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THE NEW AMERICAN YACHT THE DEFENDER.-[See page 327.]

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## TERMS FOR THE OCRENTLFIC AMERICAN.





 = NEW YORK. SATURDAY, MAY $25,1895$.

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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 of copitaliz fimpie fuel efficiency the question apt to be overlooked. Many an in stance of a high duty machine might be found where
the in terest charges greatly overbalanced the fuel econo my. A low duty machine is often the cheapest to run.
In electric heating, which is one ot 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 involv ing the largest amount of copper in the conductors has proved most acceptable to the public. The incandescent lawp, 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 of the arc lamp. There is something repugnant to the scientific econowist in the idea of delivering electric hundred volts But the public likes the incandes cent lamp, admires it when wounted on beautiful elec troliers, is willing to make it softer to the eyes by screening it with ground or cut glass and sees no enormity in wasting eighty or ninety per cent of it by the las named processes. The incandescent lamp has been ac cepted 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 whieh seems necessarily inherent in do mestic processes. It has to compete with heat mos 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 pood case made out for the employment of the electric current
The general aspect of the case is thus put by its vocates. In the electric station energy is cenerated 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 gen eration of the electric energy is compensated for in we comparative sense by the low economy of cooking 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 ex penditure ceases. It is calculated that a cooking fire may only utilize one or two per cent of the heat pro duced while cooking is going on. When the cooking ceases, all goes to waste
Electric heating has to contend with one great ob stacle-the low efficiency of the steam plant; and its utilization is only possible because of the waste of fuel in household operations.
In the field of heating the adaptability and simpli city of application of electricity may give it great suc cess. The catalogues of the suppliers of electric heat ing apparatus are full of most suggestive suggestions Fro m a radiator for heating a room to an electric curl ing tongs all are figured. There is something wonder fully 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

There are no products of combustion to be dispose of. A kettle can be boiled in a parlor without any
flame or danger from alcohol flame or danger from alcohol explosion.
As regards heating on the large scale, as of rooms or entire houses, success is very doubtful. Ordinary heating apparatus may be made to give much highe efficiency than can be given by the regulation cooking stove, where, practically speaking, a scuttle of coal may be expended in cooking a few chops. A properly arranged furnace or heating a pparatus can be made to give results far ahead of anything that electricity, with
its 94 per cent handicap, can be expected to produce.

Opening of the Metropolitan Elevated Railroad,
Clicago.
Metropolitan Elevated Railroad, the first elec tric 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 Day ton, 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 attenpt has been made to lighten the construction of the car body and trucks.

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 entir 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 pre vent 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 are, 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 man.
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 quick acting air brakes, the air being carried in storage tanks nder each car.
The first train to carry other persons than officials made its trip succesfully 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 Fort $\mathbf{y}$-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 Divis on Street, and hrence north west, parallel with Milwau kee A venue, to Logan Square. The Humboldt Park line branches off the Logan Square line at Robey Stree and North A venue, and will extend west to Crawfor Avenue when completed. The Logan Square line penetrates one of the most densely populated districts of the west side and will draw its patronage largel 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, 37 miles; Logan Square line, $4 \cdot 4$ miles; Humboldt Park line, $2 \cdot 13$ miles The variou ines contain forty-three stations.
The Metropolitan line will run 155 cars- 100 passen ers 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

Sunflower cake has been found, especially in Russia, one of the best auxiliary cattle foods. As early as the year 1866 about 100,000 centners of sunflower oil (oil of the seeds of Helianthus annuus) were manufactured in Russia, and it amount has increased year by year, it being esteemed as a very palatable alimentary oil. The oil was formerly obtained by hydraulic means; th residual cake is harder than any other variety of oi cake, and for this reason apparently it has not found a wider application. Denmark and the northern countries inport 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 the market in theform of meal it will doubtless soon find general application, suited, as it is, both on account of its composition and pleasant taste, for fattening cat tle. The percentage of proteid varies between about 30 to 44 per cent, the fat between about 9 to 18 per en. It is possible to prepare two qualities, one rich proteid and poorinfat, and the other rich in fat nd poor in proteid. When, for example, the some what finely ground meal is sifted, employing a mesh of 1 mm . that which passes through is much richer in proteid and poorer in fat than the original, while the reverse is true of that which remains in the sieve.

## [From the Western University Courant.]

spectroscopic observations of Saturn at the Allegheny Observatory.
In giving below, at the request of the editor of the Courant, an account of some recent observations of Saturn at the Allegheny Observatory, I have thought that a brief glance at the previous history of the subject would be of interest as an introduction; such a review is, indeed, necessary, in order that the reade may correctly understand the signiticance 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, revolv ing 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, 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 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 regard ed them as composed of sonie fluid denser than water Finally, the English physicist Clerk Maxwell discusse the whole matter thoroughly in a prize essay submit ted to the University of Cambridge in 1857, and showed mathematically that the rings could be neither solid nor liquid, and that stable equilibrium would be impossible 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 con siderable size cannot revolve within a certain limiting distance of a planet, as it would be torn to pieces by the strain due to unequal attraction but Roche' investigations were long overlooked. In the case of Saturn this "Roche's limit," as it is now called, is just outside the ring, and hence it follows that the ring must be made up of separate small bodies.
Thus it will be seen that the accepted hypothesis rested on a mathematical demonstration that no other constitution of the ring is possible according to the 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
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 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 photograph ing the spectrum, and measuring the displacement on the photograph, we can determine the velocity in miles per second. The moon has no motion in the line 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 made up. A satellite must move in obedience to Kepthe velocity of the satellite vaie inversely , 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 the main results ob
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,
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 onls one twenty-five thousandth part of an inch, and that the image of

Saturn, which the telescope casts on the slit of the spectroscope, must not move much more than one three thousandth of an inch during the long exposure of two hours. The plates are measured under a microscope, and while it is impossible to be certain of the fraction of an inch, an accuracy sufficient to decide of Saturn's rings is quite readily attained.

James E. Keeler.

## A Wax Found in cotton and Linen Fiber.

eadle.
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 treatment, as its occurrence is not generally known to paper makers. This wax-like film, when of sufficient thickness, can be readily scraped from the sides of the beater. A case of this formation was brought before 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 differ ent times, and found that it consisted of alumina, iron and lime salts, mixed with a substance soluble in ether. The latter substance has a sweetish smell and gener ally resembles beeswax. It has a saponification equiv alent (p.c.) of 19.46 ( KOH ), and a very definite melting point of 47.5 degrees C .
The wax on saponification gave 91.04 per cent insouble fat acids. Samples were taken and examined at different times, and were found of constant composion. The raw material that gave rise to the forma on of this substance had been previously treated nder pressure in a $31 / 2$ per cent solution of NaOH , and af terward thoroughly bleached in calcium hypochlorite solution at 32 degrees C. The wax does not niake its appearance until the bleached material is disinte grated. At the back of the beater roll a thin film may ometimes be seen on the surface of the water This in time builds itself up on the sides of the beater. The characteristic sweetish odor of the isolated wax an 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 dissol ved by soda, should urvive the treatment with alkali under pressure. The dor which is characteristic of this substance is not noticed in the raw material until after the warm bleaching, and appears to be more developed after the bleached material is allowed to lie heaped up in a dense condition for some time. By altering the mode f bleaching of the raw materials, the ocrurrence of his waxy substance can be prevented. I found in one batch of cotton fiber, that smelt strongly of the waxy substance, that the alcoholic extract amounted to 2.87 per cent, and, when treated with ether afterward, the thereal extract amounted to 0.73 per cent.
The separation of the wax in the beater is merely mechanical one, and is probably due to the fact that it intimately penetrates in the fiber. The knives of the beater roll, which tear the ultimate fiber asunder, release the wax, which floats on the surface as a fine film, and quickly builds itself up on the metallic surace with which it comes in contact. I succeeded in at one time collecting about 50 lb . of the deposit, which was found, on extraction with ether, to contain 77.54 per cent of wax.-Chem. News.

