutting off the water from the ser-

Next to the reporter, a very important functionary in the newspaper is the man who reads the other newspapers and makes extracts from them. Mr. Greeley used to think that it was enough to make a good paper the elections. The man who reads the exchanges is a three thousand papers regularly. All the newspapers ent pitch arranged so that when the keys are wrongly of newspapers, or, say, a cord of newspapers, is laid bethem over and over to see what is in them. He has to opened and closed on turning the handle. know what it is that should be taken from them and requires judgment to know this; it requires knowledge and experience as well as talent. It also requires a that are really important that may not seem so at the spend a great many hours at his desk; and heispretty tired when he gets through with his day's task.

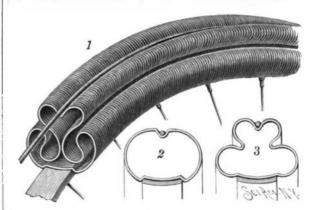
Next to the exchange reader in the newspaper organization comes the man whose duty it is to receive manuscripts and examine them and premare them for the press, to edit them, correct them; where the writer has made a little slip of rhetoric, to put the right word in or the right turn of the phrase; to clarify it all; to make the sentences clean. That is a hard job in the writing of a great many persons.

Then finally you come to the editor-in-chief, and he is always a man who gets into his place by a natural process of selection. He comes there because he can do the work; and I have known some young men who had no idea that they would ever have control of a newspaper, who have risen to that place, and who have the bottom of it all, it is always a question of characlong. The man who stays is the man who has the intellectual, it is moral. It is in the character.

News is undoubtedly a great thing in a newspaper. A newspaper without news is no newspaper. The main function of a newspaper is to give the news and tell you what has happened in the world, what events

AN ELASTIC TIRE FOR VEHICLE WHEELS.

The illustration represents a tire designed to have connected members, presenting a neatly fitting base section for the felly, while its outer surface expands under pressure in contact with the ground. The improvement has been patented by Mr. Alexander Honviews of modified forms. The sections or members



HONRATH'S ELASTIC TIRE.

practice, the tire may be partially or entirely covered by a casing of leather, rubber, or similar material.

IMPROVED FAUCET FOR BASINS, SINKS, ETC.

This faucet has a valve stem held movably in the service valve, valve seat, or other part of the faucet. The improvement has been patented by Mr. John Byrne, No. 871 East One Hundred and Sixty-ninth Street, New York City. As plainly shown in the sectional view, the casing is made in three sections, screwed one on the other, the middle section having if he had an able man to read the exchanges, provided at its upper end a valve seat adapted to be engaged by he himself was there in person to add up the returns of a disk valve on the square part of a stem moving in the valve casing. The valve preferably has a facing of very important man; and, let me say, too, he is a rubber or leather, to make a tight joint, and it is held pretty highly paid man. He has to read, we will say, in position on the stem by a nut, the upper part of the stem passing through a stuffing box in the top of the in the country come into the office, and he does not do upper section. The valve stem is held movable in the anything else. He sits at his desk all day, and a pile casing by a threaded portion screwing in a spider forming part of the middle section, a plan view of which fore him every morning; he starts to work and turns is shown in the small figure, allowing the valve to be

On the lower end of the stem is an auxiliary valve put into his paper. What is the interesting story? It adapted to engage a second valve seat in the lower part of the middle section. This valve is preferably held loosely on a flange on the lower end of the valve sense of humor, because there are a great many things stem, and is normally off its seat when the faucet is used in the usual manner, but in order to repair the first glance, and the newspaper reader has got to upper and ordinarily used valve seat or valve, the judge about that. He must always be on hand and stem is moved upward beyond the normal position, until the lower valve is engaged with its seat, shutting



BYRNE'S FAUCET.

off the water from the middle and upper section and the spout. On removing the handle, the upper section can now be readily removed, affording access to the valve seat and valve for any repairs which may be necessary or the putting in of a new valve, and obviating the necessity of shutting off the water supply in the service pipe from the main.

TO THROW LIFE LINES FROM VESSELS.

To facilitate establishing communication from a disabled or drifting ship with the shore, Mr. Anton Schmitt has patented the apparatus shown in the accompanying illustration, the introduction of which is being promoted by the Rev. Albert Stroebele, of Butler, N. J. On the vessel is carried a cannon adapted to fire a projectile in the form of an anchor having grapnel arms, to hold the anchor where it strikes, the anchor carrying a line having one end fastened on the carriage of the cannon while the other end unwinds with little windows and a pneumatic bell, so that the drill from 2 ft. 4 in. to 7 ft. radius.

from a drum on the carriage, the two ends of the line thus remaining on board the vessel. One end of a line thus connected with the shore may then be attached to a heavy chain or cable, and the latter drawn out and fastened in the anchor, affording means, by the aid of a drum or windlass on shipboard, of drawing the vessel toward the shore. Fig. 1 is a sectional side view of the anchor, whose body has a bore registering with a conical bore in the base, through which passes one run of the line, which extends around a pulley in yielding bearings in the head, and through registering apertures in the body and base, to return to the drum on the carriage. A tube loosely held in the bore of the body is adapted to engage a funnel in the base to form a guideway for the head of the heavy chain or cable when the latter is to be connected with the anchor, as shown in Fig. 3. On the front of this tube is a flanged cap, on which presses a spring normally com pressed by hooks which engage the flange, the hooks being pivoted at their rear end on links connected with a rod

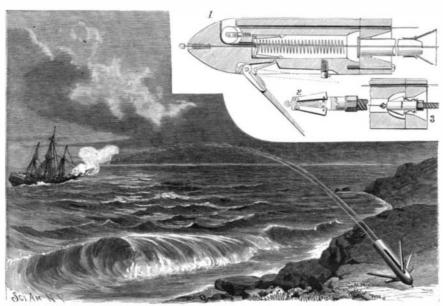
this rod first strikes the ground when the anchor is fired, disengaging the hooks and permitting the spring for first aid. etc. Dr. Honig suggests that his invento force the tube and funnel outward, as shown in Fig. 1. Pivoted in recesses in the sides of the body are three grapnel arms, each arm being recessed to receive a pivoted arm. Each arm is normally held in closed position by the wall of the barrel, but they are all forced outward by springs when the anchor is fired, the shorter arms being rigidly and the longer arms elastically held open. The head for the chain or cable to be connected with the anchor by means of the lines, after the anchor has been thrown ashore, has pivoted wings normally folded into a recess of the head, as shown in Fig. 2. These wings are spring-pressed, and are closed when drawn through the funnel in the base of studs is dispatched—similar to the pleasure, which

of the anchor, after which they swing outward and abut against the innerface of the base, whereby the head is securely connected with the anchor, and a strong connection is thus made between the anchor and the vessel.

Aliens May Become Engineers.

Aliens who have resided in the United States for six months or more, and who have declared their intention to become citizens of the United States, can be licensed as engineers or masters in the American merchant marine. Such was the decision of Attorney-General Olney in the question referred to him by Secretary Carlisle as to the legality of the action of Secretary Foster in granting licenses to the alien engineers who were serving on the American Line steamers New York and Paris at the time they were granted American registry under special act of Congress. General Olney decided that the action of Secretary Foster was valid, and that the act of 1874, under which he acted, was still in force, and unrepealed by the act of 1884, known as the Dingley act, notwithstand. ing the contention of the National Association of Marine Engineers of the United States that it had been repealed.-American Shipbuilder.

purpose. According to the Lancet, London, a new



SCHMITT'S LIFE LINE THROWING APPARATUS.

the litter are boxes for dressing materials, instruments tion would be useful in small towns for which a horse ambulance is too expensive. It brings the surgeon and his assistant very quickly to the scene of an accident and enables them to remove the patient to a hospital.

IMPROVED RADIAL DRILLING MACHINE.

A radial drilling machine, by Messrs. Craven Brothers, London, makes short work of drilling, tapping and studding the upper flange of a crank chamber. The Engineer says, "So quickly does it get through its pleasure in standing and watching it till the whole set ferred to the cellar for the winter.

we all know at some period of our lives, of seeing an The wheel is in use everywhere and for nearly every express train go by. It has been expressly designed to tap and bore holes up to 1½ in. diameter. The radial ambulance carriage has been invented by Dr. Honig, arm is carried by two trunnions on a vertically adjustof Berlin. It is not drawn by horses or men in the ordiable slide, and admits 3 ft. 9 in. up to 6 ft. 3 in. high nary way, but is propelled by cyclists, and consists of a from the face of bed plate. The radial arm is fitted kind of litter resting on a frame with five wheels, three with a clutch motion actuated by a lever in front of in front in the form of an ordinary tricycle and two at the drill head to rotate the drill spindle in either directhe back. The drivers, accordingly, sit one at each tion or to stop it instantly. The spindle is balanced end of the litter, which is covered by a removable roof and fed down by a steel out rack, and is adjustable to

> "Perhaps the speed at which we saw this machine doing the work, i. e., drilling the hole, tapping it, and driving home the stud, as we timed it, in one minute, should be in some measure attributed to the nimbleness of the operator, and again in some measure to small improvements made by Messrs. Willans and Robinson.

> "In the first place they make their own taps with a special shoulder, which, on arriving at the surface of the flange, stops all further progress of the tap. Another little feature which, vulgarly speaking, is certainly 'a tip,' is in the section of the drill stock where the drill is held by it-only one half of the inner wall of which is turned true. The remaining semicircle is cut away, so that a drill can be hurriedly inserted without much chance of missing the hole. When once entered, however, it quickly finds its place under the influence of a set screw, which binds it hard to the true surface, as in the accompanying cut."

The Oleander.

The oleander is surely a thing of great extending to the front end of the body. The head of | patient can communicate with the drivers. Beneath | beauty. No plant is easier to manage, the flowers are so pretty in both form and color and possess a fragrance of their own, therefore making it most desirable in every respect.

> The plant will thrive and bloom in almost every kind of soil. The best results, however, are obtained by using good, rich leaf mould. While growing it requires an abundance of water, and when about to bloom should be given waterings of liquid manure occasionally. This will insure an abundance of large, perfect and brilliant flowers.

It may be set in the open ground in spring and in the fall dug up, carefully keeping as much dirt as poswork that, as we look at it, we take a sort of childish sible about the roots; placed in a tub and then trans-

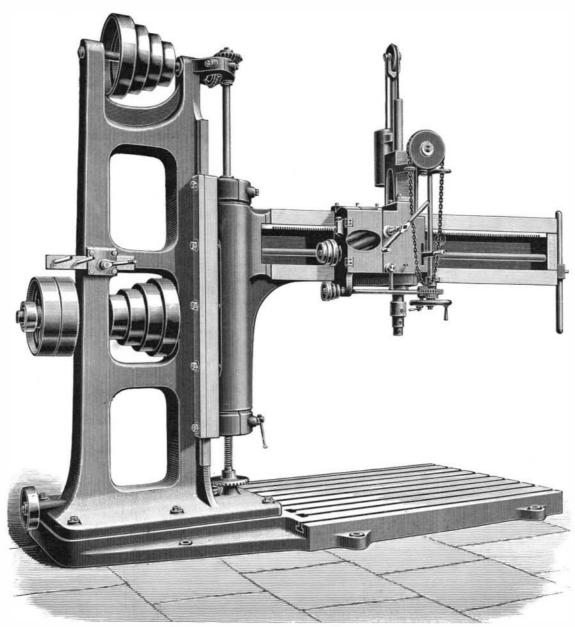
This plant is so easily grown that no flower lover

should be without it, all they require being good soil and liberal watering when needed

Grape Fruit as a Tonic.

