|  | NEW YORK, JULY 27, 1895 | $[\$ 3.00 \underset{\text { WEELIY. }}{\text { A YEAR }}$ |
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## THE LAKE STEAMER NORTH LAND.

The Northwest and the North Land are the names of two magnificent passenger steamships recently built to ply on the great lakes between Buffalo and Duluth, a distance of 1,100 miles. The construction of these vessels is but one of many indications of the rapidly increasing lake commerce, the result of the fostering care of the government in improving the navigation, by

Superior. It was stipulated that the ships should
make the trip from Buffalo to Duluth in sixty hours, and should furnish ample accommodations for five hundred passengers.
The construction of the hull does not differ ma. terially from that adopted in the highest types of ocean steamers. Twenty-eight boilers of the Belleville patent water tube system generate the steam for the
and to operate them, two independent quadruple expansion engines are used on each vessel. Each of these engines is of 3,500 horse power, so that the energy applied to the propulsion of each ship amounts to 7,000 horse power. The propellers make 120 revolutions per minute, and at each revolution thrust the ship forward 17 feet, or at the rate of about, 22 miles per hour The twin propellers are four-bladed screws 13 feet in


THE LAKE STEAMER NORTH LAND.

| widening and deepening the channels. lociss, and canals. | various engines. The boilers were subjected to a pressure of 800 pounds per square inch and are operated | diameter. There are various supplementary engines, including three triple expansion electric light engines, |
| :---: | :---: | :---: |
| The two steamers mentioned are sister ships built at | at a pressure of 275 pounds. The consumption of | engines for moving the rudder, engines for hoisting, |
| be Iron Works, at Cleveland, Ohio. The length | water is 70 tons per hour. The boilers are placed | turning capstans, operating elevators, air fans, water |
| each vessel is 386 feet, the breadth is 44 feet, and the | back to back in long rows each side of the keel, so that | pumps, feed pumps and pumps for mixing the ashes |
| epth from spar deck to the keel is 34 feet, not count- | the fire rooms are on ${ }^{\text {the }}$ A outward sides of the ship and | with water and throwing them overboard. The electric |
| $g$ the higher cabins and upper works. We give an | next the coal bunkel -ich have a capacity of 1,000 | lighting plant is very complete. One thousand two |
| graving of the North Land. The vessels ply from | tons. In these fire - ${ }^{\text {anmo, }} \rightarrow$ blowers are constantly | hundred 16 candle power incandescent lights being in- |
| ffalo to Duluth, touching at Cleveland, Detroit, |  | stalled. The search lights on the deck have $\mathbf{1 0 0 , 0 0 0}$ |
| ackinac Island, Sault Ste. Marie, Duluth and West | Each vessel is propeit: | candle power and were used on the Liberal Arts build- |

Mackinac Island, Sault Ste. Marie, Duluth and West Each vessel is propeid:
, stalled.
ing at the World＇s Fair at Chicago．The wiring schem is that used by the United States navy．The main saloon is lighted by means of beautiful clusters．

The ships are equipped by electric signal lights of 100 candle power each，connected to an automati alarm attachment located in the pilot house．In case a lamp is extinguished by accident or otherwise，it rings an alarm bell in the pilot house and also lights a lamp，immediately notifying the officers in charge that a lamp has been extinguished．The refrigerating plant is an especially interesting feature of the vessels By means of a freezing machine，all the compartments used for the storage of perishable provisions are kept at any required degree of coolness，and for various uses on ship board 1,000 pounds of ice per day are manufactured．This plant was built by the De la Vercne Refrigerating Machine Sompany，of New York City．

The accommodations for passengers are of the very best，and the decorations compare favorably with the finest tra：ssatlantic liners．On the main deck pro vision has been made for officers＇accommodation，and next to this has been fitted up a spacious and ele－ gantly furnished dining room，capable of seating 150 passengers at one time．Staterooms are arrenged in a double line along the sides of the vessels，and are handsomely finished and fitted up，well lighted and ventilated．Each room has its separate light and electric call bell，and is finished in mahogany and in white and gold．Many of the rooms are provided with sliding doors，so that two staterooms，if desired，may be used as one．At the forward end of the hurricane deck，a large deck house has been fitted up for ex－ ceptionally large and handsome staterooms．A large， airy and beautifully finished smoking room has also been arranged here，commanding an unobstructed view in front and on both sides of the vessel．Life boats，life rafts and other life－saving apparatus of suf ficient capacity to carry both passengers and crew have been provided．