## Anthion-A New Agent for quickly Washing th Hypo from Prints

by dr. h. w. vogel.
We have in the preceding number, under the heading of "Novelties." already made mention of a stuff which we have several times tested as a destroyer of hypo, and which enabled us to shorten the washing 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 importance to professional and amateur, both when 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, $\mathrm{KSO}_{4}$, and acted as

Technical High School in Berlin, Charlottenbur
an oxidizer. It changes hypo quickly to the harmless tetrathionate of soda (tetrathionic arid and soda base) iberates iodine from iodide of potassium solutions, es pecially in the presence of acid, while in alkali solu tions (hypo-soda) the free alkalies materially accelerate the oxidizing effect. The hard salt proved stable. We performed the washing as follows:
A. Gelatine Plates.-1. The fixed plate, 13 by 18 cm., was placed for five minutes in about $500 \mathrm{c} . \mathrm{cm}$. 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 $250 \mathrm{c} . \mathrm{cm}$. 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 4. , rocking several times.
4. The plate is now passed back into dish No. 2, which had been rinse

## olution as in 2 and 3

When taken from the last water the plate was found ree from hypo, and was put away to dry.
Tests.-Put into a clean glass about $10 \mathrm{c} . \mathrm{cm}$. of the ast 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 yel low, 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, ne after the other, in $500 \mathrm{c} . \mathrm{cm}$. 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 arger 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 Mountains, and remember how famous, all over the world, is their singular beauty, and their incom parable value to the tourist, the health seeker, the agriculturist and the horticulturist, as well as the miner, it is interesting to read what so intelligent a statesman as Daniel Webster thought of them just fifty years ago, and to know that his views were shared by many other prominent public men of the time. In a speech delivered in the United States Senate in 1844, with regard to the proposal that a mail service should be established between Missouri and the Pacific coast Webster said: "What do we want with this vast worthless area, this region of savages and wild beasts, of deserts, of shifting sands and whirlwinds of dust, of cactus and prairie dogs? To what use could we ever hope to put these great deserts, or these endless mountain ranges, impenetrable, and covered to their bases with eternal snow? What can we ever hope to 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 nearer Boston than it is to-day."

## 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 electric 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.
In many cases where the pipe or smoke flue from a furnace, stove, or range, may be passed through another room before reaching its connection with the chimney, it will be possible to heat the second room, at least to a very material extent, by placing in the pipe a heating drum such as shown in the accompanying illustration. It is a patented improvement of Mr James W. Johnson, of Paullina, Iowa. In the exterio


JOHNSON'S HEATING DRUM.
shell of the drum are partitions forming air compart ments at the sides, as shown in the broken-away por tion 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 colupartments, 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 cros section of the drum. Gas-tight joints prevent smoke and gases from the smoke passage entering either of
the air compartments at the sides, and the air passing the air compartments at the sides, and the air passing
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 im proved exercising device for beginners on the piano, is represented in the accompanying illustration, and has been patented by Mr. Oscar Felden, of No. 707 Ham ilton Street, Houston. Texas. It comprises a series of mute keys and two bells or sounding devices of differ ent pitch arranged so that when the keys are wrongly


## FELDEN'S FINGER EXERCISING DEVICE.

played one of the bells will be sounded. The keys, pivoted in a suitable frame, have at their rear ends eves through which extends a cord, the cord also passing through eyes on a fixed transverse beam and around pulleys at its end, and thence connecting with rhe rear en of a lever fulcrumed on the frame, the lever having at its front end a tube closed at one end, 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 nor mally 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 is exerted upon the cord which causes the lever to swing up, as shown in Fig. 1, the ball then rolling along the tube and sounding the bell. Over the rear ends of the keys is fulcrumed another lever, having at its under side a cushioned rail normally resting on the keys, whereby the lever is swung upward when either
of the keys is pressed, and on the rear end of this lever is an eye engaged by an arm fulcrumed in a bracket, the arm being connected by a loop with a striker adapted to sound another bell. With the correct touch, neither of the two bells will be sounded, the time it takes the ball to roll through the tube being the time allowed to raise the finger which strikes the first key, but if the player does not hold the key down antil the second key is struck, an interval occurs be ween the two tones and the pivoted arm then actuates the sounder to strike the second bell. The device is thus designed to facilitate the acquirement of a cor-
rect legato style of playing, or the holding of the rect legato style of playing, or the holding of the tone commences to sound, for by the pressing upon the second key when the firstis still held down one of the bells is sounded, and by allowing an interval between the touch upon successive keys the other bell will be sounded.

## Laking 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 cor respondents, 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 earth quake, 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 employ ment, and their labor is entirely agreeable to them selves. 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 once brought into action. He must learn accurately he facts, and he must state them exactly as they are; and if he can state them with a little degree of life, a little approach to eloquence, or a little humor in his style, why, his report will be perfect
Next to the reporter, a very important functionary in the newspaper is the man who reads the other news papers and makes extracts from them. Mr. Greeley used to think that it was enough to make a good paper if he had an able man to read the exchanges, provided he himself was there in person to add up the returns of the elections. The man who reads the exchanges is a very important man; and, let me say, too, he is pretty highly paid man. He has to read, we will say, three thousand papers regularly. All the newspapers in the country come into the office, and he does not do anything else. He sits at his desk all day, and a pile of newspapers, or, say, a cord of newspapers, is laid be fore him every morning; he starts to work and turns them over and over to see what is in them. He has to know what it is that should be taken from them and put into his paper. What is the interesting story? It requires judgment to know this; it requires knowledge and experience as well as talent. It also requires a sense of humor, because there are a great many things that are really important that may not seem so at the first glance, and the newspaper reader has got to judge about that. He must always be on hand and 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 or ganization comes the man whose duty it is to receive manuscripts and examine them and preware 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 havecontrol of a newspaper, who have risen to that place, and who have filled it with wisdom and success and force. Yei at the bottom of it all, it is always a question of characer as well as of talent. A fellow that is practicing arts of deception may last a little while, but he cannot last long. The man who stays is the man who has the staying power; and the staying power is not merely 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 ell you what has happened in the world, what events have occurred of all sorts, political, scientific, and nonsensical. What a wonder, what a marvel it is, tha here, for one or two cents, you buy a history of the entire globe of the day before!
*From a lecture delivered to the students of Union College by Charles for May.

## AN ELASTIC TIRE FOR VEHICLE WHEELS.

The illustration represents a tire designed to have the characteristics of a pneumatic tire, but which is not inflated, and which it is purposed shall be far more durable than the ordinary rubber tire. It is made of spring wire, in sections or as a series of continuous or 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 Honrath, of St. John, Kansas. Fig. 1 shows the preferred form of construction, Figs. 2 and 3 being sectional views of modified forms. The sections or members are held firmly and compactly in position by a tie rod or wire of suitable size, located in a central recess in the outer surface of the tire. If found desirable in


## 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 valve casing, and provided with a service valve and an auxiliary cut-off valve, both moving with the stem, to permit of readily shutting off the water from the service pipe whenever it may be necessary to repair 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 at its upper end a valve seat adapted to be engaged by a disk valve on the square part of a stem moving in the valve casing. The valve preferably has a facing of rubber or leather, to make a tight joint, and it is held in position on the stem by a nut, the upper part of the stem passing through a stuffing box in the top of the upper section. The valve stem is held movable in the casing by a threaded portion screwing in a spider forming part of the midale section, a plan view of which is shown in the small figure, allowing the valve to be opened and closed on turning the handle.
On the lower end of the stem is an auxiliary valve 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 stem, and is normally off its seat when the faucet is used in the usual manner, but in order to repair the upper and ordinarily used valve seat or valve, the 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 unwind 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 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 extending to the front end of the body. The head of this rod first strikes the ground when the anchor is fired, disengaging the hooks and permitting the spring to 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 standing and watching it till the whole set of the anchor, after which they swing outward and abut against the inner face 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 merehant marine. Such was the decision of At-torney-General Olney in torney-General Olney in the question referred to him by Secretary Carlisle
as to the legality of the as to the legality of the
action of Secretary Foster action of Secretary Foster
in granting licenses to the in granting licenses to the alien engineers who were serving on the American Line steamers New York and Paris at the time they were pranted American registry under special ant registry under special act of Congress. General Olney decided that the ac-
tion 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, notwithstanding the contention of the National Association of Marine Engineers of the United States that it had been repealed.-American Shipbuilder.