Grape fruit, plump and juicy, is in market again, a harbinger of spring. This fruit is an admirable tonic, as well as a most appetizing breakfast or luncheon relish. A doctor says that the sharp stimulus of fruit is the best thing to set the digestive organs in order for the day, and the peculiar properties of the grape fruit give it marked medicinal

When eaten at luncheon it is prepared in a different way than for breakfast service. For the second meal the contents of two halves should be scraped out, the seeds and tough cone of dividing skin taken out and the pulp and juice thus obtained used to fill one of the halves, which it will just about do. A tablespoonful of sugar and one of rum or sherry mixed with the juicy pulp adds the perfecting flavor, At breakfast, with the long pointed orange spoon, the meat is eaten out as is that of an orange and very little sugar is used, many persons preferring none, on the ground that its full medicinal value is better obtained.-Popular Science News.



RADIAL DRILLING, TAPPING, AND STUDDING MACHINE.

Stained Glass, Ancient and Modern.

The limitations of the early manufacture of glass were an advantage to the early workers. The small size of the first sheets of colored glass made it necessary that the designer should execute his work in small pieces. insuring a juxtaposition of color. Much of the beauty which we now recognize and admire in old work is due to the fact that the artist or artisan was forced to subdivide his design into almost infinitesimal pieces in order to execute the same with economy in reference to material employed. Many happy accidents have thus been handed down to us.

The celebrated windows at Notre Dame owe their great brilliancy and charm of color to the above-mentioned fact. The celebrated glass at Saint Chapelle. so much written about, owes also its effect to this min uteness of detail.

The windows of the Seven Sisters in York Cathedral, England, are said to have been made by apprentices, and also, we are told, were executed from a lot of remnant glass that was supposed to be practically worthless. The result obtained was so successful, and has been so much praised by connoisseurs from that time to the present, that these windows now stand as possibly the best example extant of their peculiar kind of

If we look at the early Dutch, Belgian, French, or English specimens, we find practically the same influences at work in all these different schools-a certain simplicity of background with an elaboration of detail in some one central point, in most cases an escutcheon or family coat-of-arms. In the early Swiss glass we find this idea of centralization of ornament carried still further, while the regular escutcheon, family coat-ofarms, etc., were executed as in other cases, and imaginative center pieces were invented by the designer. Great numbers have been handed down to us, filled with all sorts of fantastic castles, knights, etc., just as the mood happened to strike the artist or artisan at work.

More elaborate glass treatment is to be found in the early figure work placed in the large cathedrals and churches throughout Europe. Here the same influence was at work, and in almost all cases secured an excellence of color which could not have been obtained by preconceived design, and that was the necessity of the workman to so subdivide his design as to represent all details by very small pieces of glass. The result in these larger windows was the same as in the smaller lights already mentioned, and beautyand juxtaposition of color was obtained, unsurpassed, unrivaled even at the present day.

Age has also added to the beauty of cathedral glass. The climate in certain countries, especially in England, has so soiled and dimmed these windows that they now have an artistic quality of color unrivaled by any work produced at first hands. This point was most strikingly exemplified when, a few years ago, an attempt was made in England to cleanse certain of the old cathedral windows, the beauty of which had been famous for many centuries. No sooner had the workmen performed their task than the windows were found to be crude and garish in color, much of the very quality which had caused them to be models for later glass work was destroyed, and the value of the windows completely lost. This is but one of the many instances which could be given to illustrate the statement that the peculiarity of the color of the old windows is produced by age and accident more than by the ability of the glass workers first executing them.

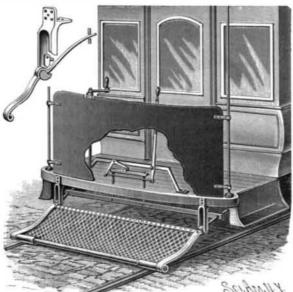
The modern glass worker is expected to obtain the rare color of the old work with the more perfect design and drawing of modern times. The task is not an easy one. In order to obtain the brilliancy of color of the old cathedral glass, the modern designer must of necessity so subdivide his window as to gain the same juxtaposition of color by the use of very small pieces, As these pieces are of necessity fastened together by the leads, the result is a large mass of black in the completed window. For this reason many black; in fact, the color is visible only on a bright, sunshiny day. This depth of color has been called for by the great number of black lines introduced, and by the mechanical necessity of putting the glass together with leads. An effort is being made at the present time to overcome this difficulty. The modern designer is attempting-with what success will soon be shown-to in color by the juxtaposition of different tones, but is also light in color. The mechanical difficulties are very great, but the improved leads now used, and the modern stiffening bar, it is hoped, will be able to overcome these.

In household work the modern designers may truthfully be said to have far surpassed the work of their ancient fellow-craftsmen. Outside of the simple, clear leaded lights of the Dutch and Belgian school, and the heraldic light of the middle ages with their coats-ofarms, escutcheons, etc., little household glass can be said to have been executed up to the present time. | year given to Lord Rayleigh for his discovery of argon | mable cotton, touching the burning hot stems and Now, however, this has been changed. Every build- in the atmosphere.

ing of any importance has some small portion of leaded glass. Every city hall, every State bouse, every private residence of any importance, has one or more leaded lights, in many cases a great number, and this constant demand for leaded work has created a school of glass in America which is unsurpassed by any other at the present day. The use of the delicate American opal for the accentuation of the ornament against a background either in clear white, white rippled, white Venetian or white cathedral, has opened up a field of design which has never been equaled.—Kate Field's Washington.

A FENDER FOR CABLE OR TROLLEY CARS.

The illustration represents a light and inexpensive device, readily transferable from one end of the car to the other, for picking up and carrying without injury until the car is stopped persons who may be caught in the way of a moving car. It has but few parts, may be readily raised and lowered by the gripman or motorman, and its supports are clear of the tracks, bumpers, and drawheads of the car. It has been patented by Mr. Louis F. Trinchard (address in care of F. Querens, Jr., P. O. box 905, New Orleans, La.) The main frame of the fender consists of two end bars, shown in full in the small figure, and a front bar held at its ends in the eyes of the end bars. A central intermediate semicircular socket section of the end bar rests on a pivot bar of a bifurcated hanger, there being a latch above the pivot bar, and the rear end of each end bar is received in an opening in a transverse suspension bar connected by a yoke with a bridge bar just behind the dashboard, as shown in the broken-away portion of the main view. On this bar is an elbow lever connected with a hand lever, by moving which to the right or left the fender may



TRINCHARD'S CAR FENDER.

be raised or lowered. The front bar of the fender frame has at its ends rollers adapted to travel on the rails when the fender is lowered.

Well Cared For.

This means much in homing pigeon keeping. Your feed must be of the best, and your supply of water the freshest and in plenty; also a pan of grit and ground oyster shells, good small Canadian peas, and some vetches, together with hulled oats, are the correct standard feed for the American racer at this period, with a few handfuls of small corn during an occasional cool spell or after a hard fly, and you must not forget the bathtub on every bright and warm day. The bathtub for the racing homer. I think, is a superb institution and works wonders, despite the fact that very many of the best Belgian fanciers rarely supply them to their birds. It is within the power of any of our but that it was safe to leave the lamp on the cloth. young flying fanciers to bring their birds into fit racing When he returned the cloth was blazing. The fire of our most prominent designers have lowered the condition, if they are patient, attentive, and watch was soon put out, and not much damage was done. tone of glass so that their windows are almost their birds closely, giving them the best quality of feed obtainable, and not try to breed from and race their few months ago, the Boston Journal of Common adds, birds at the same time. All this, coupled with a clean, sweet loft, ample ventilation, and enough exercise without fatiguing them, will certainly have good results; but if they think all this too much trouble and feed and breed indiscriminately, with lots of hemp seed, common and cracked corn, and lazily loaf around produce a stained glass window which is not only rich in the sunshine and the loft all day, then they will score more misses than hits, and the 200 miles station will settle them sure.—Amer. Fancier.

Honors for Lord Rayleigh.

London Chemical Society.

A recent issue of the SCIENTIFIC AMERICAN (May Academy of Sciences, held in Washington, also calls attention to the fact that the Barnard medal was this

Correspondence.

Repairing Commutators. To the Editor of the SCIENTIFIC AMERICAN:

In your issue of April 27, G. H. G. asks for some composition for filling cracks in a commutator. You reply that the only way to repair will be to take the commutator apart and replace the mica. But if he happens to have no appliances for this work, a temporary repair can be made of thick shellac solution and dry plaster of Paris. Fill the crack with the shellac, then put on the plaster, kneading with a knife blade until it is stiff and smooth. Let it dry five or six hours or longer before scraping off the top even with

I have used this method for repairing street railway motor armatures for more than a year, and no armatures have come back in that time for a fault due to this filling.

the surface. It should be thoroughly dry before the

Covington, Ky.

armature is used.

A New Italian Lake.

To go to bed in a plain and to get up on the banks of a lake, to lie down an agricultural laborer and to wake a fisherman, is not a common experience, says the Florentine correspondent of the Scotsman, even in these days of telluric storm and seismic convulsion. Such, however, is precisely what has just happened, and not many miles from Rome. Alighting at the station of Monte Rotondo, famous for a Garibaldian victory, which preceded by a few days the Garibaldian defeat at Mentana on November 2, 1867, you proceed to Leprignano, not far from Castelnuovo di Porto. This is a hamlet numbering about one thousand souls, chiefly agricultural in their calling. It stands some 600 feet above the sea level, on a plateau to the right of the Tiber, near the valley watered by the Gramicia torrent. Few visitors but those interested in Etruscan antiquities are ever seen at Leprignano, quite unattractive as it is, except for the ruins of Capena, that ancient Etruscan city whose importance may even now be gaged by the number and quality of its tombs. On the morning of the 8th instant, however, the little hamlet was conscious of a profound rumbling, the preliminary to further sounds of similar import, announcing the noise it is now making in the world. On the 12th and 13th the rumbling was repeated, and on the latter date it was found that the soil occupying a space of six hectares had collapsed, and that the vacuum had been filled with water, forming quite a respectable lake. Sulphurous gases bubbled up to the surface, disclosing the springs from which the lake is fed, while from its raw margin emanated similar exhalations, finding their vent through the numerous cracks that run their eccentric course around it. All the countryside turned out to witness the improvised sheet of water, and some young peasants, more adventurous than their fellows, advanced toward the brink, only to feel the earth giving way beneath them and to get a good ducking. The extreme unsteadiness of the surrounding soil. indeed, favors the view that the lake will gradually widen in circumference, for already there have been landslips at various points of its margin, followed immediately by a rise of the water.

Fires Caused by Incandescent Lamps.

An investigation into the cause of a fire in a Winter Street dry goods store, in Boston, recently, resulted in demonstrating that an incandescent electric lamp will generate sufficient heat to set inflammable material into a blaze. The fire in question, for which a still alarm was given, was caused by allowing an incandescent lamp to remain for a few moments on a pile of cotton cloth in the packing room. The person in charge left the room for a few moments, not dreaming

This case recalls one reported from Louisville, Ky., a which demonstrates the same thing. The fire started, says the Insurance Herald, while the window dresser was preparing a Christmas snow scene. The window was lighted with incandescent lights, which it appears had not been changed for a year, except when made necessary by accidental breakage. The carbon in an incandescent globe has a life of 600 hours, and as it wears out the carbon loop offers increasingly less resistance to the current, and, therefore, increasingly more heat is thrown off upon the glass bulb and even upon the metal stems to which the globes are affixed. When The fortunate discoverer of argon has been made the a new light is attached the globe becomes only warm recipient of the Faraday medal, which is a gift of the under continuous use, but after it gets old the globes are hot and the stems attain burning heat. The dresser was filling the floor of the window with loose 11, 1895) in a review of the late meeting of the National cotton upon cheesecloth, to represent snow. This was packed closely around the stems and globes of the electric lights, and there is no doubt that the inflamglobes, caused the fire.

THE AMERICAN YACHT DEFENDER.