Prevention of Electrolytic Action upon Water
In the annual report of Superintendent George J． Bailey，of the Albany，N．Y．，water works，for the year 1893，the effect of the elcetric current on the wate mains situated near the power house of the Albany Railway Company was referred to，and it was furthe said that，though conferences had been held with the officials of the railway company，no remedial action had been adopted．In May of last year the railway company agreed to replace the damaged mains with new ones；to pay all expensesthat had beenoccasioned to the department from this cause，and to so arrange that no further trouble would occur ；all of which agreements have been fully kept．The methods adopt ed and used for the protection of the mains are ex plained in a communication addressed to Superintend ent Bailey by Henry P．Merriam，electrical engineer o the railway company．In this communication Mr Merriam says：

The remedy which has been applied for the pre ven tion of electrolytic action of the railway current on water and gas pipes in South Pearl Street consists in providing a regular metallic path for the return cur reut，leading from the underground pipes to the powe station．

It has been demonstrated that destructive action of the electric current is contined to those surfaces of the underground piping where the current leaves the met al，passing thence to the moist surrounding earth the resulting decomposit
＂To prevent this pas
To prevent this passage of current from pipes to earth，heavy copper wires，connected to the negativ bus＇bar of the station switehboard，have been run along South Pearl Street 600 feet to the south and 3,000 feet to the north，with a branch running east through South Ferry Street to Broadway，a distance of 1,300 feet．At intervals along this route branch wires are connected，leading across the street and intercepting all gas and water mains．Each main is tapped and provided with a three－quarter bronze plug，which con－ nects with the branch wires．The current，which it is impossible to prevent from returning to the neigh－ borhood of the station by way of the street mains，is hus conducted into the station without the corrosion f lead or iroin pipes．＂
The cost to the Albany Railway Company for re placing mains，etc．，was $\$ 1,419.26$ ．Water and Gas Review．

Wire Rope One Thonsand Nine Hundred
Years old．
While conlucting a series of tests with a 100 ton testing $m$ ：chine at the Yorkshire College in England which included the testing of a steel wire rope，Prof Goodman stated that such ropes were not a modern in vention，and that he had recently seen a bronze wire rope one half inch in diameter and from 20 to 30 feet long which had been found buried in the ruins of Pompeii and which must have been at least 1，900 years old．

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ARCHEEOLOGY．－The Condition of the Partbenou．－By Somers




 ELECTRICITY．－The Maximum Possible Effiency of Gal vanic
Bateries－By HeNR M MRTON．P．D．－Gives the results of ex－
periments on the Smee．Danieli．Grove batteries．
 of Cbemistry in the University of Edinburgb，bringing to lik bt








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with uranium, be investigated the matter bimself, and found his incredulity justifled; for the gas be obtained in his receiver contained no nitrogen whatever, but was a new gas which he was utterly unable to identify with any known terrestrial substance. Now new elements do not hang on every bush in the days when keen-eyed science searches through every nook and cranny of creation ; and so its discovery, even though there were nothing more, was a very wonderful thing. We have said the new gas could beidentified with no known terrestrial element : but it was identified, and that very quickly, with the mysterious element in the outer layer of the sun's atmosphere called belium. Before considering the remarkable consequences of the discovery, let us ask how Ramsay could know that the colorless gas which be held in his test tube was identical with a substance $93,000,000$ of miles away, which no man had ever seen. Briefly, it was by the light which it emitted on being beated to incandescence. That different substances on being beated give out lights of different colors, may be seen in every display of fireworks; that every known substance, on being reated to an incandescent condition, gives out a light peculiarly and characteristically its own, is a broader statement, but just as true. The light may not look characteristic to the unaided eye; but when it passes through the triangular prisms of a spectroscope, the original ray is dispersed into a broad band, or spectrum, whose vari colored lines declare in an unyielding voice the nature of its constituents. Moreover, the spectroscope's decisions cannot be invalidated by distance. Its jurisdiction extends to the walls of the universe.