SCHMITT'S LIFE LINE THROWING APPARATUS.
we all know at some period of sur lives, of seeing an express train go by. It has been expressly designed to express train go by. It has been expressly designed to
tap and bore holes up to $11 / 2 \mathrm{in}$. diameter. The radial arm is carried by two trunnions on a vertically adjustable slide, and admits 3 ft .9 in . up to 6 ft .3 in . high from the face of bed plate. The radial arm is fitted with a clutch motion actuated by a lever in front of the drill head to rotate the drill spindle in either direc tion or to stop it instantly. The spindle is balanced and fed down by a steel out rack, and is adjustable to drill from 2 ft .4 in . to 7 ft . radius.
"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 sinall improvement 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 is certainly ' a the,' is 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 beauty. No plant is easier to manage, the flowers ar 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 quires an abundance of water, and when about to
bloom should be given waterings of liquid manure bloom should be given waterings of liquid manure
occasionally. This will insure an abundance of large occasionally. This will insu
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 pos sible about the roots; placed in a tub and then trans ferred to the cellar for the winter.
This plant is so easily grown that no flower lover should be without it, al 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 value.

When eaten at luncheon it is prepared in a different way $t h a n$ 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 tablespoon ful of sugar ard 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 bet ter obtained.-Popular Science News.

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 minuteness 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 work.
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
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 sunall pieces of glass. The result in these larger windows was the same as in the smaller lights already mentioned, and beauty and 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 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 of our most prominent designers have lowered the tone of glass so that their windows are almost 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 at-tempting-with what success will soon be shown-to produce a stained glass window which is not only rich in color by the juxtaposition of different tones, but is 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.
ing of any im portance 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 (add ress 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 trans verse suspension bar connected by a yoke with a bridge bar just behind the dashboard, as shown in bridge bar just behind the dashboard, as shown inthe broken away portion of the main view. On this 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 frame has at its ends rollers adapte
the rails when the fender is lowered.

## Well Cared For.

Thismeans much in homing pigeonkeeping. Your eed 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 sunall Canadian peas, and some vetches, together with hulled oats, are the coriod,
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 young flying fanciers to bring their birds into fit racing condition, if they are patient, attentive, and watch their birds closely, giving them the best quality of feed obtainable, and not try to breed from and race their 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 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.

The fortunate discoverer of argon has been made the recipient of the Faraday medal, which is a gift of the London Chemical Society.
A recent issue of the Scientific American (May 11, 1895) in a review of the late meeting of the Nationa Academy of Sciences, held in Washington, also calls at tention to the fact that the Barnard medal was this year given to Lord Rayleigh for his discovery of argon in the atmosphere.

## Sorrespondence.

## 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 tem porary 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 the surface. It should be thoroughly dry before the armature is used.
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.
A. A.

Covington, Ky.

## 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, This is a hamlet numbering about one thousand souls,
chiefly agricultural in their calling. It stands some 600 chiefly agricultural in their calling. It stands some 600
feet above the sea level, on a plateau to the right of the 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 inary to further sounds of similar import, announcing
the noise it is now making in the world. On the 12 th the noise it is now making in the world. On the $12 t$ th
and 13 th 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 giv ing 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 im. mediately 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 but that it was safe to leave the lamp on the cloth. When he returned the cloth was blazing. The fire was soon put out, and not much damage was done.
This case recalls one reported from Louisville, Ky., a few months ago, the Boston Journal of Common adds, 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 appear 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 areaffixed. When a new light is attached the globe becomes only warm under continuous use, but after it gets old the globe are hot and the stems attain burning heat. The dresser was filling the floor of the window with loose 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 inflammable cotton, touching the burning hot stems and globes, caused the fire.

## the american yacht defender.

The series of races in which the Valkyrie, as the British champion, attempted to win the America's cup in competition wlth the A merican yacht Vigilant took place off Sandy Hook in the autumn of 1893, the first race being sailed Saturday, October 7, the second, Monday, October 9, and the third, Friday, October 13, in all of which the Vigilant was victorious. Now work is heing rapidly pusbed forward on an American yacht is heing rapidly pussed forward on an American yacht which has been aptly named Defender, which will pro-
bably compete with a British yacht next September bably compete with a British yacht next September
for that great blue ribbon of the sea which still refor that great blue ribbon of the sea which still re-
mains in the land of its naturalization. After the defeat of the Valkyrie Lord Dunraven's challenge was of course a foregone conclusion, and all yachtsmen and the general public as well are looking forward to the races which will be sailed off Sandy Hook in a few months for the time honored trophy, for yacht racing probably appeals to a much larger section of the community than any other form of sport. The most important concession granted to Lord Dunraven this year was the right to choose his boat as the New York Yacht Club does at present, so that in all probability not only the Valkyrie III. which the Dunraven syndicate are building, but the Fife cutter Ailsa will be brought over and trial races sailed off Sandy Hook to determine which shall be the British champion.
In America we have, as it were, put all our eggs in one basket, and are relying almost entirely on the Vanderbilt-Morgan-Iselin boat Defender, which the Herreshoffs are building at Bristol, R. I., as this boat will probably have to race against the pick of two modern cutters designed by the two foremost nava architects in Great Britain. The order for the De fender was placed last January with the Herreshoffs, who are undoubtedly the greatest yacht designers in the world, and they are under contract to deliver the
yacht June 15, and her trial races will be sailed soon after to see if any modification as to rig is required.
The Defender is a sloop yacht. The approximate measurements are as follows. The exact measure ments have not as yet been made public, for from the time of their conception until long after launching the cup defenders have ever been mysteries to the public, and the present yacht is, if anything more so than the preceding ones. This secrecy must be maintained, so as to keep the lines and dimensions from rivals and those interested in the challenging yacht.
The present figures, although in some instances unofficial, will probably be but little out when comparison can be actually made
The Defender is not far from 126 feet over all and between 89 and 90 feet at the water line. The beam is about 23 feet, draught about 19 feet. She has no auxiliary centerboard forward, but is an out and out
keel boat. She has a $3 \overline{5}$ foot lead bulb weighing 60 tons. In the lead bulb of the Defender, Herreshoff has remedied a serious defect in the Vigilant. Where the latter in a heavy sea pounded with her flat outside ballast, the Defender will rise and fall without pound ing, as the egg-shaped form of -her ballast gives easy entrance and withdrawal.
The Tobin bronze plates, as used in the Vigilant, have been superseded by manganese bronze plates below the water line, and above it as far as possible they are of aluminum with an alloy of about ten per cent of copper to resist corrosion and give added
strength. strength.
Not only is the upper portion of the plating of the Defender of aluminum, but thedeck beams themselves are of the same material, and the saving in weight over steel will be more than double the amount saved by the plating. The total saving effected by the use of aluminum is estimated at seven tons, which is expected to tell greatly in favor of the Defender in the races. A dispatch from Boston states that the mast is 102 feet long; boom, 102 feet; gaff, 64 feet bowsprit, 44 feet; topmast, 61 feet 2 inches; spin-
naker pole,
72 naker pole, 72 feet. These dimensions may be slightly decreased in fitting. It is said that the Defender will have 7,000 square feet of canvas in her mainsail alone, and her total sail area will be from 12,500 to 13,000 square feet. The distance from the deck to the hounds will be about 72 feet. The Defender's principal gain in sail area will be in the mainsail, the spinnaker being somewhat smaller than that of the Vigilant. One of the most interesting feature of the Defender is the manner of working the sails. All the halliards will be led below through tubes in the deck, and they will be worked by means of powerful winches.
The main sheet will also be led below, where it can be handled by a few men with the aid of a winch. Possibly the same may be done with the sheets of the head sails, but many of the details of the yacht are still kept secret. Much of the heaviest work of trimming sheets can thus be carried on below the deck. leaving the deck itself clear for other work. Our full page engraving represents the Defender as she will probably appear at the race with spinnaker set. Our smaller views give a side elevation and a half bow, half
stern elevation.

It is of course still a question whether the Defender will be selected to compete, but there seems to be a very general opinion that the safety of the America's cup rests almost entirely with the Defender, for each new boat has been better than the last. The international yacht races have promoted an honorable rivalry among yacht designers, and serve the
pose of quickening patriotic feeling.