The series of races in which the Valkyrie, as the in all of which the Vigilant was victorious. Now work pose of quickening patriotic feeling. is being rapidly pushed forward on an American yacht which has been aptly named Defender, which will probably compete with a British yacht next September the general public as well are looking forward to the omen. determine which shall be the British champion.

architects in Great Britain. The order for the De- and bleached bones. fender was placed last January with the Herreshoffs, If a knife, pin, or tinder box were lost within some companying it whatever direction the root may take. after to see if any modification as to rig is required.

measurements are as follows. The exact measure-|or, at least, destroyed habits founded upon leisure and ments have not as yet been made public, for from immunity from persecution. the time of their conception until long after | The Courting of Animals.—This subject seems to wonder at the magnitude of the immense colonies of launching the cup defenders have ever been mysteries prove attractive to many naturalists. In Vol. X of subterranean fungi which must exist interlacing themto the public, and the present yacht is, if anything, the "Transactions of the Wisconsin Academy of Sci. selves at the roots of such forests of trees. more so than the preceding ones. This secrecy must ences," there is a highly interesting paper by Mr. and be maintained, so as to keep the lines and dimensions Mrs. Peckham on the "Courtship of Certain Spiders," fungi of all kinds in forests and round the roots of cerfrom rivals and those interested in the challenging It seems to be the case that the sharpness of vision in tain trees. The lichen is now almost generally ad-

The present figures, although in some instances unofficial, will probably be but little out when comparison can be actually made.

between 89 and 90 feet at the water line. The beam periments it was proved that this recognition was is about 23 feet, draught about 19 feet. She has no really due to sight. These results are interesting, beauxiliary centerboard forward, but is an out and out cause some have affirmed that spiders cannot see keel boat. She has a 35 foot lead bulb weighing 60 nearly as far as twelve inches. Further experiments ing chlorophyl, manufactures starch and other chemitons. In the lead bulb of the Defender, Herreshoff seem to show that spiders can differentiate color. M has remedied a serious defect in the Vigilant. Where Racovitza, a Roumanian naturalist, has been studying the latter in a heavy sea pounded with her flat outside the courting and marriage customs of the octopus, and ballast, the Defender will rise and fall without pound- in a recent number of the "Archives de Zoologie Ex- the fact that a lichen may be actually synthesized by ing, as the egg-shaped form of her ballast gives easy perimentale" he gives us some of his observations. It sowing certain algae along with certain definite fungi entrance and withdrawal.

cent of copper to resist corrosion and give added -Science Gossip.

is 102 feet long; boom, 102 feet; gaff, 64 feet; human husbandman, and would quickly disappear if it is hard to arouse them. bowsprit, 44 feet; topmast, 61 feet 2 inches; spin-the attention of the insects was withdrawn.

The effect of the grass naker pole, 72 feet. These dimensions may be The fields of the farmer ants cover scores of square and no bad results have ever been noticed on account slightly decreased in fitting. It is said that the De- miles in Sonora, a large part of which is quite densely of it. Cattle on the ranches frequently come upon fender will have 7,000 square feet of canvas in her populated by them. The home of a colony is marked patches of this grass, where they feed for perhaps half mainsail alone, and her total sail area will be from ordinarily by a circular clearing from five to thirty feet an hour, and then fall asleep for an hour or more, when 12,500 to 13,000 square feet. The distance from the in diameter, on which nothing is permitted to grow, they wake up and start feeding again. deck to the hounds will be about 72 feet. The De This serves as a sort of parade and exercise ground. The programme is repeated perhaps a dozen times, fender's principal gain in sail area will be in the main-sail, the spinnaker being somewhat smaller than that three to twenty feet wide. On the seeds of this grass like the poppy, the grass contains opium, or whether of the Vigilant. One of the most interesting features the insects subsist, planting it every spring and garner. its sleep-producing property is due to some other subof the Defender is the manner of working the sails. ing the crop in the autumn. Across the rings which stance, has not been determined.--Pearson's Weekly. All the halliards will be led below through tubes in surround formicaries run turnpikes a few inches wide, the deck, and they will be worked by means of power- connecting farm with farm for many furlongs. ful winches.

be handled by a few men with the aid of a winch. The latter appear to keep down and exterminate all busta and is known from reliable persons to have a Possibly the same may be done with the sheets of the other plants, such as cacti, grease wood and mesquite. narcotic effect on horses and other stock." head sails, but many of the details of the yacht are The plants naturally prevailing in that part of the still kept secret. Much of the heaviest work of trim- country are entirely absent from the most thickly ming sheets can thus be carried on below the deck, settled farming districts. In short, these insects have of girls; but recent measurements disprove this. The leaving the deck itself clear for other work. Our full developed an art of agriculture peculiar to themselves, boys, up to their eleventh year, were found torun about page engraving represents the Defender as she will have made conquest of the land for their needs and a quarter to half an inch taller than the girls. They probably appear at the race with spinnaker set. Our have artificialized certain cereals as thoroughly as were then overtaken by the girls, who surpassed them smaller views give a side elevation and a half bow, half maize and barley have been artificialized by man. In height till their sixteenth year, when the boys again stern elevation.

will be selected to compete, but there seems to be a markable intelligences; and incidentally, an animal British champion, attempted to win the America's cup very general opinion that the safety of the America's and a plant have come to be mutually dependent upon in competition with the American yacht Vigilant took cup rests almost entirely with the Defender, for each leach other for existence." The favorite cultivated place off Sandy Hook in the autumn of 1893, the first new boat has been better than the last. The interna-plant of these ants is the familiar buffalo grass. race being sailed Saturday, October 7, the second, tional yacht races have promoted an honorable rivalry Monday, October 9, and the third, Friday, October 13, among yacht designers, and serve the wholesome pur- is difficult to distinguish between true parasitism and

Natural History Notes.

for that great blue ribbon of the sea which still re- of peculiar habits, is found in Cape Colony, some other 'are known in which the two plants in union mutually mains in the land of its naturalization. After the de-parts of Africa and in Madagascar. It is something; benefit each other, and the term applied to such unions feat of the Valkyrie Lord Dunraven's challenge was of like a heron or stork, has a melancholy gait, lives on would be symbiosis. Symbiosis may then be defined course a foregone conclusion, and all yachtsmen and fish and frogs and is considered in Africa a bird of ill as the associated existence of two or more plants for Under its quiet appearance it nourishes purposes of nutrition. races which will be sailed off Sandy Hook in a few æsthetic tastes. When it casts off its sober demeanor, months for the time honored trophy, for yacht racing it indulges in a fantastic dance. In a state of nature, union each supplies its partner with materials that probably appeals to a much larger section of the com- two or three join in the dance, skipping around each the partner requires; a reciprocity system being the munity than any other form of sport. The most im- other, opening or closing their wings. They breed on rule of their combined existence. Many of the forest portant concession granted to Lord Dunraven this year trees or on rocky ledges, forming a huge structure of trees, common shrubs, etc., have attached to their was the right to choose his boat as the New York sticks. These nests are so solid that they will bear the roots fungoid partners which, absorbing from the Yacht Club does at present, so that in all probability weight of a heavy man on the domed roof without col-ground moisture and mineral matters, hand these not only the Valkyrie III. which the Dunraven syndillapsing. The entrance is a small hole, placed in the chemicals over to the larger tree, receiving in return cate are building, but the Fife cutter Ailsa will be least accessible side. In a lonely rocky glen, Mr. starch and other organic materials, which the tree has brought over and trial races sailed off Sandy Hook to Layard once counted half a dozen of their nests, some formed in its foliage. The black popular and many almost inaccessibly placed on ledges of rock. One other plants have the thread-like filaments of fungi In America we have, as it were, put all our eggs in inest contained at least a large cartload of sticks. They i woven over their roots. one basket, and are relying almost entirely on the occupy the same nest year after year, repairing it as Vanderbilt-Morgan-Iselin boat Defender, which the required. The female is credited with the joiner work the germinating seed into the ground becomes en-Herreshoffs are building at Bristol, R. I., as this boat and the male is the decorator. On the platform out- tangled with the myceloid filaments of the fungus alwill probably have to race against the pick of two side the inner portion he spreads out all kinds of ob- ready existing in the soil, thenceforward the connecmodern cutters designed by the two foremost naval jects of virtu, brass and bone buttons, bits of crockery tion continues until death. As the root grows onward

who are undoubtedly the greatest yacht designers in miles, the loser made a point of examining the hamthe world, and they are under contract to deliver the merkops' nests. Indeed, were it not that hyenas, the kind described is very large, most of the Ericaceæ, yacht June 15, and her trial races will be sailed soon leopards, and jackals ranged in their vicinity, it is Coniferæ and Cupuliferæ co-operating with subterrahighly probable that man's curiosity or resentment The Defender is a sloop yacht. The approximate would have often extirpated these interesting artists,

spiders is accentuated by love. A male of Satis pulex imitted to be of a composite character, each lichen was put into a box in which was a female of the same being comprised of (1) a fungus made up of a web of species twelve inches away, and the male "perceived myceloid threads with (2) an alga in its interior, the her at once, lifting his head with an alert and excited combination of alga and fungus thus forming the one The Defender is not far from 126 feet over all and expression, and went bounding toward her." By ex-The Tobin bronze plates, as used in the Vigilant, some have thought, behave brutally in its love affairs. amalgamate and interweave their cells, with the result have been superseded by manganese bronze plates M. Racovitza assures us that "there is nothing more that a lichen is formed. below the water line, and above it as far as possible than a courteous flirtation," and that "the male bethey are of aluminum with an alloy of about ten per haves with a certain delicacy toward his companion."

Not only is the upper portion of the plating of the ernment scientific corps, recently paid a visit to some that graze upon it. Horses, after eating this grass, in Defender of aluminum, but the deck beams themselves very remarkable farmers in Sonora, Mexico. These nearly all cases sleep standing, while cows and sheep are of the same material, and the saving in weight are the so-called agricultural ants, which plant fields almost invariably lie down. It has occasionally hapover steel will be more than double the amount saved of grain and regularly harvest their crops, upon which pened that travelers have stopped to allow horses to by the plating. The total saving effected by the use they depend wholly for food. In fact, should the feed in places where the grass grew pretty thickly, of aluminum is estimated at seven tons, which is ex- crops fail, they would perish of famine. On the other and the animals have had time to eat a considerable pected to tell greatly in favor of the Defender in the hand, the cereals that they grow have been specialized quantity before its effects manifested themselves. In races. A dispatch from Boston states that the mast by cultivation, like the wheat and other grains of the such cases have gone to sleep on the road, and

In the region described there is practically no vege-The main sheet will also be led below, where it can tation except the grasses cultivated by these ants.

It is of course still a question whether the Defender ment of the desert has developed one of the most re-

Co-operation in Plants.—Although in some cases it symbiosis, says Mr. George Clayton, in a recent paper on this subject, and to pronounce definitely that the host plant does not get some advantage from the para-The Dancing Hammerkop.—The hammerkop, a bird site that feeds upon its juices, yet innumerable cases

Unlike parasites, two symbiotic plants living in

In the first instance, the root which descends from the mycelium which invests it grows with it, ac-

The number of plants having symbiotic relations of nean partners. It is notable that the chief species of flowering plants which are symbiotic are gregarious in character, and, like the oak, fir, heather, etc., form large forests, or moors, and one may be filled with

It will also be plain why there is such a profusion of lichen plant.

The myceloid threads of the fungus, being most exterior, fulfill the function of gathering from the air moisture, while its partner, the alga, owing to its havcals; thus here, again, the partners supply each other with matter necessary for the life of both.

A most interesting proof of this union is afforded by is satisfactory to know that the octopus does not, as in a favorable place, when the two separate plants

Sleepy Grass.

In some parts of New Mexico there grows a grass Agricultural Ants.-Prof. W. J. McGee, of the gov- which produces a somniferous effect on the animals

The effect of the grass passes off in an hour or two.

Mr. Frederick V. Colvill, Botanist United States Department of Agriculture, says: "The so-called sleepy grass mentioned in a recent article in Pearson's Weekly is known technically as Stipa viridula ro-

It is often supposed that boys in growing keep ahead "Thus," says Prof. McGee, "the rigorous environ- grew faster than the girls, and came to the front.