In 1868 J. Norman Lockyer, by means of this most remarkable of all instruments of precision, discovered certain lines in the solar spectrum which could only be accounted for on the bypothesis of a new element, which be named belium.
The most prominent of these lines was one marked $D_{3}$, close to the yellow line of sodium. The first thing which struck Ramsay in examining the gas from uraninite was the $D_{s}$ line of the solar spectrum. Amazed, and balf doubting his own senses, he sent the tube to Professor Crookes, of London, the world famed authority on the spectra of the elements, who fully
confirmed Professor Ramsay's discovery. Since then confirmed Professor Ramsay's discovery. Since then helium has been prepared by Lockyer, Cleve of Upsala, and others; and its existence can no longer be doubted. The gas, bowever, obtained from cleveite is not pure helium, but contains other elemental gases bitherto unknown, whose investigation and separation will tax all the powers of chemical ingenuity. The presence o these other curious gases, the simplicity of the helium spectrum, the obstinate pertinacity with which it re fuses to be classed with any of the "happy families" into which the other elements have arranged themselves, together with the enormous quantities in which it exists in the bottest part of the sun's atmosphere, lead us to think that we are on "the ragged edge" of solving that burning question of physico-chemical very probable that the atc $n \mathrm{n}$ of our so-called elements are but different combinatic us and aggregationsof the atous of one primordial element; and it is possible indeed that this primordial element is belium or one of the strange elements associated with it
The late Professor Huxley says that the "idea that atoms are absolutely ungenerable and inmutable 'manufactured articles' stands on the same sort of foundation as the idea that biological species are 'manufactured articles' stood thirty years ago;" and Professor Richter, of Breslau, stated in 1891 that the plained by the supposition of yet simpler primordial substances." These "simpler primordial substances" substances." These "simpler primordial substances",
have very probably come upon the stage with helium have very probably come upo
within the last three months.
Hail to them! We may now realize the dream of the alchemist-the transmutation of metals. But outside of these considerations there are others of a somewhat different nature. The gas nitrogen, so lazy and inert that it is useful in the atmosphere merely as a diluent, when in combination with other elements, gives us our most valued medicines, poisons, explosives, andindustrial products. lts useful compounds may be num bered by the thousand. The gas helium holds out the same promise. When made to combine with other elements, we may look for compounds baving
properties a conception of which we have as yet not properties a conception
the shadow of a dream.

## electrical items worth remembering.

An accumulator should never be short-circuited. cent.
To maintain an electric arc 1 inch long requires about 118 volts.
A well charged cell of storage battery has about one-balf the resistance of a discharged one.
A secondary battery of 800 elements will illuminate a vacuum tube of high resistance for $31 / 2$ hours with out recharging.
The electrical resistance of German silver is, in round
numbers, 13 times that of copper, and the resistance of on is 6 times that of copper.
The discharge of small storage cells should be limited to $11 / 4$ amperes per plate; of large cells, $21 / 2$ amperes per plate. A battery should not be allowed to remain discharged longer than two days.
In an arc light produced by alternating currents, both carbons are consumed at the same rate and both remain pointed. Carbons burn faster with the alter nating current than with the direct.
The electrolytic fluid used in different storage batteries varies. In some it is a 20 per cent solution of sulphuric acid in water: in others it is much stronger, the proportion of acid being as high as much 36 per ent.
For a pole finder take two clean lead electrodes and dip them in dilute sulphuric acid; connect them with the circuit to be tested. One electrode soon become brown and the other gra