## Natural History Notes.

The Dancing Hammerkop.-The hammerkop, a bird of peculiar habits, is found in Cape Colony, some other parts of Africa and in Madagascar. It is something like a heronor stork, has a melancholy gait, lives on fish and frogs and is considered in Africa a bird of ill omen. Under its quiet appearance it nourishes æsthetic tastes. When it casts off its sober demeanor, it indulges in a fantastic dance. In a state of nature, two or three join in the dance, skipping around each other, opening or closing their wings. They breed on trees or on rocky ledges, forming a huge structure of sticks. These nests are so solid that they will bear the weight of a heavy man on the domed roof without collapsing. The entrance is a small hole, placed in the least accessible side. In a lonely rocky glen, Mr. Layard once counted half a dozen of their nests, some almost inaccessibly placed on ledges of rock. One nest contained at least a large cartload of sticks. They occupy the same nest year after year, repairing it as required. The female is credited with thejoiner work and the male is the decorator. On the platform out side the inner portion he spreads out all kinds of objects of virtu, brass and bone buttons, bits of crockery If bleached bones.
If a knife, pin, or tinder box were lost within some miles, the loser made a point of examining the ham merkops' nests. Indeed, were it not that hyenas, leopards, and jackals ranged in their vicinity, it is highly probable that man's curiosity or resentment would have often extirpated these interesting artists. or, at least, destroyed habits founded upon leisure and immunity from persecution.
The Courting of Animals. - This subject seems to prove attractive to many naturalists, In Vol. X of
the "Transactions of the Wisconsin Academy of Scithe "Transactions of the Wisconsin Academy of Sci-
ences," there is a highly interesting paper by Mr. and Mrs. Peckham on the "Courtship of Certain Spiders." It seems to be the case that the sharpness of vision in spiders is accentuated by love. A male of Satis pulex was put into a box in which was a female of the same species twelve inches away, and the male "perceived her at once, lifting his head with an alert and excited expression, and went bounding toward her." By experiments it was proved that this recognition was really due to sight. These results are interesting, because some have affirmed that spiders cannot see nearly as far as twelve inches. Further experiments
seem to show that spiders can differentiate color. M. Racovitza, a Roumanian naturalist, has been studying the courting and marriage customs of the octopus, and in a recent number of the "Archives de Zoologie Experimentale" he gives us some of his observations. It is satisfactory to know that the octopus does not, as some have thought, behave brutally in its love affairs M. Racovitza assures us that "there is nothing more than a courteous firtation," and that "the male behaves with a certain delicacy toward his companion." -Science Gossip.
Agricultural Ants.-Prof. W. J. MeGee, of the government scientific corps, recently paid a visit to some very remarkable farmers in Sonora, Mexico. These are the so-called agricultural ants, which plant fields of grain and regularly harvest their crops, upon which they depend wholly for food. In fact, should the crops fail, they would perish of famine. On the other hand, the cereals that they grow have been specialized by cultivation, like the wheat and other grains of the human husbandman, and would quickly disappear if the attention of the insects was withdrawn.
The fields of the farmer ants cover scores of square
miles in Sonora, a large part of which is quite densely miles in Sonora, a large part of which is quite densely
populated by them. The home of a colony is marked ordinarily by a circular clearing from five to thirty feet in dianueter, on which nothing is permitted to grow. This serves as a sort of parade and exercise ground. Around the clearing is a ring of luxuriant grass from three to twenty feet wide. On the seeds of this grass the insects subsist, planting it every spring and garnering the crop in the autumn. Across the rings which surround formicaries run turnpikes a few inches wide, onnecting farm with farm for many furlongs.
In the region described there is practically no vege tation except the grasses cultivated by these ants. The latter appear to keep down and exterminate all other plants, such as cacti, grease wood and mesquite. The plants naturally prevailing in that part of the country are entirely absent from the most thickly ettled farming districts. In short, these insects have developed an art of agriculture peculiar to themselves. have made conquest of the land for their needs and have artificialized certain cereals as thoroughly as
maize and barley have been artificialized by man.
"Thus," says Prof. McGee, "the rigorous environ-
ment of the desert has developed one of the most remarkable intelligences; and incidentally, an anima and a plant have come to be mutually dependent upon each other for existence." The favorite cultivated plant of these ants is the familiar buffalo grass.
Co-operation in Plants.-Although in some cases it is difficult to distinguish between true parasitism and 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 parasite that feeds upon its juices, yet innumerable cases are known in which the two plants in union mutually benefit each other, and the term applied to such unions would be symbiosis. Symbiosis may then be defined as the associated existence of two or more plants for purposes of nutrition.
Unlike parasites, two symbiotic plants living in union each supplies its partner with materials that the partner requires; a reciprocity system being the ule of their combined existence. Many of the forest rees, common shrubs, etc., have attached to their oots fungoid partners which, absorbing from the ground moisture and mineral matters, hand these chemicals over to the larger tree, receiving in retur starch and other organic materials, which the tree has ormed in its foliage. The black poplar and many other plants have the thread-like filaments of fung woven over their roots.
In the first instance, the root which descends from he germinating seed into the ground becomes entangled with the myceloid filaments of the fungus al ready existing in the soil, thenceforward the connec tion continues until death. As the root grows on ward the mycelium which invests it grows with it. ac companying it whatever direction the root may take
The number of plants having symbiotic relations of he kind described is very large, most of the Ericaceæ, Coniferæ and Cupuliferæ co-operating with subterra 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 way be filled with wonder at the magnitude of the immense colonies of subterranean fungi which must exist interlacing themelves at the roots of such forests of trees.
It will also be plain why there is such a profusion of ungi of all kinds in forests and round the roots of cer tain trees. The lichen is now almost generally ad mitted to be of a composite character, each lichen being comprised of (1) a fungus made up of a web of myceloid threads with (2) an alga in its interior, the combination of alga and fungus thus forming the one lichen plant.
The myceloid threads of the fungus, being most exerior, fulfill the function of gathering from the air moisture, while its partner, the alga, owing to its having chlorophyl, manufactures starch and other chemicals; 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 the fact that a lichen may be actually synthesized by sowing certain algæ along with certain detinite fungi in a favorable place, when the two separate plants amalgamate and interweave their cells, with the result that a lichen is formed.

In some parts of New Mesico there grows a grass which produces a somniferous effect on the animals that graze upon it. Horses, after eating this grass, in nearly all cases sleep standing, while cows and sheep almost invariably lie down. It has occasionally happened that travelers have stopped to allow horses to feed in places where the grass grew pretty thickly, and the animals have had time to eat a considerable quantity before its effects manifested themselves. In uch cases horses have gone to sleep on the road. and is hard to arouse them.
The effect of the grass passes off in an hour or two, and no bad results have ever been noticed on account of it. Cattle on the ranches frequently come upon patches of this grass, where they feed for perhaps half an hour, and then fall asleepfor an hour or more, when they wake up and start feeding again.
The programme is repeated perhaps a dozen times, until thirst obliges them to go to water. Whether, like the poppy, the grass contains opium, or whether its sleep-producing property is due to some other subance, has not been determined.--Pearson's Weekly. 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 robusta and is known from reliable persons to have a narcotic effect on horses and other stock."

IT is often supposed that boys in growing keep ahead firls ; but recent measurements disprove this. The boys, up to their eleventh year, were found torun about a quarter to half an inch taller than the girls. They were then overtaken by the girls, who surpassed them grew faster than the girls, and came to the front.

## SUSPENDED RALLWAY SYSTEMS.

The subject of rapid transit is now attracting great attention in wany of the large cities of the world, including Paris, Berlin, Boston and New York. Among Berlin, Boston and New York. Among
recent projects for urban transportation recent projects for urban transportation
is one in which the cars are suspended 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 considers that the enormous speed of 186
miles per hour may be attained. We miles per hour may be attained. We
give some illustrations of his design. 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, $e$ through the medium of a center pin, $e$,
which permits of a certain amount of which permits of a certain amount of
lateral play. The oar is suspended by springs which render riding eass. Each


Figs. 1 and 2.-ELEVATION AND SECTION OF THE ELECTRIC MOTOR.
street travel, and the cars will be sus pended, say 16 feet above the surface of the ground, suitable places with step being provided where the cars stop for passengers. The inventor says: The pas senger 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 ve hicle 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 sus pended 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 compara tively small.