SUSPENDED RAILWAY SYSTEMS.

The subject of rapid transit is now attracting great attention in many of the large cities of the world, including Paris, Berlin, Boston and New York. Among recent projects for urban transportation is one in which the cars are suspended and the motive power is electricity. In this form of aerial railway a derailment would be practically impossible, the center of gravity being very low.

M. Langen has designed such a road for Berlin and other places, and the system is adapted both for ordinary rapid transit or for high speed service, for he considers that the enormous speed of 186 miles per hour may be attained. We give some illustrations of his design. Figs. 1 and 2 show an elevation and sectional view of the electric motor and its mode of attachment to the car. The derailment of the wheels is prevented by the friction plates. The wheels are secured to the motor case in the usual way and are supplied with springs to take up shocks. The car is fastened to the motor through the medium of a center pin, e, which permits of a certain amount of lateral play. The car is suspended by springs which render riding easy. Each truck has four wheels. Each car is provided with two motors as shown in Fig. 5. Each truck is also provided with brakes which seize the rail at

In addition to the invention of the passenger car, M. Langen has designed an inspection car, which is suspended in the same manner but has only one electric motor. On the other truck is a gas or petroleum motor which actuates the running gear if the supply of electricity fails. If the motors of the cars or the supply of electricity should fail, owing to a break in the line, the passengers can be conveyed to one of the comprehensive plan, specially designed to meet and is not as great as in most other schemes for aerial

which support the tracks are constructed on the cantilever plan and are secured to columns, various styles of which have been devised to suit the conditions of the streets on which the railway is to be built, as a single column and double column support. Fig. 5 shows the trial line which has been erected at Deutz, which is across the Rhine from Cologne. Fig. 6 shows a design for the suspended electric railway intended for a crowded Berlin street. The cars seat fifty persons each and access to them is gained from stations which are built at con-

both the top and bottom.

current is supplied on the well known block system, The lower line of cars is intended to accommodate the has since been carried out in all the other ships of the

and if a car should be temporarily stopped between stations, there is no chance of the next car colliding, as no electricity is supplied to the block following the one where stoppage occurs until the car which has stopped has left the block. An electric brake is also automatically applied.

The first concession which has been given to the promoters of the Langen system has been granted by the cities of Elberfeld and Barmen. It is decided to build within a year an aerial line between the two cities. The contract was signed toward the end of the year 1894. For our engravings and the foregoing particulars we are indebted to the Revue Universelle.

Coming now nearer home, we will give a few particulars of the system proposed for New York City and vicinity by Mr. J. R. Hawkins, of Mountainville, N.Y. It is a very

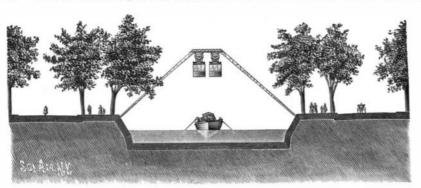


Fig. 3.—THE CARS SUSPENDED OVER A CANAL.

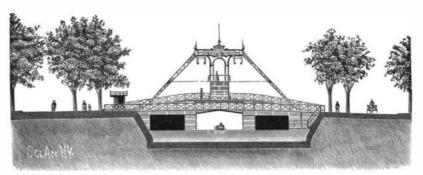
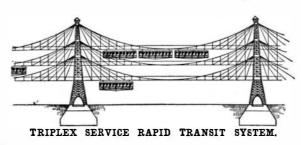
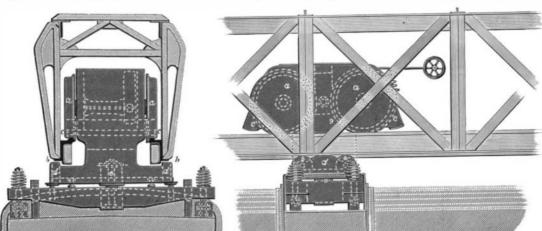


Fig. 4.—THE RAILWAY AT A FLOOD GATE.



cars of the other line. The expense of the new system | accommodate the great and rapidly increasing population of this metropolis. He designates it the Triplex transportation. The cars make comparatively little | Service Rapid Transit System. Suitable piers or towers noise and curves are passed with ease. The girders | are located at intervals, from which several independent | Repulse never exceeded 11°. The mean angles of oscil-



Figs. 1 and 2.-ELEVATION AND SECTION OF THE ELECTRIC MOTOR.

venient intervals. The current is supplied to the tracks are supported on the suspension plan, and from those which had proved so effective in the Repulse. motors by three wires which are carefully insulated trucks on these tracks the cars are suspended. The This work was completed for the ships of the Channel and protected from contact with other wires. The cars of the different tracks may run at different speeds. Squadron during their annual refit last summer. It

street travel, and the cars will be suspended, say 16 feet above the surface of the ground, suitable places with steps being provided where the cars stop for passengers. The inventor says: The passenger does not have to step in front of a passing vehicle, thus endangering life, does not have to wait for a vehicle to pass; and the car, when boarded, does not have to wait for any obstructing vehicle to pass or get out of its way while running, and is ready to proceed at once when boarded, and can continue its journey with unabated speed, until a passenger is ready to board or land, thus saving from ten to twenty per cent of time, besides the saving of time to all other traffic, by leaving the street almost entirely free for all other vehicles.

The three roads combined, of the suspended triplex system, can be built to carry twice the number of passengers that all the New York roads combined can at the present time accommodate, while the cost of construction will be comparatively small.

Bilge Keels.

Sir William White, K.C.B., LL.D., the Director of Naval Construction, was the author of a paper entitled "Notes

on Further Experience with First-class Battle Ships." which was read at the recent meeting of the Institution of Naval Architects. In the course of his paper, Sir Wılliam said that, as an experiment, the Repulse had been fitted with bilge keels, so that she might be tried in company with sister ships belonging to the Channel Squadron. These keels are about 200 feet in length and 3 feet deep.

The Resolution (without bilge keels), by orders from the Admiralty, had been purposely kept in very nearly the same condition of stability as the Repulse. Comparing the returns from these two ships, it appears that the Resolution on one occasion reached a maximum inclination to the vertical of 23°, whereas the

> lation were, of course, considerably below these maxima -probably about one-half. The Royal Sovereign and Empress of India were also in company. The condition of coal stowage in these two ships at the time gave them greater stiffness and a quicker period, which, under the conditions of weather and sea, caused rather heavier rolling than in the Resolution. In view of this experience, although the trial was limited, and not representative of many conditions occurring at sea, it was decided to fit all the other ships of the class with bilge keels similar to

class. On the cruises of the Channel Squadron which have taken place since bilge keels were fitted there have been but few opportunities of obtaining proof of their practical value. So far as experience has gone, however, there is a consensus of opinion among officers in command that rolling has been greatly reduced by the bilge keels.

As regards the influence of bilge keels on speed, the practical test of actual service proves that there is no sensible reduction in speed for power, or material increase in coal expenditure for a given speed, at a given draught, and with the bottom in similar condition.

Fig. 5.-SUSPENDED ELECTRIC RAILWAY-TRIAL LINE AT DEUTZ, NEAR COLOGNE.

A TEXAS hailstorm on April 24 made sieves of frame houses, blockaded the Great Northern Railroad, and killed large numbers of live stock. The hailstones are said to have been as large as hen's eggs.

English Locomotive Cabs.

Writing to Engineering (London) Mr. Clement E. Stretton severely criticises the English practice of depriving locomotive engineers of all shelter from the weather while engaged in the performance of their duties. He says:

The recent collision at Binegar, which was caused by the driver and fireman trying to obtain shelter upon a bitterly cold night when running tender first, should first. In course of time he would allow himself to be market had grown to be a great industry, and that be the means of obtaining far more protection for en- patted, and eventually becames tame and fond of his some men were getting rich at it. Ranchers were also

gine drivers than they at present have. Unfortunately several locomotive engineers appear to still hold the old opinion that "to provide a comfortable cab would render the men careless," and also add to the cost of the engine. The wishes and requests of the engine drivers and firemen to be provided with better cabs, and also that those engines which regularly are working tender first should be provided with weather boards upon the tenders, seem to receive very little attention, for nothing has at present been done to provide better protection to drivers generally.

Probably no greater difference in "cabs" can be seen than in the various engines working over the metropolitan lines, where the engines of one company will be found to have a complete "cab" and shelter provided for running in either direction, but the engines of another company have no covering

whatever over the men. There is no possible reason master as to leave the herd and come up to the veran-tempered and accommodating, and one day he turned why various engines, performing the same service, da when called, and receive scraps from the table as should be so differently constructed, nor is there any his reward. Of course he had to do his daily task on reason why the American engine driver should be able the cultivation, but showing himself still uncertain to perform his duties in comfort and yet that the same protection should be refused to the English driver.

SPORTING OXEN AND BUFFALOES.

the district as J. J., was manager and part owner of some big bags. a Behar indigo factory. Being short of factory oxen, grown bull which was of such a savage and morose geese with oxen may sound a little queer, but that's wasn't a goose hunter along the coast who didn't have

disposition that the natives could do nothing with him - he would charge them again and again, and could only be approached by jamming the herd in a mass round him in the "Bail-Khana," or bullock house. J. J. was rather a good hand at breaking in "Cutcha" horses; the fancy took him to try and tame the bull buffalo. So he told his "jemadah" to have the animal securely fastened in the shade of a large pepul tree which grew in the compound in front of his bungalow veranda. Then he forbade any of the servants to go near, and took the entire charge of the "bisa" himself. For a long time he fed him very sparingly, and whenever he was passing the pepul tree he would go near and talk to the bull in a full deep voice; sometimes using very flowery Hindostani, in which he made frequent allusions of a defamatory character to

bull buffaloes in general and the direct ancestors of this the way we used to hunt'em in the early days. A originated scores of novelties in the amusement line one in particular. These remarks were often emphasized good stalking ox, I want to tell you, was a valuable by recourse to a rather heavy bamboo "lathi" which bit of property forty years ago in California, and we was kept handy. The animal would charge J. J. in used to talk about him and discuss his points just the most savage manner, but as he was securely fastened to the tree, and his trainer took good care to keep points of their bird dogs. A good stalking ox could some little distance beyond the end of his tether, these earn his owner anywhere from \$50 to \$100 a day if the onslaughts were of little avail. Moreover, they were owner himself was any good, and enjoyed the sport as always met by a sharp crack on the nose by the afore- much as the hunter did.

the folly of this mode of procedure, and contented himself with merely shaking and tossing his head. Then J.J. took up the attack, walking round and round the tree, shouting loudly and calling Mr. "Bisa" all kinds of names! After this some canes of the succulent sugar plant were introduced, and the poor beast, being in a very low condition, soon learned to take them out of his master's hand, though showing some shyness at



Fig. 6.-PROJECT FOR AN ELECTRIC SUSPENDED RAILWAY FOR BERLIN.

with the native plowmen, the planter devised the plan of utilizing him as an ambush for wild duck shooting, these birds being quite accustomed to the herds of village buffalo which graze along the margins of the jhils A correspondent of the Graphic, London, writes from and lagoons. After some practice this bull became India: Some years ago a friend of mine, known in very steady under fire and enabled his master to make

A correspondent of the N. Y. Sun says: "I made a he purchased from some natives a number of buffaloes good deal of money in the early days of California, to work in the plow. Among this draught was a full when we used to stalk wild geese with oxen. Stalking

every cent I had in a gold mine venture. In all the counties bordering on the bay, and in fact all along the coast, wild geese occupied the wide and open plains by the hundreds of thousands. I have seen more than a thousand acres of these big fowl pasturing in a solid block, and that many cattle feeding couldn't have cleared the grass away as completely as those geese did. I heard that the killing of these geese for

> offering a bounty for the geese, as cattle raising was becoming an important business, and the geese preempted so much of the pasture area that the loss was serious to the cattle men. I scraped enough money together to buy a gun, and abandoned gold mining for goose hunting.