## dicates the positive pole

In mixing the acid solution for a storage cell, care is required to avoid accident. The acid must be very slowly added to the water, to avoid splashes and the too sudden rise of temperature. The water must neve be poured into the acid.
The internal resistance of a cell of storage battery is from 0.001 to 0.005 of an ohm. The average electro motive force is 2 volts, and the working capacity of a good sized cell is 350 ampere hours, that is, it will economically deliver a 35 ampere current for ten hours.
Where no coil is used it requires a battery baving an electro-motive force of 1,080 volts to produce a spark 0.005 inch long in air. Sir William Thomson said "greater electro-motive force per unit length of air is required to produce a spark at short distances than at long."
To find the direction of a current, arrange the wire conveying the current in the meridian so that it wiil be north and south. Place a common compass under the wire. If the N . pole of the needle turns west, the current is flowing from south to north.
In charging storage batteries, the electro-motive force of the charging current should be $2 \cdot 3$ volts for each accumulator in series, and the charging current should not exceed 1 ampere per plate for suall cells, composed of say $6^{\prime \prime} \times 8^{\prime \prime}$ plates, or 2 amperes per
for large cells, composed of say $10^{\prime \prime} \times 12^{\prime \prime}$ plates.
It requires a potential difference of 10,000 volts to produce a spark $\frac{1}{1}$ inch long between two metal balls. As this proportion practically holds good for longer distances, it would of course require 100,000 volts to pro duce a spark 1 inch long, the striking distance be tween a print and a plate being at the rate of 1 inc r 23,400 volts.
Trouve's bichromate of potash battery solution is a follows: Water, 9 quarts; pulverized bichromate of potash, $2 \cdot 6$ pounds; sulphuric acid, $7 \frac{1}{2}$ pounds. It is prepared as follows: The powdered bichromate o potash is dissolved as far as possible in the water, and the sulphuric acid is added, very slowly, stirring con tinually with a glass rod. The misture beats by de grees and the bichromate becorues completely dis solved, and when once dissolved the solution remain clear, and crystallization does not take place on cool

## How Electricity Sets Fires.

William McDevitt, chief of the electrical depart went of the Philadelphia Underwriters' Association recently gave a demonstration of some of the ways in the common practice grounding telephone wires on gas pipe. A bad connection is generally made-quite sufficient for tele phone purposes-and then if the telephone wire be omes crossed with an electric light wire, the large current meeting resistance at the ground connection heats the joint, punches a bole in the gas pipe, and the arc formed lights the gas. Mr. McDevitt gave a complete demonstration of the gas and insulation on the wire burning simultaneously. He also exhibited ection of gas pipe that bad caused a fire in just this way. The wires in the sockets of electric lamps are liable to touch the casing, when an arc may be formed. For this reason, no drapery should be used around the lamp sockets. The advantage of using metal conduits with insulated lining through which to run the wire was demonstrated, a wire outside being dangerously heated, while from that inside the conduit there was no risk. A caution was'given agains the rough bandling of flexible cords used for electric lights as a common cause of short circuits and fire. There are other dangers due to ignorance on the part of the general public of the character of the electric current. In one case on record, the walls of a room a great number of metal threads. These were in contact with the electric light wires, and when the current was turned on, the whole room was set ablaze. An obscure danger from frictional electricity bas been traced. Sparks may be caused by shuffing the feet
on carpet or by the rubbing of silk. Where benon carpet or by the rubbing of silk. Where ben-
zine is used to clean such materials, a spark thus
caused may give rise to a dangerous fire. It is believed that some benzine fires bave been caused in this way. Another cause of fires is the unreliability of fuses. They are put in the line to be burned out when an excessive current is turned on, but, like safety valves, they do not alwass work. If they fail to fuse, a dangerous current may be carried along the line. To obviate this danger, a standard should be adopted.-Boston Transcript.