## Bilge Keels.

Sir William White, K.C.B., LL.D. the Director of Naval Construction, wa the author of a paper entitled "Notes on Further Experience with First-class Battle Ships,' which was read at the recent meeting of the Insti tution of Naval Architects. In the course of his paper, Sir William 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 comprehensive plan, specially designed to meet and accommodate the great and rapidly increasing popula tion of this metropolis. He designates it the Triplex Service Rapid Transit System. Suitable piers or towers
are located at, intervals, from which severalindependent
 the same condition of stability as the Repulse. Com paring the returns from these two ships, it appears that the Resolution on one occasion reached a maxi Repuls inclination to the vertical of $23^{\circ}$, whereas the epulse never exceeded $11^{\circ}$. The meanangles of oscil ation were, of course, consi derably 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 con ditions of weather and sea caused rather heavier rolling han in the Resolution. In iew of this experion. In iew of this experience, al though the trial was limited and not representative of many conditions occurring a sea, it was decided to fit al the other ships of the clas
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 both the top and bottom.
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 canbe conveyed to one of the cars of the other line. The expense of the new system is not as great as in most other schemes for aerial transportation. The cars make comparatively little noise and curves are passed with ease. The girders 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 suspendedelectricrailfor the suspendedelectricrailway intended for a crowded
Berlin street. The cars seat fifty persons each and access to them is gained from stations which are built at conwith bilge keels similar to enient 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 Channe and protected from contact with other wires. The cars of the different tracks may run at differentspeeds. Squadron during their annual refit last summer. It 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 alse 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. 5.-SUSPENDED ELECTRIC RAILWAY-TRIAL LINE AT DEUTZ, NEAR COLOGNE.
class. On the cruises of the Channel Squadron which Channel Squadron which bilge keels were fitted there have been but few oppor tunities of obtaining proo of their practical value. So far as experience has gone however, there is a con sensus of opinion among officers in command that rolling has been greatly reduced by the bilge keels. reduced by the rards the influence of bilge keels on speed, the practical test of actual ser vice proves that there is no sensible reduction in speed for power, or material in crease in coal expenditur for a given speed, at a given draught, and with the bottom in similar con dition.

A Texas hailstorm on April 24 made sieves o frame houses, blockaded the Great Northern Rail road, 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 bitterly cold night when running tender first, should be the means of obtaining $f$
gine drivers than they at present have. Unfortunately several locomotive engineers appear to stil hold the old opinion that "to provide a comfortable cab would render the men careless," and also add to 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 nothing has at present
been done to provide better been done to provide better
protection to drivers genprotect
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 pany will be found to have a complete "cab" and
shelter provided for runshelter provided for run-
ning 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 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 reason why the American engine driver should be able to perform his duties in comfort and yet that the same protection should be refused to the English driver.

## SPORTING OXEN AND BUFFALOES.

A correspondent of the Graphic, London, writes from India: Some years ago a friend of mine, known in the district as J. J., was manager and part owner of a Behar indigo factory. Being short of factory oxen, he purchased from some natives a number of buffaloes to work in the plow. Among this draught was a full grown bull which was of such a savage and morose 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 fastthe animal securely fast-
ened 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 one in particular. These remarks were often emphasized by recourse to a rather heavy bamboo "lathi" which
was kept handy. The animal would charge J. J. in the most savage manner, but as he was securely fastened to the tree, and his trainer took good care to keep some little distance beyond the end of his tether, these onslaughts were of little avail. Moreover, they were always met by a sharp crack on the nose by the afore-
said bamboo. Soon the "bisa" began to awaken to
the folly of this mode of procedure, and contented himself with merely shaking and tossing his head. Then J.JJ. 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 tome them out of his master's hand, though showing some shyness at first. In course of time he would allow himself to be


Fig. 6.-PROJECT FOR AN ELECTRIC SUSPENDED RAILWAY FOR BERLIN.
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 olid block, and that many cattle feeding couldn't have cleared the grass away as completely as thos ave cleared the grass away allimetely as thos eese did. I heard that the killing of these geese fo market had grown to be a great industry, and that some men were getting rich at it. Ranchers were also offering a bounty for the geese, as cattle raising wa becoming an important business, and the geese pre empted so much of the pasture area that the loss was serious to the cattl 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 wer 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 po one could get within half a mile of alok. Hid ing in gruss blind was trid and worked well for a time but the cunning geese size the blinds up at last and wouldn't come anywber 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 al most on the heels of a host of geese, and the fowls took no notice of them. He had an ox that was even tempered and accommodating, and one day he turned it loose and let it feed along toward where a tremen
dous 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 wasn't a goose hunter along the coast who didn't have a goose-stalking ox."

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 quan tities of wood, and the operation of a long line of complex activities. These small articles play an im portant part in the eco nomies of all civilized na tions. To stop at once the manufacture of toys andall not really needful article in these nations would be to put a stop to a large part of the working and producing forces that con stitute the origin of civili zation. 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 add ing to our productions al the wares that find favor abroad, while we have
he way we used to hunt 'em in the early days. A ood stalking ox, I want to tell you, was a valuable bit of property forty years ago in California, and we about the same as sportsmen nowadays discuss the points of their bird dogs. A good stalking ox could earn his owner anywhere from $\$ 50$ to $\$ 100$ a day if the owner himself was any good, and enjoyed the sport as wuch as the hunter did.
"I went to California in 1851, and promptly dropped the cultivation, but showing himself still uncertain 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 vil lage buffalo which graze along the margins of the jhil and lagoons. After some practice this bull became very steady under fire and enabled his master to make ome big bags.
A correspondent of the N. Y. Sun says: "I made a good deal of money in the early days of California when we used to stalk wild geese with oxen. Stalking geese with oxen may sound a little queer, but that's


A SPORTING BUFFALO. originated scores of novelties in the amusement line that are being sold and imitated abroad. There is in humanity a chord that responds to the touch of rivolity, adds the American Wood Worker, and that chord has enabled the inventors of ingenious nothings o 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 road, or 46 per cent of all railroads.

## Shop Photography.

James F. Hobart tells, in the Iron Age, how to select the necessary apparatus, the material, and how to do the work of photographing machinery and other goods.
Photography has become so necessary to the manufacturer that he can no more do without it than he 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 employed it to the extent he might, and by all but a few concerns photographing is done in a loose, haphazard manner, sometimes by one and sometimes by another "photographer to the trade," who may chance to be available at the time pictures are needed. As a result, there is not even a ghost of a system in the preparation of pictures or in the sizes used. Neither are they got out always at the time and in quantities to suit the man who pays for them. Another thing is the ownership of the negatives. The photographer claims them, and as he has got them, and possession is said to be nine points of the law, he generally keeps them and makes the manufacturer await his pleasure. Indeed, it has been stated that the only way to get a neg:tive away from a photographer is " with a club," and there seems to be a good deal of truth in the statement.
Once equipped with the required apparatus, the necessary material and "know how." photographs can be turned out at will, and usually in a small fraction of the time required by professional photographers to deliver the same amount of work. This is notbecause the shop operator can do work quicker than the professional, but because he has only one man's work to look after, instead of having to cater to twenty or thirty customers at once, when, perhaps, all of them want their work first, and " day before yesterday" at that.
The apparatus and material that should be purchas ed to begin with need not cost more than $\$ 100$, although 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 negratives there must be provided three trays, at least $10 \times 12$ 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 $15 \times 19$ inches, for toning prints, to be kept for that purpose exclusively. When it comes to mounting the prints on cardboard, ther 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 $10 \times 12$ inches in size, and a picture of that area will be large enough to show up any ordinary machine. A good $10 \times 12$ 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 top or the bottom of the plate, thus making a change in height without moving the camera itself. The swing back is to keep the perpendicular lines of the machine vertical on the picture. It is often desirable to tilt the camera up or down a little, or even considerably, in order to get the whole of a tall machine on the plate, or, perhaps, to show the top as well as two sides This can be done, but the plate which is to form the negative is tilted so that the picture of the object appears wedge shaped.
Perhaps one of the best illustrations of the use of the swing back that can be made is to set up a plain board say 16 feet long. Erect this board on one end, then set up the camera in front of it and tilt the machine so that the top of the board is visible on the ground glass. A close inspection of the image will show that the top is very much narrower than the bottom making a wedge-shaped picture, which is far from being a correct representation of the object itself. In order to correct this error, the swing back must be used, and so changed that the ground glass will stand perpendicular. Then, no matter how much the camera itself may be out of level, the picture will be perfectly symmetrical in all its parts, provided the lens is rectilinear, as it should be. The glasses must be so proportioned that pictures of all objects are not distorted by being reduced more or less to a circular form, as is the case with some of the cheap view lenses inthemarket. A very good test for a lens is to draw
up the camera so that the image of the figure almost covers the ground glass. Then, with a nice straight close $\$ 5$, for which please send me," etc. Mr. A. E. dge, test the lines on the ground glass. If they are it. Just what I have felt the keenest want of for with perfectly straight, the lens is rectilinear. If the lines Mr. Charles E. Cole felt the keenest want of for years." are not straight and the figure as perfect a square as the one in the drawing, then the lens must be discarded or a better one.
A good lens for photographing machinery can be purchased for $\$ 35$. It will cover an $8 \times 10$ plate in good shape. Two kinds of lenses are made, one kind being known as "wide angle," that is, it will put into the picture anything coming within an angle of $90^{\circ}$ to $100^{\circ}$. The ordinary lens will not take in more than $50^{\circ}$ or $60^{\circ}$, and this kind is much better for making pictures of machinery, because the perspective of a machine is not made so prominent with a narrow as with a wide angle lens. In cases where the room in which a picture has to be taken is limited, as when photographing a large machine in a small room, the wide angle lens is a necessity. If expense is no object and the shop is to purchase a first-class photographic outfit, then both a wide angle and an ordinary lens should by all means be included in the list and both made to fit the same flange on the camera. For the $\$ 100$ limit we must be content with a single lens, and that is one covering no more than $60^{\circ}$.
The developing trays are next to be selected, and if there is a handy pattern maker in the shop, he can save that item of expense by making some neat pine frames of the size required for the trays, and then set ting a pane of glass in a rabbet made for that purpose inside each frame. The glass must be set with shellac or asphaltum varnish, and the entire frame should also be given several coats of the same substance. This method makes trays with transparent bottoms, and they are nice ones to work with. Some concerns use wooden trays with wooden bottoms as well. They are good when large sizes are necessary.