"When hunting for wild geese on those plains first began, the hunters were able to crawl up on them as they fed and get within easy gunshot. But the geese soon got on to the sportsmen, and by and by no one could get within half a mile of a flock. Hiding in grass blinds was tried and worked well for a time, but the cunning geese sized the blinds up at last and wouldn't come anywhere near a bunch of grass. So something had to be done. Some one had noticed that cattle feeding on the plains could crop the grass almost on the heels of a host of geese, and the fowls took no notice of them. He had an ox that was even

it loose and let it feed along toward where a tremendous flock of geese were pasturing. Now and then he'd hurry the ox up a little, walking close to it on the side away from the geese. By and by the ox got close enough to the geese to satisfy his owner, who stood still until the ox had passed on out of the way. Then he emptied one barrel of his gun into the flock on the ground and gave it the other as the birds rose. He picked up sixty-two geese. The ox was somewhat surprised, but didn't object to repeating the operation next day, when it was equally successful. Geese were worth a dollar apiece. That was the origin of stalking wild geese with oxen. In less than a month there

a goose-stalking ox."



A SPORTING BUFFALO.

about the same as sportsmen nowadays discuss the

said bamboo. Soon the "bisa" began to awaken to "I went to California in 1851, and promptly dropped road, or 46 per cent of all railroads.

The Toothpick Industry.

Insignificant articles like the toothpick represent the investment of millions of capital, the employment of skilled labor, utilization of the latest inventions, the consumption of vast quantities of wood, and the operation of a long line of complex activities. These small articles play an important part in the economies of all civilized nations. To stop at once the manufacture of toys and all not really needful articles in these nations would be to put a stop to a large part of the working and producing forces that constitute the origin of civilization. Some European nations live mainly by their work on articles that are really only mere toys and playthings. In the United States we are rapidly adding to our productions all the wares that find favor abroad, while we have

that are being sold and imitated abroad. There is in humanity a chord that responds to the touch of frivolity, adds the American Wood Worker, and that chord has enabled the inventors of ingenious nothings to coin fortunes out of their trifles.

THE eastern hemisphere, on which dwell 92 per cent of the population of the world, has 170,792 miles of rail-

Shop Photography.

James F. Hobart tells, in the Iron Age, how to select

can dispense with the draughtsmen who design his tools and machinery or the salesmen who turn the manufactured products into cash. Notwithstanding that photography is so valuable, the manufacturer has not hazard manner, sometimes by one and sometimes by and there seems to be a good deal of truth in the more than 60°.

necessary material and "know how," photographs can save that item of expense by making some neat pine factorily, and the incandescing material is not woven be turned out at will, and usually in a small fraction frames of the size required for the trays, and then setof the time required by professional photographers to ting a pane of glass in a rabbet made for that purpose deliver the same amount of work. This is not because inside each frame. The glass must be set with shellac clusters of these burners are used in Paris with good fessional, but because he has only one man's work to be given several coats of the same substance. This stand any reasonable amount of handling; and it is look after, instead of having to cater to twenty or method makes trays with transparent bottoms, and thirty customers at once, when, perhaps, all of them they are nice ones to work with. Some concerns use ing, and be serviceable to the last shred. The conwant their work first, and "day before yesterday" at wooden trays with wooden bottoms as well. They are sumption of gas in the De Mare burners is limited to

The apparatus and material that should be purchased to begin with need not cost more than \$100, although lows: as the operator gets into the business he will become acquainted with many "conveniences and luxuries" which he will want, and which will bring the cost to a somewhat higher figure. To begin with, purchase a camera, tripod and lens, one or two double dry plate holders and a focusing cloth. These comprise the articles necessary for exposing the plates. For developing the negatives there must be provided three trays, at least 10×12 inches, a glass graduate for measuring the developer and two or three bottles in which to keep the developing solutions.

For making pictures from the negatives there will be needed two "printing frames," three trays, and another bottle or two. For the trays, those used for the negative developing can be used, but it is better to get one large tray, at least 15×19 inches, for toning prints, to be kept for that purpose exclusively. When it comes to mounting the prints on cardboard, there will be needed only a soft bristle paste brush, although some of the luxuries of the art will probably soon be obtained, consisting of glass forms for trimming the prints and a burnisher for finishing up the pictures after they are mounted. This operation (burnishing) is a very important one, but a burnisher is expensive, costing about \$25, and in all large towns there are dealers in photographic material who will burnish prints at a small cost.

The camera should not be less than 10×12 inches in size, and a picture of that area will be large enough to show up any ordinary machine. A good 10×12 camera can be purchased for \$25. It should have a rising front and swing back. The rising front enables the operator to throw the image a little more toward the | monials for our "Scientific American Cyclopedia of | was shown. There were views of veritable thundertop or the bottom of the plate, thus making a change in | Receipts, Notes and Queries," of which the following | bolts, where two separate flashes run into each other. height without moving the camera itself. The swing form a part. Professor Edward S. Holden, of the Also views of flashes shooting upward from the earth. back is to keep the perpendicular lines of the machine Lick Observatory, says: "It is a mine of useful infor- He showed a comparison between a sheet of glass vertical on the picture. It is often desirable to tilt mation set forth in a simple manner, and it will be cracked by heat with the form of a lightning flash, the camera up or down a little, or even considerably, found of value to all who have to do with practical and closed the series by showing a view of a flash in order to get the whole of a tall machine on the matters—as who has not, nowadays?" Mr George F. taken from the rear end of a railway train in moplate, or, perhaps, to show the top as well as two sides. Kunz, the gem expert, says: "The Scientific Amerition, which had the appearance of a broad ribbon This can be done, but the plate which is to form the can Cyclopedia of Receipts' cannot fail to be highly of light—very remarkable. He proved that it could negative is tilted so that the picture of the object ap valuable to artisans of all kinds, such as jewelers, sil- not have been due to the local movement of the nears wedge shaped.

swing back that can be made is to set up a plain board, and adjusting a great variety of articles with which separating it into two parallel branches near together, say 16 feet long. Erect this board on one end, then set they are constantly coming in contact." Professor W. one nearly back of the other, which would make the up the camera in front of it and tilt the machine so F. Watson, of Furman University, says: "It exceeds light from each merge on the plate and give the effect that the top of the board is visible on the ground my expectations. I believe it to be the most compre- of a broad ribbon of light. glass. A close inspection of the image will show that hensive and reliable work of its kind that has ever! The views were very instructive, in showing the the top is very much narrower than the bottom, been published." Robert Bond, M.D., says: "It many phases of lightning and in correcting false ideas making a wedge-shaped picture, which is far from be- pleases me to say that no other book I have would I on the subject. Photographers generally should be ing a correct representation of the object itself. In exchange for it could I not duplicate it. I have used prepared to catch views of lightning, in order that it order to correct this error, the swing back must be several of the formulas and have had absolutely no may be studied photographically as effectively as used, and so changed that the ground glass will stand failures when I use pure materials. Being a chemist, of astronomy is now done. perpendicular. Then, no matter how much the course I know how to select. In fact, some of your forcamera itself may be out of level, the picture will be mulas are marvelous." The Rev. C. C. Brown says: perfectly symmetrical in all its parts, provided the lens | "Your 'Cyclopedia of Receipts' is a wonderful book. I In our description of the Descret Museum, Salt Lake is rectilinear, as it should be. The glasses must be so reinked the ribbon that I am now using by following City, in the SCIENTIFIC AMERICAN of April 20, the size proportioned that pictures of all objects are not dis- the directions given in the book; I have also made a of the main lecture hall was erroneously given as 16 by torted by being reduced more or less to a circular splendid hektograph and a supply of ink." Mr. M. E. 32 instead of 66 by 32 feet, as it should have read. The form, as is the case with some of the cheap view lenses Lee says: "I am so captivated with your 'Cyclopedia museum was represented by its president, Dr. James in the market. A very good test for a lens is to draw of Receipts, Notes and Queries,' that I desire another | E. Talmage, at the Dublin meeting of the Museums a large square on a piece of paper or board, then set for a new year's present to a friend of mine and in-Association in June of last year.

covers the ground glass. Then, with a nice straight Dye says: "Cyclopedia received. Am delighted with the necessary apparatus, the material, and how to do the ground glass. If they are it. Just what I have felt the keenest want of for years." the work of photographing machinery and other goods. perfectly straight, the lens is rectilinear. If the lines Mr. Charles E. Cole says: "I think it is the finest Photography has become so necessary to the manuare not straight and the figure as perfect a square as thing of the kind I ever saw. May its sale never stop facturer that he can no more do without it than he the one in the drawing, then the lens must be discarded until every family in the civilized countries of the for a better one.

A good lens for photographing machinery can be purchased for \$35. It will cover an 8×10 plate in good shape. Two kinds of lenses are made, one kind being employed it to the extent he might, and by all but a known as "wide angle," that is, it will put into the of incandescent gas lighting to which the name of the few concerns photographing is done in a loose, hap- picture anything coming within an angle of 90° to 100°. inventor, M. De Mare, has been given. The arrange-The ordinary lens will not take in more than 50° or 60°, ment consists of an atmospheric burner fitting designed another "photographer to the trade," who may chance, and this kind is much better for making pictures of to be easily attached to an ordinary burner point. This to be available at the time pictures are needed. As a machinery, because the perspective of a machine is not fitting is of extremely ingenious design and construcresult, there is not even a ghost of a system in the pre- | made so prominent with a narrow as with a wide an- tion; being probably the smallest and most compact paration of pictures or in the sizes used. Neither are gle lens. In cases where the room in which a picture air and gas mixing apparatus ever successfully used they got out always at the time and in quantities to has to be taken is limited, as when photographing a for this purpose. It is professedly designed upon the suit the man who pays for them. Another thing is large machine in a small room, the wide angle lens is a principle of the Giffard injector. The mixed gas and the ownership of the negatives. The photographer necessity. If expense is no object and the shop is to air issue at the top of the fitting through a slit, which claims them, and as he has got them, and possession is purchase a first-class photographic outfit, then both a causes the flame to spread in the regular batswing said to be nine points of the law, he generally keeps wide angle and an ordinary lens should by all means shape. Across the flame is suspended, by means of a them and makes the manufacturer await his pleasure. be included in the list and both made to fit the same brass yoke, a length of twisted platinum wires, carry-Indeed, it has been stated that the only way to get a flange on the camera. For the \$100 limit we must be ing a row of what appear to be asbestos fibers. In negative away from a photographer is "with a club," content with a single lens, and that is one covering not the heat of the atmospheric flame these fibers become

Once equipped with the required apparatus, the there is a handy pattern maker in the shop, he can nor globe is required to enable the light to burn satisthe shop operator can do work quicker than the pro- or asphaltum varnish, and the entire frame should also effect. Before lighting, the fibers, being flexible, will good when large sizes are necessary.

The cost of the articles necessary is about as follis stated to be 25 candles.

Camera and tripod	
Lens	35.00
Three 9×11 trays, at \$1.65	4.95
Two 8×10 plate holders	8.00
Focusing cloth	50
8-ounce glass graduate	50
Two 8×10 printing frames	1.00
One large tray, 15×19, for toning	4.00
One 2-quart fluted glass funnel	70
One 3-inch brush for pasting prints	50
One 3-inch camel's hair brush for dusting plates	50
One box (one doz.) dry plates, 8×10	2.40
1 ounce pyrogallic acid	45
1 pound carbonate of soda (sal soda)	10
1 pound sulphite of soda	45
5 pounds hyposulphiteof soda	35
1 pound ground alum	10
1 ounce sulphuric acid	12
15 grains chloride of gold	60
1 pound chloride of sodium (common table salt)	4
8 ounces nitrate of silver in crystals	
One package round filter paper, 13-inch	
100 negative envelopes	
One dozen sheets albumen paper	
One dozen sheets, 8×10, ferro-prussiate paper	
One quire non-actinic orange paper	
100 card mounts, 10×12	
One quart parlor paste	
One quart partor paste,,	
Total	\$97.76

This estimate comes within the \$100, and by the time the first picture has been made the balance of \$2.24 will be found in demand for little things of convenience in the dark room.

Unsolicited Testimonials.

versmiths, microscopists, and many others who are camera, but gave as a possible explanation that it Perhaps one of the best illustrations of the use of the desirous of obtaining recipes for making, repairing might have been produced because of a single stroke

up the camera so that the image of the figure almost close \$5, for which please send me," etc. Mr. A. E. world has got a copy."

The De Mare Incandescent Gas Burner.

Public attention is being given in Paris to a system highly incandescent, and yield a brilliant light. The The developing trays are next to be selected, and if effect is certainly striking; and as neither chimney into any textile form, the simplicity and cheapness of the arrangement are obvious. For street lighting, said that one string will last for 1,500 hours of light-2% cubic feet per hour; and the illuminating power

Photographs of Lightning.

Mr. J. N. Jennings, of Philadelphia, and of the Philadelphia Photographic Society, gave an interesting exhibition of views of lightning before the Society of Amateur Photographers, in this city, on the 14th inst., which proved, in his estimation, that the artists' conception of lightning, as depicted by them, was wholly wrong. He had illustrations of the earliest ideas of lightning gathered from the records of the ancients; lightning as the Western Indians sketched it; a comparison of the discharge of electricity over the surface of a dry plate, between the two terminals of a Holtz electrical machine, with the appearance of iron filings on a piece of glass or paper as arranged between the two poles of a magnet when the latter is placed under the paper, and a comparison of a heavy discharge spark from such machine with an ordinary lightning flash. A photograph of a silver dollar laid on the surface of a dry plate and illuminated by the faint discharge of electricity about it was very

Other pictures represented the curious tree-like appearance of lightning, and the dark branches or black branches seen to emanate from the side of the stroke. Mr. Jennings stated that when the picture was made he observed, at the time of the flash, these branches had the appearance of a deep orange color, which accounts for the phenomenon of their taking black on the sensitive plate. A peculiar phase of a single flash, separating into two branches going in the same direction downward, the path of one being further off than We have received a large number of unsolicited testi- the other, on account of the lateral action of the wind,

The Descret Museum.

Columbia College Library.

President Seth Low, of Columbia College, New York City, has given one million dollars to build the new library building, which will be erected on the new site of the college at One Hundred and Sixteenth Street, New York, Mr. Low wishes the library building to be a memorial to his father, the late A. A. Low, "a merchant who taught his son to value the things for which Columbia College stands." The new library will be erected in the center of a terrace occupying the highest point of land of the new site and will be the center of the imposing group of buildings. Access to the facade of the new building will be gained by a flight of steps 325 feet wide, which lead to a subordinate flight 140 feet wide, which, in turn, lead to the main terrace on which the library building will be erected. The classic building will be in the form of a Greek cross, and will be surmounted by a dome at the intersection of the arms. The summit of the dome will be 136 feet above the upper terrace. Bronze doors will give entrance to the portico, from which the richly ornamented vestibule will be reached. Marble doorways will lead thence to the president's room and the office, on the left and right respectively, while directly ahead the vestibule will open into the main reading room, which will occupy the whole space beneath the dome, which will be 70 feet in diameter. From the four piers of limestone at the corners will rise four richly coffered vaults, which correspond to the four arms of the building. These vaults will be 17 feet deep and will end in semicircular windows, 44 feet wide and 22 feet high. A marble and bronze colonnade, 29 feet high, will connect the piers and support a gallery adorned with statues of heroic size beneath the great windows and at the level of the second story. The colonnade gives access to an ambulatory surrounding the reading room, and thence to the halls and special libraries occupying the four wings of the building, also to the four stone staircases leading to the upper stories. The northern arm of the library is set apart for the law library, the western for the administration, the eastern for the Avery architectural library, while the southern is occupied by the vestibule and adjoining chambers before mentioned.

The second story contains the trustees' room, the president's private room, special libraries, etc. The third story will be devoted to lecture rooms, of which there will be ten, and to rooms for officers of the college. The main depository for books will be situated in the basement of the building, which is entirely above ground. The design of the library has been prepared by Messrs McKim, Mead & White. It will be constructed of buff Indiana limestone.

The library of Columbia College is one of the most remarkable collections in the country, the number of volumes in 1893 exceeding 160,000. Though primarily intended for the use of the students, a generous hospitality is extended to scholars or to any one who is making special investigations.

PROTECTING THE PIPES NEAR ELECTRIC RAILWAYS FROM ELECTROLYTIC ACTION.

occurred of damage to water, gas, and other pipes ing on the washer receives the exterior thread of the permanent screw jack fitted to it. In this case, when

from the fact that the ground has become charged with electricity, and an electrolytic action thus set up by the escaping current, quickly destroying the pipes within its influence. To obviate this difficulty the improvement represented in the accompanying illustration has been patented by Mr. Richard Watkins, of No. 1909 M Street, Sacramento, California. The current is supplied by the generator to the trolley line in the usual way, and the generator is also connected with the rails and with the pipes in the street, these pipes being connected with the rails at frequent intervals and at points where the connection may be most easily made. The conductors should be large, so that the current will flow easily, and they are brazed or otherwise firmly secured to the rails to make good contact, while connection with the pipe is preferably made by means of a

solder being applied to make sure of a tight joint. By thus utilizing the street pipes for return conductors the current passes freely back to the generator and there is no chance for electrolytic action.

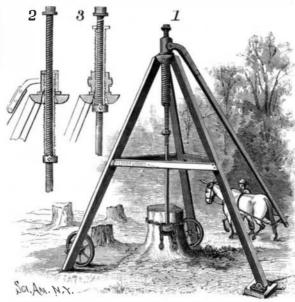
*** Solid Stream Forms,

Mr. D. W. Taylor, United States Naval Constructor, the gold medalist, read a paper recently before the Institution of Naval Architects, in amplification of that Depth of Water Necessary to Avoid Abnormal Resistance of Ships." There was plenty of experience, he was materially retarded, but he was unable to discover is first started and slowly drawn up by the main shaft, would almost certainly be found, even in midocean.

water was six times the draught amidships. Very broad ships required a slightly greater draught than ships of ordinary proportion, while the greater the speed, the more need for great depth. This was because shoal water produced but little effect upon any but the wave resistance, and at slow speed the wave resistance was very small. It, however, increased with the speed. In the case of a very fast ship, the wave resistance might well be 10 per cent of the total resistance at 10 knots, and be 60 per cent or more of the total at 21 or 22 knots. An increase of one-fifth in an even keel, it is with considerable difficulty, and the wave resistance would mean but 2 per cent at 10 much shoving with spars, etc., on the davit heads, knots, while an increase of one-fifth in the wave resistance at the high speed would mean an increase of 12 per cent in the retarding influences; and this, of course, means an increase of engine power.

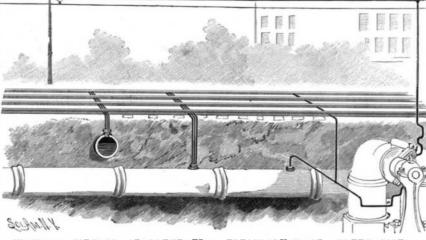
A SIMPLE AND EFFECTIVE STUMP PULLER.

The tripod frame of this stump puller has two of its legs provided with wheels, to facilitate moving it



WILSON'S STUMP PULLER,

about, and to the third leg is swiveled a shoe, the head block at the top being preferably of metal, and having a conical opening, a half round washer resting on the block above the opening. The improvement has been patented by Mr. James D. Wilson, of Montague, Mich. Secured in any suitable way to the stump is a lifting shaft at whose upper end is a cap, the shaft having an exterior thread, preferably of two and a quarter inch pitch, and an adjustable clutch on the shaft, below the head block, is adapted for locking engagement with the lower end of a hollow shaft through which the lifting shaft passes. The interior of the hollow shaft has a thread engaging that of the lifting shaft, and the hollow shaft has a flange at its upper end and an exterior thread, preferably of four and a Since the general introduction of trolley roads in half inch pitch, the hollow and the lifting shafts being the streets of towns and cities, numerous cases have shown in their normal position in Fig. 1. A nut rest-



WATKINS' METHOD OF PREVENTING ELECTROLYSIS OF STREET PIPES

plug screwed into the pipe, but without the use of lead, hollow shaft, the shape of the washer and of the head block permitting the lifting shaft to be somewhat inclined without becoming cramped. Arms projecting from the nut are secured to a lever or sweep to which a draught animal is attached, the lifting shaft moving up at a speed corresponding to the pitch of its screw thread, as the sweep is carried around, but when the clutch on the lifting shaft engages with the hollow shaft the latter is also carried up with the main shaft, at a correspondingly greater speed, owing to its coarser read a year ago on "Solid Stream Forms, and the pitch, the stump then being raised four and a half If the passengers accommodated themselves on them, inches at each revolution of the sweep. In Fig. 2 the lifting shaft is shown drawn up to a connection with said, to establish the fact that in water only three the auxiliary shaft, and in Fig. 3 the two shafts are kept filled, which might enable the occupants to pretimes the draught of a ship the progress of that ship shown elevated together. As will be seen, the stump

any authentic case of retardation where the depth of and is afterward raised more rapidly by the coarser thread on the auxiliary shaft.

Improved Boat-lowering Devices Needed.

Commander Tupper, of the Royal Navy, in a recent number of the Nautical Magazine, makes the following suggestions:

What are the means of hoisting out boats? Simply by the use of curved davits secured to the ship's side and capable of swinging outboard, as may be required, if the vessel is on an even keel; if the vessel is not on that the davits on the side with "heel from" can be turned out, and of course this difficulty increases with the angle of heel. Again, assuming that the davits have been placed in the outboard position, then comes the difficulty of lowering the boats and disengaging them without bilging the boat against the ship's side or capsizing her in the act of disengaging; with the lee boats this difficulty is minimized, but with the weather boats it is always a very serious matter. It therefore amounts to this, that in cases of collision and grounding, when the boats are most wanted quickly, it is more than probable that only half the complement of boats can be got out at all.

How can these defects be remedied? I. By improving the form of davits. II. By fitting the davits with jackstays from the commencement of the curved part to the water line, fitting runners on these jackstays and securing them to the lower blocks of the boat's falls, which should disengage from the slings directly the boat becomes waterborne.

As to I. Improvements in the form of davit. I may mention: (a) That in the Royal Navy some davits are fitted with a horizontal toothrack into which a worm works; that is, cogs are fitted round the stem of the davit and a spiral screw fitted on the gunwale; this screw is revolved by a handle, and working in the cogs causes the davit to revolve in any required direction. It is a most convenient arrangement and would enable davits to be turned outboard on the side with heel from, when other means could not be effectively used. (b) I have seen a form of davit in use in the American navy which has rather taken my fancy; the davits are straight bars of iron or steel; their lower ends are T shaped and rest in eye bolts close to the waterline, their upper ends carry the upper purchase blocks of the boat's falls in such a manner that the boat is slung from the stem and stern posts, and swings in between the two davits, the tumblehome of the ship's side giving sufficient angle for the keel of the boat to rest on the gunwale of the ship, and be secured there or transported from there to amidships on a trolley if more convenient. Now with this form of davityou could always get a boat out by forcing the davits away from the ship's side by screw or hydraulic jacks, and when the boat is hanging over the water you can lower davits and boat together, keeping the boat close up to the davit head until there is no chance of her being stove against the ship's side when the falls are lowered.

(c) Another and a very good form is a curved davit pivoted and hinged on the gunwale itself, having a

the boat is hoisted and the screws are close home, the boat rests in the curves of the davits well inside the gunwale, and when the screws are out to the full extent the boat is suspended over the water well clear of the ship's side.

In both (a) and (c) jackstays could easily be fitted; in (b) they are not necessary, but could be fitted to the davits themselves from the heads to water line. All these forms are, to my mind, much superior to the usual boat's davit.