The cost of the articles necessary is about as follows :

| Camera and tripod....... | \$25.00 |
| :---: | :---: |
| Lens | 35.00 |
| Three $9 \times 11$ trays, at $\$ 1.65$ | 4.95 |
| Two $8 \times 10$ plate holders | 8.00 |
| Focusing cloth. | 50 |
| 8 -ounce glass graduate | 50 |
| Two $8 \times 10$ printing frames | 1.00 |
| One large tray, $15 \times 19$, 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 oz.) dry plates, $8 \times 10$. | 2.40 |
| 1 ounce pyrogalic acid | 45 |
| 1 pound carbonate of soda (sal soda) | 0 |
| 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). |  |
| 8 ounces nitrate of silver in crystals. | 00 |
| One packageround filterpaper, 13 -inch | 55 |
| 100 negative envelopes. | 75 |
| One dozen sheets albumen paper | . 00 |
| One dozen sheets, $8 \times 10$, ferro-prussiate paper | 45 |
| One quire non-actinic orange paper. | 50 |
| 100 card mounts, $10 \times 12$. | . 75 |
| One quart parlor paste | 50 |

Total.
\$97.56
This estimate comes within the $\$ 100$, and by the time the first picture has been made the balance of enience in the dark room.

Unsolicited Testimonials.
We have received a large number of unsolicited testi monials for our "Scientific American Cyclopedia of Receipts, Notes and Queries," of which the following orm a part. Professor Ed ward S. Holden, of the Lick Observatory, says: "It is a mine of useful information set forth in a simple manner, and it will be found of value to all who have to do with practical matters-as who has not, nowadays?" Mr George $\mathbf{F}$ Kunz, the gem expert, says : "•The Scientific Ameri can Cyclopedia of Receipts' cannot fail to be highly valuable to artisans of all kinds, such as jewelers, silversmiths, microscopists, and many others who are
desirous of obtaining recipes for making, repairing and adjusting a great variety of articles with which they are constantly coming in contact." Professor W F. Watson, of Furman University, says: "It exceed my expectations. I believe it to be the most comprehensive and reliable work of its kind that has ever been published." Robert Bond, M.D., says: "It pleases me to say that no other book I have would I
exchange for it could I not duplicate it. I have used several of the formulas and have had absolutely no failures when I use pure materials. Being a chemist, of course I know how to select. In fact, some of your for "Yas are marvelous." The Rev. C. C. Brown says: Your 'Cyclopedia of Receipts' is a wonderfulbook. I the slendid heks given in the book, I have also made Lee says: "I am so captivated with your "Cyclopedia of Receipts, Notes and Queries,' that I desire another
for a new year's present to a friend of mine and in-

Mr. Charles E. Cole says: "I think it is the finest
thing of the kind I ever saw. May its sale never stop until every family in the civilized countries of the world has got a copy."

## The De Mare Incandescent Gas Burner.

Public attention is being given in Paris to a system Pincandescent gas lighting to which the name of the inentor, M. De Mare, has been given. The arrange ment consists of an atmospheric burner fitting designed to be easily attached to an ordinary burner point. This fitting is of extremely ingenious design and construc tion; being probably the smallest and most compact air and gas mixing apparatus ever successfully used for this purpose. It is professedly designed upon the principle of the Giff ard injector. The mixed gas and air issue at the top of the fitting through a slit, which rad in the regular batswin shape. Across the flame is suspended, by means of a shape. Across the flame is suspended, by means of a
brass yoke, a length of twisted platinum wires, carry brass yoke, a length of twisted platinum wires, carry
ing a row of what appear to be asbestos fibers. In ing a row of what appear to be asbestos fibers. In
the heat of the atmospheric flame these fibers become the heat of the atmospheric flame these fibers become
highly incandescent, and yield a brilliant light. The effect is certainly striking; and as neither chimney nor globe is required to enable the light to burn satis factorily, and the incandescing material is uot woven into any textile form, the simplicity and cheapness of the arrangement are obvious. For street lighting clusters of these burners are used in Paris with good effect. Before lighting, the fibers, being flexible, will stand any reasonable amount of handling; and it is said that one string will last for 1,500 hours of lighting, and be serviceable to the last shred. The con sumption of gas in the De Mare burners is limited to $23 / 8$ cubic feet per hour; and the illuminating power is stated to be 25 candles.

## Photographs of Lightning.

Mr. J. N. Jennings, of Philadelphia, and of the Philadelphia Photographic Society, gave an interest ing exhibition of views of lightning before the Society of Amateur Photographers, in this city, on the 14 th inst., which proved, in his estimation, that the artists conception of lightning, as depicted by them, wa | wholly wrong. He had illustrations of the earlies 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 ter minals of a Holtz electrical machine, with the appear ance 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 later is placed under the paper, and a cochine with an 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 illuminate by the faint discharge of electricity about it was very novel.
Other pictures represented the curious tree-like ap pearance of lightning, and the dark branches or black ranches 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 ac counts for the phenomenon of their taking black on he sensitive plate. A peculiar phase of a single flash separating into two branches going in the same direc tion down ward, the path of one being further off than the other, on account of the lateralaction of the wind, was shown. There were views of veritable thunder bolts, where two separate flashes run into each other Also views of flashes shooting upward from the earth. He showed a comparison between a sheet of clas cracked by heat with the form of a lightning flash and closed the series by showing a view of a flash taken from the rear end of a railway train in mo tion, which had the appearance of a broad ribbon of light-very remarkable. He proved that ic could not have been due to the local movement of the camera, but gave as a possible explanation that it might have been produced because of a single stroke separating it into two parallel branches near together, one nearly back of the other, which would make the light from each merge on the plate and give the effect of a broad ribbon of light.
The views were verv instructive, in showing the many phases of lightning and in correcting false ideas on the subject. Photographers generally should be prepared to catch views of lightning, in order that it may be studied photographically as effectively as astronomy is now done.

## The Deseret Museum.

In our description of the Deseret Museum, Salt Lake City, in the Scientific American of April 20, the size of the main lecture hall was erroneously given as 16 by 32 instead of 66 by 32 feet, as it should haveread. The museum was represented by its president, Dr. James E. Talmage, at the Dublin meeting of the Museums E. Talmage, at the Dublin mee
Association in June of last year.
columbla conege Library City, has siveth Low, of Columbia College, New York 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 New York. Mr. Low wishes the library building to be chant 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 inter section 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 vestrbule will be reached. Marble door ways 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 a n 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 apar 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 con structed 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 hospi tality is extended to scholars or to any one who is mak ing special iuvestigations.