But in addition to more efficient davits surely every well found mail steamer should carry a large kind of unsinkable boat, something after the style of the old troop boat carried in some of our troop ships, which could be launched from whichever happened to be the leeside, and also capable of automatically disengaging itself and floating if the ship sank before there was time to launch the boat.

Again, it seems practicable so to construct the bridges and promenade decks that they should automatically disengage to form three, four, or more rafts which would be left floating when the vessel has subsided. Shrouds, backstays, etc., interfered considerably with the chances of floating such rafts formerly; but now that we no longer require more than one mast, which could be fitted as a tripod mast, and that the funnel guys are quite easily slipped, I do not see that anything need interfere with these rafts floating. they might at any rate have a chance of being rescued. Small depots of water and provisions could always be serve their lives for three or four days, when they

RECENTLY PATENTED INVENTIONS. Engineering.

BEATING ENGINE.—William H. Ethell, Dayton, Ohio. This is a paper-making machine for thoroughly and unformly beating the stock to a proper consistency in a very short time. The tank has a midfeather forming two compartments, one with a channel at or near the middle of the bottom, and beating rollers are secured in a shaft journaled in the tank on opposite sides of the midfeather, one of the beating rollers being located above the channel. Bed plates are arranged under the beating rollers, and a back plate is arranged in front of the roller located over the channel, while a second back fall is arranged in the rear of the other roller.

BOILER.-Thomas A. Myers, Mendon, N. Y. This improvement comprises a front and rear head made ring-shaped and connected with each other by pipes, while an inner head is arranged within and connected with some of the pipes, and it is located a suitable distance from the front head to form a fire box with the latter, the inner head being provided with pipes extending into the opening of the rear head. A steam drum arranged above is connected with all the pipes. The shell is preferably made of alternate layers of sheet metal, asbestos, and wire netting, so that all the heat generated will be retained to heat the water passing through the pipes.

HORIZONTAL COKE OVEN.-Franz J. Collin, Dortmund, Germany. This improvement is designed to facilitate a very hot working of the ovens, ren dering it possible to coke bituminous coal and coal con taining small quantities of gas and incapable of satisfactory baking. The oven comprises a series of juxtaposed horizontal chambers or ovens in which the passages for the gas and the heating channels are so arranged that the escaping gases can be used for heating the boilers, and the extraction of products can be effected in the most simple manner. The arrangement is such that a freshly charged oven is heated by the heat evolved in an adjacent oven, the two adjacent ovens being never empties in immediate succession, and the production of gas and coke being continuous.

Caisson for Ships.—Costello N. Holford, Washington, D.C. According to this improvement the hull of the vessel is provided with rows of screw bolts extending from the keel to the water line, to which may be secured detachable ribs having a contour to snugly fit the vertical sides of the vessel, a horizontal rib joining the vertical ribs at the keel, while means are provided for detachably connecting a cap plate or housing. It is designed by this means to render the whole of the hull, from the keel to the water line, accessible in separate sections, for cleaning, repainting, or repairing without necessitating the putting of the ship into dry dock.

MARINE VESSEL -- Sebastien Lacavalerie, Caracas, Venezuela. This is a vessel adapted to be propelled either on or beneath the surface of the water. It is cigar-shaped, and at its bow end terminates in a small cone and at its stern in a larger cone, both cones being independent of the body portion, and the stern cone forming a compartment large enough to contain rudder-working apparatus and afford a lookout. The propeller comprises a series of spiral flanges and their supporting rings encircling and extending the full length of the hull, the rings serving as braces and turning loosely on the hull, and the driving shaft being arranged longitudinally in the bow of the vessel, with a head at its forward end to retain it in the bow cone. The vessel is provided with air tanks in which air is held under pressure for breathing purposes when the vessel is submerged.

Railway Appliances.

CAR FENDER. - Robert Thomson. Brooklyn, N. Y. Thisis an improvement upon a formerly patented invention of the same inventor of a fender with an elastic cushion at the front, and covered with a yielding netting, the frame being hung from standards detachably connected with the end of the car. The improvement provides for the fender being conveniently slid on the car, either beneath the body or the platform, and being automatically locked when adjusted. A portion of the yielding covering of the fender frame is also so constructed that it may be folded flat on the main portion of the cov ering or be elevated to act as a guard to prevent a falling body passing rearwardly over it, the buffer cushion being also of novel character, durable, and inexpensive to

CAR FENDER.—Otto A. Wicke and Philip Reinhart, Brooklyn, N. V. According to this improvement there are parallel brackets beneath the car and eyes suspended from its front end, a sliding fende having turned-up braces sliding on the brackets, and brackets on the fender top engaging the eyes. The device is easily applied to an ordinary car, and may be readily pushed back beneath the car or extended forward of airtight vessels for the hides to be tanned, one set to ready for use, when it will trip and catch a person on the dashboard, preventing any injury to a person caught by the fender.

STATION INDICATOR. - William F. Prendergast, New York City. Two movable aprons are, according to this invention, adapted to display the name of the same station at opposite faces of a casing fastened in the middle of a car, so that it will be conveniently visible from all parts of the car, the aprons being moved by sets of drums geared together and intermediate mechanism, on the turning of a crank arm by one of the trainmen. The names of all the stations on the route are p inted in order on both aprons, and they are thus shifted simultaneously while traveling in a forward direction, and simultaneously turned backward as the train travels in a reverse direction over the route

DUMPING CAR. - Mexico Van Pelt, Moundsville, West Va. This car has a tilting platform which may be readily pushed to either side, to dump the dirt or other material on one or the other side of the track, without necessitating the uncoupling of the cars. The lower platform has stops at the edges and transverse vertical guides, while the upper platform has a transverse

sliding connection with the main platform and pendent transverse guide members adapted to engage the guides in the main platform, stay chain devices connecting the platforms.

Mining, Etc.

CONCENTRATING ORES. - Walter J. Hammond, London, England, and John Gordon, Rio Janeiro, Brazil. This is an improvement on a formerly patented invention of the same inventors, providing a superior apparatus for separating lighter and heavier particles of ore and other substances in the same manner as is now done by a skilled hand in "panning." By the improvement a simple mechanism is made to impart to a conical vessel a varying motion around a fixed center, and an oscillating motion, eccentric to the center of reciprocal motion, around its own center, the different velocities allowing substances of different weights to come to rest or continue in suspension for purposes of separation. The apparatus is principally designed for separating gold from gravel and sulphurets from quartz, but apatite or phosphate of lime may likewise be sepa rated from heavier material.

Mechanical.

COMBINATION PLANE.-Jacob W. Tripp, Salt Lake City, Utah. This invention con principally of a stock adapted to receive a removable wooden sole piece shaped to conform to the curved or straight surface to be planed, a bit having gear teeth being engaged by a segmental lever for shifting the bit into proper position, and there being an auxiliary guide stock pivoted on an adjustable arm held on the main stock. The plane is of simple and durable construction, and it is arranged for universal adjustment, to enable the operator to conveniently plane straight or curved work, such as stair rails on all sides, and for moulding, fitting, plowing, tonguing, rabbeting, etc.

HAND CRIMPING TOOL.-John Wood. Long Island City, N. Y. This is a strong and simple tool for quickly and firmly crimping a cap on the flaring mouth of an oil can or other receptacle. It consists of a stock on which is held a disk, levers being pivoted on the stock which have handles at their upper ends and crimping rolls journaled on their ower ends adjacent to the edges of the disk. The disk serves as an anvil to properly permit the three crimping rolls to crimp the flange in under the flaring mouth of the spout.

HOD HOISTING MACHINE.—Gustaf P. Wern, Brooklyn, N. Y. In this machine a stay shafton which is a spacing sleeve connects the upper ends of the standards, chain wheels turning on bearings of the sleeve and there being friction rolls between the wheel hubs and the bearings. The hoisting wheel consists of two paral lel chain wheels and a driving sprocket wheel at the outer side of one of the chain wheels, bolts on which are tubes or spacing sleeves extending through all the wheels and connecting them. The friction is reduced to a minimum by the employment of friction rolls in the bearings, and the machine is very strong and durable, the individual parts not being liable to be thrown out of align ment under the heaviest strains.

Agriculturai.

HARVESTER ATTACHMENT. — Charles Stucke, Appleton, Minn. According to this improve ment, gathering pans or screens underlie the platform and elevator aprons and the binding table, in combination with troughs, spiral conveyors and elevator chain, to gather any shelled grain falling out and convey it to a bagging device. The attachment is designed to save the shelled grain which may become incidentally thrashed out in the operation of cutting, elevating and binding it into sheaves, and which ordinarily falls to the ground and is wasted.

SHOVEL PLOW.-William F. Hartig, Evansville, Ind. This invention relates to plows having laterally extending wings or sweep members, and the inventor has devised a construction in which the several sweep or cutter attachments can be readily attached to or detached from the standard, and can be readily adjusted to the desired vertical angles, as the condition of the hill or row may require. The plow may be used as an ordinary bull tongue plow, or it may have lister blades at each side, double cutter wings, or one cutter and one lister wing, in either adjustment, the wings being quickly and easily swung inward or outward by shifting the operating levers, or they may be swung parallel with the heel of the standards

Miscellaneous.

APPARATUS FOR TANNING.—William 11. View of Capistrano Station, California. T. Harrison, Pooler, Ga. This apparatus comprises sets 2. Design for a fireplace. of airtight vessels for the hides to be tanned, one set to track in front of the car. A soft spring buffer covers the | pump pumping the liquor from the filled vessel into the empty ones, and from the latter into the first vessel, while heaters are provided for heating the liquor as it is discharged from the pump to the vessels. The hides are by this means, alternately subjected to the action of the tanning liquor and a complete vacuum. The vessels are reinforced in such a way as to make them perfectly airtight and entirely safe when the vacuum is formed.

> COAL AND GAS STOVE. - Donald McDonald, Louisville, Ky. This is an improvement on a gas stove formerly patented by the same inventor, to enable it to burn coal or other solid fuel as well as gas, and at the same time. The invention consists chiefly in the combination of a gas burner, a solid fuel grate or basket, and a supplemental grate which may be adjusted to cover and protect the gas burner and asbestos lining, when coal is used, or may be thrown back to expose the gas burner and give it full effectiveness when gas alone is used. The improvement affords a very cleanly, quick and desirable method of igniting coal and starting a fire without kindling wood.

> STEAMER AND BAKER.—Burchard T. Kuhl, Orlando, Fla. This is a cheap and simple appa-

ratus which may be usedover a lamp. It has a lower steaming compartment adapted for use in steaming food or making jelly, preserves, etc., and an upper oven for baking, the oven being so arranged that it may be converted into a steaming chamber if desired. All the parts are readily accessible and the joints are closed by a water seal, so that the flavor of the things cooked may be re tained and the odor will not escape into the room. Articles contained within it may be kept hot with very little

DISCOUNT WHEEL.-James G. Huffman, Decatur, Ill. This is a wheel to be revolved by the dropping of a coin in a slot, the wheel stopping at places which cannot be previously determined and pointing out certain discounts to be made to the person operating it. The machine is of simple construction and attractive in appearance. The coins which work the wheel are dropped into a till, and the wheel is designed to afford amusement with the attractiveness of speculation.

FILLING MACHINE.-John F. Wolven, St. Clair, Mich. For filling simultaneously a large number of vessels with a liquid, as the filling of bottles or communion cups for church services. this inventor has devised a machine comprising a reservoir with funnels and elastic valves with upwardly extending rods, each valve rod being connected with one of a series of arms extending from shafts journaled in suitable bearings, there being a handle by which all the shafts may be given a swinging motion to open and close the valves.

PUMP PIN. - James W. Mapps, York, Neb. This is a pin especially adapted for connecting the pump rod to a windmill. It has a body section and a drop section, the latter being shorter than the body section, and when the body section is employed as a pump pinit is provided with a head. The head is not needed when the pin is employed as a horizontal clevis for plows, or similar purposes, the head end of the body being then threaded to receive a nut.