## PROTECTING THE PIPES NEAR ELECTRIC RAILWAYS

 FROM ELECTROLYTIC ACTION.Since the general introduction of trolley roads in the streets of towns and cities, numerous cases have the streets of towns and cities, numerous cases hav
occurred of damage to water, gas, and other pipe occurred of damage to water, gas, and
from the fact that the ground has befrom the fact that the ground has be-
come charged with electricity, and an electrolytic action thus set up by the es caping 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 Wat kins, 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 conductor should be large, so that the current will flow easily, and they are brazed or otherwise firmly secured to the rails to make cood contact, while connection with the good contact, while connection with the
pipe is preferably made by means of a plug screwed into the pipe, but without t solder being applied to make sure of a use of lead of a tight joint tors the current passes freely back to the generato 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 In stitution of Naval Architects, in amplification of that read a year ago on "Solid Stream Forms, and the Depth of Water Necessary to Avoid Abnormal Resist ance of Ships." There was plenty of experience, he said, to establish the fact that in water only three times the draught of a ship the progress of that ship was materially retarded, but he was unable to discover
any authentic case of retardation where the depth of water was six times the draught amidships. Ver hips 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 verysmall. 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 the wave resistance would mean but 2 per cent at 10 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 iucrease 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

bout, 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 he 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 ifting 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 en gagement 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 haft, and the hollow shaft has a flange at its uppe nd and an exterior thread, preferably of four and a half inch pitch, the hollow and the lifting shafts being shown in their normal position in Fig. 1. A nut restshown in their normal position in Fig. 1. A nut rest
ing on the washer receives the exterior thread of the
and is afterward raised more rapidly by the coarse 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 followng 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 n even keel, it is with considerable difficulty, and much shoving with spars, etc., on the davit heads that the davits on the side with "heel from" can be urned 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 seriou 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 improv ing 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 ar 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 direc ion. 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 wings in between the two davits, the tumblehome of the ship's side giving sufficient angle for the keel of he 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 davit you could always get a boat out by forcing the davits away from the ship's side by screw or hy draulic jacks, and when the boat is hanging over the water you can lower davits and boat together, keep ing the boat close up to the davit head until there no chance of her being stove against the ship's side when the falls are lowered
(c) A nother and a very good form is a curved davit pivoted and hinged on the gunwale itself, having a permanent screw jack fitted to it. In this case, when 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 them selves from the heads to water line All these forms are, to my mind, much su perior 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 roop 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. gain, it seems practicable so to construct the
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 hread, 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 toits coarse pitch, the stump then being raised four and a hal inches at each revolution of the sweep. In Fig. 2 the lifting shaft is shown drawn up to a connection with the auxiliary shaft, and in Fig. 3 the two shafts are is first started and slowly drawn up by the mainshaft,


WATKINS' METHOD OF PREVENTING ELECTROLYSIS OF STREET PIPES. bridges and promenade decks that they should auto matically disengage to form three, four, or more rafts which would be left floating when the vessel has sub sided. Shrouds, backstays, etc., interfered considera bly with the chances of floating such rafts formerly hut 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. f the passengers accommodated themselves on them they might at any rate have a chance of being rescued. Small depots of water and provisions could always be kept filled, which might enable the occupants to pre serve their lives for three or four days, when they would almost certainly be found, even in midocean.

RECENTLY PATENTED INVENTIONS. Engineering.
Beating Engine.-William H. Ethell, ayton, Ohio. This is a paper-making machine for thoroughly and unformly beating the stock to a prope
consistency in a very short time. The tank has a mid feather forming two compartments, one with a channel at or near the middle of the bottom, and beating roller are secured in a shaft journaled in the tank on opposit sides of the midfeather, one of the beating rollers being ler the beating rollers, and a back plate is arranged ront of the roller located over the channel while second back fall is arranged in the rear of theother rolle
Boiler.-Thomas A. Myers, Mendon . Y. This improvement comprises a front and rea by pipes, while an inner head is arranged within an onnected with some of the pipes and it is located a suit able distance from the front head to form a fire box with the latter, the inner head being provided with pipes exending into the opening of the rear head. A steam rum arranged above is connected with all the pipes. he shell is preferably made of alterwate Jayers of shee eetal, asbestos, and wire netung, so that all the heid through the pipes.
Horizontal Coke Oven.-Franz J. Colliu, Dortmund, Germany. This improvement is de signed to faclitate a very hot working of the ovens, ren
dering it possible to coke bituminous coal and coal con taining small guantities of gas and incapable of satisfac tory baking. The oven comprises a series of juxtapose horizontal chambers or ovens in which the passages for the gas and the heating channels are so arranged that the scaping gases can be used for heating the boilers, an he extraction of proucts can be effected in the most mple manner. The arrangement is such that a freshly harged oven is heated by the heat evolved in an adjain immediate succession, and the production of gas and coke being continuous.
Caisson for Ships.-Costello N. Hol ord, Washington, B.C. According to this improvemen bolts extending from the keel to the water line, to whic may be secured detachable ribs having a contour to snug fit the vertical sides of the vessel, a horizontal rib join ing the vertical ribs at the keel, while means are provide or detachably connecting a cap plate or housing. It is from the keel to the water line, accessible in separate from the keel to the water line, accessible in separat necessitating the putting of the ship into dry dock.
Marine Vessel.-Sebastien Lacavalerie, Caracas, Venezuela. This is a vessel adapted to be It is cigar-shaped, and at its bow end terminates in mallcone and at its stern in a larser cone, both cone being independent of the body portion, and the stern one forming a compartment large enough to contain propeller comprises a series of spiral flanges and the upporting 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 ongitudinally in the bow of the vessel, with a head at its Corward end to retain it in the bow cone. The vessel is provided with air tanks in which air is held under pressure ior breathing purposes when the vessel is sub merged.

## 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 netting, the frame being hung from standards detachably counected with the end of the car. The improvemen ither beneath the body or the platform, and being aut atically locked when a justed. A portion of the vield ing covering of the fender frame is aso so constructed hat it may be folded flat on the main portion of the covering 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 hilip Reinhart, Brooklyn, N. Y. According to this improvement there are parallel brackets beneath the car and eyes suspended from its front ena, a sliding fender
having turned-up braces sididing on the brackets, and brackets on the fender top engaging the eyes. The de-
vice is easily applied to an ordinary car, and may be readily pushed back beneath the car or extended forward eady for use, when it will trip and catch a person on the rack in front of the car. A soft spring buffer covers the dashboara,
the fender.
Station Indicator.-William F. rendergast, New York City. Two movable aprons are of the same station at opposite in the middle of a car, so that it will be conveniently visibe from all parts of the car, the aprons being moved by sets of drums geared together and intermediate mechan sm , on the turning of a crank arm by one of the traininted in order on both aprons, and they are thus shifted while traveling in a and simultaneously turned backwar

Dumping Car. - Mexico Van Pelt Moundsville, West Va. This car has a tilting platfor dirt or other material on one or the other side of the track, without necessitating the nncoupling of the cars. The
bower platform has sto st the edges and transverse ver lical glatform has stops at the edges and transverse ver-
tide the upper platform has a transverse
sliding connection with the main platform and pendent ansverse guide members adapted to engage the guides
the main platform, stay chain devices connecting in the main $p$
he platforms.

## Mining, Ete.

Concentrating Ores. - Walter J Hammond, London, England, and John Gordon, R Janeiro, Brazil. This is an improvement on a former patented invention of the same inventors, proviaing uperior apparatus for separating lighter and heavie asticles of ore and other substances in the same manne mprovement a simple mechanism is made to impart to conicel vessel a varying motion around a fixed center and an oscillating motion, eccentric to the center of r ciprocal motion, around its own center, the differen
velocities allowing substances of different weights come to rest or continne in suspension for purposes eparation. The apparatus is principaly designed f but apatite or phosphate of lime may likewise be separated from heavier material.

## Mechanical

Combination Plane.-Jacob W. ripp, Salt Lake City, Utah. This invention consist 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 int proper position, and there being an auxiliary guide stock The plane is of simple and durable construction, and it
The main stan arranged for universal adjustment to enable the oper to conveniently plane straight or curved work, such , tonguing, rabbeting,
Hand Crimping Tool.-John Wood, Long Island City, N. Y. This is a strong and simple tool or quickly and firmly crimping a cap on the flaring tock on which is held ather receptacle. It consists of a the stock which have handles at their upper ends an crimping rolls journaled on their ower ends adjacent 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 tand ir a spacing sleeve connects the upper ends of the and there being friction rolls between the wheel hubs and he bearings. The hoisting wheel consists of two paral-
el 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 minium by the employment of friction rolls in the bearing vidual parts not being liable to be thrown out of algnment under the heaviest strains.

## Agriculturai

Harvester Attachment. - Charles Stucke, Appleton, Min. Accoring to this improvement, gathering pans or screens underlie the platform
and elevator aprons and the binding table, in combinaand elevator aprons and the binding table, in combina-
tion with troughs, spiral conveyors and elevator chain, ion with troughs, spiral conveyors and elevator chain, gather any shelled grain falling out and convey it
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 nd is wasted.
Shovel Plow.-William F. Hartig, Evansville, Ind. This invention relates to plows having aterally extending wings or sweep members, and the insweep or cutter attachments can be readily attached to or detached from the standard, and can be readily adjusted the desired vertical angles, as the condition of the hill or row may require. The plow may be used as an ordi-
nary bull tongue plow, or it may have lister blades at ach side, double cutter wings, or one cutter and one liser wing, in either ad justment, the wings being quickly nd easily swung inward or outward by shifting theoperating levers, or they may be swung parallel with the heel of the standards.

## Miscellaneous.

Apparatus for Tanning.-William Harrison, Pooler, Ga. This apparatus comprises sets be filled at a time with the tanning liquor, a reversing pump pumping the liquor from the filled vessel into the empty ones, and from the latter into the flrst 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 rinforced in such a way as to make them perfectly air tight and entirely safe when the vacuum is formed.
Coal and Gas Stove. - Donald Mc Donald, Louisville. Ky. This is an improvement on enable it to burn coal or other solid fuel as well as gas, nd at the sametime. 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 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

Steamer and Baker.-Burchard T.
ratus which may be usedover a lamp. It has a lower
steaming compartment adapted for use in steaming food teaming compartment adapted for use in steaming food baking, the oven being so arranged that it may be con. nd the jointe are closed by a water seal, so that the flavor of the things cooked may be retained and the odor will not escape into the room. Arti-
cles contained within it may be kept hot with very little heat.
Discount Wheel.-James G. Huff man, Decatur, Ill. Thisis a wheel to be revolved by the which cannot be previonsly 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 dropped into a till, and the wheel is designed to
amusement with the attractiveness of speculation.
Filling Machine.-John F. Wolven, t. Clair, Mich. For flling simultaneously a large number of vessels with a liquid, as the filling of bottles or
communion cups for church services. this inventor 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 valve rod being connected with one of a series of arms
extending from shafts journaled in suitajo bearings, extending from shafts journaled in suitajle bearings,
there being a handle by which all the shafts may be winging motion to open and close the valves.

Pump Pin. - James W. Mapps, York Veb. This is a pin especially adapted for connecting the pump rod to a windmill. It has a body section and drop section, the latter being shorter than the body section, and when the body section is employed as
pump pin it is provided with a head. The head is not needed when the pin is employed as a horizontal clevi 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

## SLIENTIFIC AMERICAN

BUILDINGEDITION
MAY, 1895.-(No. 115.
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3. The brick power station of the Brooklyn City RailMiscellaneous Contents: A state park in the Catskill Mountains.-To prevent the slamming of screen doors, illustrated.-Quarrying by means of fire.-A
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supplies.-Screen doors, illustrated.- Stair flnishing, illustrated.-A hoist for use over hatchways, illustrated.-Ventilating the school room.-Gas burning range, illustrated
The Scientiffc American Building Edition is issued monthly. $\$ 2.50$ a year. Single copies, 25 cents. Thirtytwe large quarto pages, forming a large and splendid Magazine of architectrie. ricliy adorned with
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Pusiness and Personal.

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hints to CORrespondents.

(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 ? put on razors and fine pocket cutlery, is accomplished ?
A. For hollow finishing, the following wheels are re quired: A mahogany wheel for rough glazing. A maForflat flnishing: A buff wheel for rough. A buff wheel for smooth A buff wheel for finishing. Lastly a pol isher. 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 mahrigany and glue and screw them together, so that thegrain of one piece crosses the other to prevent warping. Let it get thoroughly dry, and wedge
it on the spinde 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, pineor deal wood will do as well as ma hogany, only leave it about double the width of the across. which is about $1 / 2$ inch wide by 12 or 14 nches 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 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 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 mixto 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 weakening ? A. No; unless accompanied by disease. 2 .
What is the difference between a rapid rectilinear and a single view lens ? A. A rapid rectilinear is whatits name indicates. A single view may not be rapid. It always
distorts the image especialy near the 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. 6729 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 wlthout regard to other considerations, any convex lens
will take an image. You will be sure of good results 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 work to be done. 5. How can I prepare my own dry
plates? A. We cannot give the information in the ammand. Consult Supplement, Nos. 647 649, 696, 541, 374, 340, 299, 272, or Sinclair's " Dry Plate (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 becomes ropy or appears like the white of eggg. Apply it warm. Buff the grain off the leather where it is let it dry a few hours, and it is ready for practical use; nd 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 Indaa rubber are cut fine and melted to gether with 5 parts of oil of turpentme in an iron, wel and add 4 parts of yellow wax, stirring constantly whil, melting. This mixture while warm is added with constant stirring to a melted mixture of 15 parts fish oil an parts of tallow, and the whole is agitated until it ha sides in a warm place, and when the belts are in use, from time to time upon th ' inner side. By this treat-
ment they become very durable. 3. Is it injurious to any kind of dynamo to run for any considerable length No; unless it becomesunduly heated. 4. How can I find he horse power of a common slide valve engine? A. 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 he indicated horse power. In the absence of logarithmi formulx or expansion table, multiply the boiler pressure
for $5 / 8$ cut-off by $0.91 ;$ for $1 / 2$ cut-off by $0.85 ; 3 / 8$ cut-off by .75; $3-10$ cut-off by 0.68 . This will give the mean en ine pressure per square inch near enough for ordinars practice, for steam pressures between 60 and 100 pound always remembering that the piston travel is twice the troke multiplied by the number of revolutions per minute 5. What is metalic packing? Is it applicable to the stuff ng box of engine? A. Meanic packing is used a 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 front one in proportion, would it run easier than if made he usual size? A. Possibly. We understand that the principle is now being tried on some French bicycles, f a bicycle had a chain on each side, would it run with fass friction than with single chain. A. Data are wan ing to determine this. It is so much trouble to keep one chain in order that we shoula be very siow to introduce
(6532) F. F. asks: What is the temperature of the bottom sheets of a tubular boiler on the apacity? Also what is the temperature on the water side of same? The above question came up at a meeting our association; one member claimed that it was 1,100 egrees on the side next to fire. Some said he was right,
解 for to decide for us. A. The temperature of the ture of the water when making steam, probably 150 to 20 degrees. The iron is a quick transmitter of heat and although the fire against the fire sheet may be 1,400 to ,600 degrees, the surface of the plate is seldom above
(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 commutalor and a cast field; the field is mounted to stind erect, and the bearings are made of brass and crewed to the poles. I have also made a dynamo like the elght light dynamo except it is two-thirds size, and 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 eason for un that some acid gets mixed up with the steam. But we do not know where it comes from. We use ordnary rain water in the boiler. To
prevent leakage between joints the steam chest is packed with asbestos paper.f Could the acid come from this, owing to the way the fiber may have been treated ? As means of examining at present the product formed if ou could tell the real cause and suggest a remeds, you would greatly oblige us. A. The water from the conn absorbent of iron and is known to disintegrate and carry awaytheiron,leaving the graphitic carbon in place, and in a condition to be cut away with a knife. This is percentage of carbon. There is only a partial remedy in he 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 characterstic of ordinary graphit
(6535) J. M. C. asks how to distinguish between gold and its imitations, either plated articles or The following may answer for rough tests: Gold should dissolve in a misture of one part nitric with three parts hydrochloric acia. A residue indicates silver. If sulphuric One quick metho 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 It did its work in a thorough manner, but I have carelessly mislaid your formula and would greatly appreciate
republication. A. Take strips of red or blue flannel, as these colors are particularly attractive to them, dip in wherever the pests are troublesome.
(6537) T. Y. C. says : Please give me in the SCIENTIFIC American a recipe for an elastic water-
proof glue. A. Glue which stands moisture without proof glue. A. Glue which stands moisture without
softening. Dissolve in 8 fl. oz. of strong methylated pirit $1 / 2$ ounce each of sandarac and mastic; next add $1 / 1$ ounce of turpentine. This solution is then added to a hot, thick solution of glue, to which isinglass has been
added, and is next filtered while hot through cloth or a aieve

## to inventors. <br>    

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