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

SCIENTIFIC AMERICAN

BUILDING EDITION

MAY, 1895.-(No. 115.)

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- 1. Plate in colors, showing a residence at Glen Ridge, N. J., recently erected for W. T. Taliaferro, Esq. Perspective elevation and floor plans. A fine example in the Colonial style. Mr. Chas. E. Miller, architect, New York.
- Perspective elevation and floor plans of a cottage at Tenafly, N. J., erected for Chas. Vogt, Esq., at a cost of \$5,800 complete. Mr. W. L. Stoddart, architect, New York. An attractive design.
- 3. A dwelling at Kennebunkport, Me. Three perspective elevations and floor plans. A most picturesque residence, with many artistic features. Mr. Henry P. Clark, architect, Boston, Mass.
- 4. A log cabin chapel recently erected at Black Rock. Conn. Perspective elevation and ground plan. Mr. Bruce Price, architect, New York.
- 5. A cottage at Park-Hill-on-Hudson, N. Y., recently erected for Geo. L. Rose, Esq., at a cost of \$12,000 complete. Two perspective elevations and floor plans. Mr. A. F. Leicht, architect, New York. A well executed design, showing many excellent features.
- 6. A house at Orange, N. J., recently completed for Thomas L. Smith, Esq. Messrs. Child & De Goll, architects, New York. A pleasing design in the
- 7. The Yonkers Public School, No. 8, at Bronxville, N. Y. A good example of school architecture.
- 8. A dwelling of modern design, recently erected for M. Strong, Esq., at Montclair, N. J. Two perspective elevations and floor plans. Cost complete, \$6,000. Mr. Christopher Myers, architect, New York.
- A house at Indiana. Pa. Perspective elevation and floor plans. Cost complete \$3,100. Architect, Mr. E. M. Lockard, Indiana, Pa. An attractive design in the Colonial style.
- 10. A very attractive residence at Montclair, N. J., erected for Frederick S. Gage, Esq. Perspective elevation and floor plans. Mr. E. R. North, architect, Montclair, N. J

- 13 The brick power station road Company.
- 14. Miscellaneous Contents: A State park in the Catskill Mountains.-To prevent the slamming of screen doors, illustrated .- Quarrying by means of fire .- A new lawn sprinkler, illustrated .- Art in metal tile roofing, illustrated.-An improved hot water heater, illustrated.-A macadamized road through swampy land.—Tinners' hardware and roofers' supplies.—Screen doors, illustrated.—Stair finishing, illustrated.—A hoist for use over hatchways, illustrated .- Ventilating the school room .- Gas burning range, illustrated.

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References to former articles or answers should give date of paper and page or number of question.

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Winterals sent for examination should be distinctly marked or labeled.

(6528) W. E. B. says: Can you give me any information as to how the fine crocus finish, such as put on razors and fine pocket cutlery, is accomplished? A. For hollow finishing, the following wheels are required: A mahogany wheel for rough glazing. A manogany wheel for smooth glazing. A lead wheel or lap. Forflat finishing: A buff wheel for rough. A buff wheel for smooth. A buff wheel for finishing. Lastly, a polisher. To make the glaze wheels: Get the spindles, and point them on each end; then get a block of beech and wedge it on the steel at one end with iron wedges; and turn it for the pulley for the band to run on. Take two pieces of flat mahogany and glue and screw them together, so that the grain of one piece crosses the other to prevent warping. Let it get thoroughly dry, and wedge it on the spindle and turn it true. The lead wheel is made the same way, but wider, and has agroove turned in the edge. The wheel is put into sand, and a ring of lead run round the edge; it is then turned true. To make the buff wheels, proceed as with the glaze; but to save expense, pine or deal wood will do as well as mahogany, only leave it about double the width of the glaze, which is about 1/2 inch wide by 12 or 14 inches across. 'The buff wheels are covered with glue, and then the leather is tacked on with tacks driven in about half way, so that they may be easily drawn out again. 'The leather is then turned true. The polisher is made the same way, but the size of the polisher must be a little less than any of the other wheels, say about 1 inch. The buff wheels are dressed by laying on a fine thin coat of clear glue, and rolling them round-No. 1, in superfine corn emery; No. 2, in smooth emery; No. 3, by making a cake of equal parts of mutton suet, beeswax, and washed emery; then it is held on the wheel while it is going round. The glaze wheels are dressed while using, by mixing a little of the emery with oil, and putting it on the wheel with a stick or the finger. The leather of the polisher is not covered with glue, but dressed with a mixture of crocus and water, not oil. Care must be taken to keep each wheel and substance to themselves; the work must be carefully wiped after each operation, and cleanliness must be studied above all things in using the polisher, as the slightest grease getting on it stops the polishing.

(6529) J. M. asks: 1. Is perspiration eakening? A. No; unless accompanied by disease. 2. What is the difference between a rapid rectilinear and a singleview lens? A. A rapid rectilinear is what its name indicates. A single view may not be rapid. It always distorts the image, especially near the margin. 3. Will a square tube with a square cut prism answer as well as the round tube for the spectroscope, No. 672? A. Yes. 4. What size lens should I use to take a common size cabinet portrait? A. Use the size given by reputable makers. If it is only a question of taking the image without regard to other considerations, any convex lens will take an image. You will be sure of good results only with good lenses made for the particular kind of work to be done. 5. How can I prepare my own dry plates? A. We cannot give the information in the space at our command. Consult Supplement, Nos. 647, 649, 696, 541, 374, 340, 299, 272, or Sinclair's "Dry Plate Making," which we can mail you for 50 cents.

(6530) F. W. L. says: 1. How can I make a cement for the splices of a leather belt? A. Take of common glue and American isinglass, equal parts; place them in a boiler, and add water sufficient to just cover the whole. Let it soak ten hours, then bring the whole to a boiling heat, and add pure tannin until the whole becomes ropy or appears like the white of eggs. Apply it warm. Buff the grain off the leather where it is to be cemented; rub the joint surfaces solidly together, let it dry a few hours, and it is ready for practical use; and if properly put together, it will not need riveting, as the cement is nearly of the same nature as the leather itself. 2. Also a good dressing for same kind of belt? A. Five parts of India rubber are cut fine and melted together with 5 parts of oil of turpentme in an iron, well covered vessel; then add 4 parts of resin, stir well, melt, and add 4 parts of yellow wax, stirring constantly while melting. This mixture while warm is added with constant stirring to a melted mixture of 15 parts fish oil and 5 parts of tallow, and the whole is agitated until it has congealed. The mass is applied to old belts upon both sides in a warm place, and when the belts are in use, from time to time upon tho inner side. By this treatment they become very durable. 3. Is it injurious to any kind of dynamo to run for any considerable length of time with any lamps or motors in circuit with it? A. No; unless it becomes unduly heated. 4. How can I find the horse power of a common slide valve engine? A. Multiply the square of the diameter of the cylinder in inches by 0.7854, and this product by the mean engine pressure, and the last product by the piston travel in feet per minute. Divide the last product by 33,000 for the indicated horse power. In the absence of logarithmic formulæ or expansion table, multiply the boiler pressure for % cut-off by 0.91; for % cut-off by 0.85; % cut-off by 0.75; 3-10 cut-off by 0.68. This will give the mean engine pressure per square inch near enough for ordinary practice, for steam pressures between 60 and 100 pounds, always remembering that the piston travel is twice the stroke multiplied by the number of revolutions per minute. 5. What is metallic packing? Is it applicable to the stuffing box of engine? A. Metallic packing is used for steam engine piston rods. It is made in metal rings or mixed with other packing. 6. What is the lubricant for commutators? A. Use a small quantity of oil,

(6531) W. H. M. asks: 1. If the rear sprocket of a bicycle were 6 inches in diameter and the front one in proportion, would it run easier than if made the usual size? A. Possibly. We understand that the principle is now being tried on some French bicycles. 2. If a bicycle had a chain on each side, would it run with less friction than with single chain. A. Data are wanting to determine this. It is so much trouble to keep one chain in order that we should be very slow to introduce a second one,

(6532) F. F. asks: What is the temperature of the bottom sheets of a tubular boiler on the side next to the fire when the boiler is forced to its full capacity? Also what is the temperature on the water side of same? The above question came up at a meeting of our association; one member claimed that it was 1,100 $\,$ degrees on the side next to fire. Some said he was right. others said he was not, so to settle the matter it was left for you to decide for us. A. The temperature of the water side of fire sheets is but little above the temperature of the water when making steam, probably 150 to 200 degrees. The iron is a quick transmitter of heat, and although the fire against the fire sheet may be 1,400 to 1,600 degrees, the surface of the plate is seldom above 600 degrees

(6533) R. A. C. writes: I have made motor No. 641, and it works so well that I write you to let youknowhow I made it. I have provided a bronze bar commutator and a cast field; the field is mounted to stand erect, and the bearings are made of brass and screwed to the poles. I have also made a dynamo like the eight light dynamo except it is two-thirds size, and it runs the above motor nicely.

(6534) **J. J.** D., Kan., writes: The inner sides of the steam chest of an engine we have are being continually eaten away. The metal becomes so soft that it can be easily cut into with a knife. We can't see any reason for it unless it be that some acid gets mixed up with the steam, But we do not know where it comes from. We use ordinary rain water in the boiler. To prevent leakage between joints the steam chest is packed with asbestos paper. & Could the acid come from this, owing to the way the fiber may have been treated? As the chest has been thoroughly cleaned lately, we have no means of examining at present the product formed, If you could tell the real cause and suggest a remedy, you would greatly oblige us. A. The water from the condensing steam on the inner surface of the steam chest is an absorbent of iron and is known to disintegrate and carry away their on, leaving the graphitic carbon in place, and in a condition to be cut away with a knife. This is notably so with very soft castings, which contain a large percentage of carbon. There is only a partial remedy in the making of engine parts that are in contact with steam to have the iron low in carbon. By cutting off a portion of the soft surface and testing, you will find it characteristic of ordinary graphite.

(6535) J. M. C. asks how to distinguish between gold and its imitations, either plated articles or alloys. A. An assay or analysis is the only good method, The following may answer for rough tests: Gold should dissolve in a mixture of one part nitric with three parts hydrochloric acid. A residue indicates silver. If sulphuric acid is added to the solution, a precipitate indicates lead One quick method is to determine its specific gravity Silver may be dissolved in nitric acid. It should, with excess of ammonia, give a colorless, clear solution, Sulphuric acid may be used to test for lead.

(6536) G. W. W. says: Will you kindly republish the formula foryour buffalo moth exterminator; It did its work in a thorough manner, but I have carelessly mislaid your formula and would greatly appreciate its republication. A. Take strips of red or blue flannel, as these colors are particularly attractive to them, dip in solution of arsenic and lay around the edges of carpets or wherever the pests are troublesome.

(6537) T. Y. C. says: Please give me in the Scientific American a recipe for an elastic waterproof glue. A. Glue which stands moisture without softening. Dissolve in 8 fl. oz. of strong methylated softening. Dissoive in S n. oz. or strong meanymore spirit 1/2 ounce each of sandarac and mastic; next add 1/2 ounce oach of sandarac and mastic; next add 1/2 ounce of turpentine. This solution is then added to a hot, thick solution of glue, to which isingless has been added, and is next filtered while hot through cloth or a sieve

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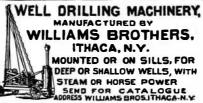
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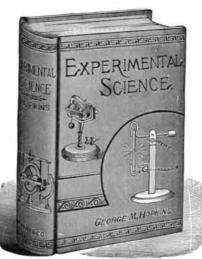
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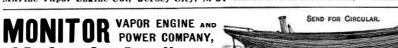
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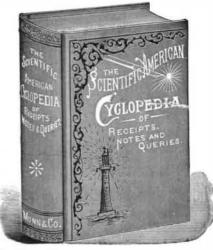
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