## Cycle Notes.

A well known New York firm has introduced what is termed the folding bicycle. The wheel differs slight ky from the ordinary style except that the upper and lower bars of the frame are crossed by a light bar that works on a pivot, so that when a person bas finished a ride and wishes to convert his bicycle into a shape suitable for transportation, be merely unscrews a bolt and the bicycle folds up, turning by the cross bar. The durability of this type is not lessened by the fact that the bar is interchangeable. The advantages of this folding bicycle are evident to all who bave occasion to transport wheels on railroad trains. There are a few in use, by reason of the fact that the demand for the ordinary type of machine this year has been so great that the manufacturers are able to devote little ime to novelties.
A twenty-four bour bicycle race occurred at Putney England, June 22-23. Mr. A. C. Fountaine made 474 miles 1,296 yards in the twenty-four hours.
In France the bicycle is called the "pneu." Surgical Journal for June 13 Dr. Charles W. Townsend bas an article on this subject in which be states that he sent a list of questions to eighteen women phy sicians in Boston and throughout the State in regard to the value of bicycling for wouen. The replies, be says, seem to bim to cover the field of bicycling for women very satisfactorily, showing that the bicycle is or great value to the average woman, even to the woman with various forms of uterine disease. They also show that the bicycle when improperly used may do harm. Outdoor exercise, he says, is of great value to every one, and women, as a class, suffer greatly from the lack of it. Another thing from which women suffer is too beavy and too tight clothing. Both o these ills the average woman is entirely unconscious of, and will deny the need of more exercise on the one band, or the existence of heavy and tight clothing on the other. No amount of dress-reform preaching or of calisthenic exercises will remedy these evils or awaken the woman to a knowledge of the possibilities of the enjoyment of life. This is what the bicycle is doing, and is destined to do in the future. The bicycle provides not only an agreeable method of exercise in the open air, but also demands a comfortable loose and light costume. Whether it will change woman's dress so far as to discard the skirt and sub stitute the divided garment or loose knickerbocker remains to be seen. Patients who have substituted the comfortable loose bealth waists for corsets while they were riding have found that corsets were unnecessary for their everyday dress and decidedly uncomfortable. Like all forms of exercise, the bicycle, be says, can do harm by excessive use. Too great speed or too long rides are exbausting and may injure some delicate point. The exercise is so agreeable and inspiriting that there is more danger of excess than in many outdoor sports, especially if a spirit of ambition and rivalry is allowed. The long rides on timeccout runs are indulged in by womlt in great harm. Dr. Townsend thinks that bicycling is beneficial to women, not from any special effect on the pelvic organs, but because it is an agreeable, healthful form of exercise in the open air, a form which exercises the whole body and indirectly benefits special conditions. And the converse of this bolds true, that as a general exercise bicycling is not burtful to the pelvic organs even when these are affected, unless the disease is so acute that any exercise as great as this is contraindicated. In the samejournal Dr. James R. Cbadwick publishes an article entitled Bicycle Saddles for Women, in which he remarks that he finds no serious attempt has as yet been made to produce a saddle that shall beadapted to a woman's anatowy. His inquiries have not enabled hin to form definite conclusions, but have made evident the fact that the saddles in wost use require many adjustments to be comfortable to the generality of female riders; that some of the saddles are absolutely unfitted for the use of wowen; and that the teachers bave no definite ideas by which they can adapt the saddle to the use of wetaen.

If half of the million of dollars expended annually in New York City for charity, says the Texas Sanitarian, were invested in Western lands and the rising generation of the pauper element in that city were placed thereon and made self-sustaining, the ratio of defective population would be wonderfully decreased, and the opprobrium of our civilization would be materially softened. Verily here is a field for the philan-

## an improved musical instrument

The illustration represents an instrument of a banjo or guitar type, but having two connected sound boards, orguitar type, but having two connected sound boards,
from which are obtained tones designed to blend and from which are obtained tones designed to blend and
afford music of an altogether superior quality. The afford music of an altogether superior quality. The
improvement bas been patented by Mr. Henry I. Holimprovement has been patented by Mr. Henry I. Hol-
comb, of Centerville, South Dakota. The body of the instrument has an interior chamber, with the usual tone opening in the sounding board, and within the

body is a second hollow auxiliary body of similar contour, the end blocks of the two bodies being connected at the front and rear by strips or pins of wood. An interior bridge connects the main or outer sounding board with the outer face of the sounding board of the auxiliary body, the latter also baving a sound opening registering with the opening in the main sounding board, although of smaller diameter.

## HIGH SPEED NAVIGATION.

A boat placed upon water sinks until th the water that it displaces is equal to its own weight. In order to give it a horizontal speed, it is necessary to overcome the resistance that the water offers to the vertical section of the immersed part. If such boat is flat bottomed and if one succeeds in giving it a sufficient speed, the gravity that keeps it immersed, entering more into composition with the horizontal force that carries it along, it sinks less deeply, is light ened and is lifted until it glides over the surface of the liquid. The resistance to progression is then greatly reduced. The boat is immersed anew as soon as the horizontal propulsion ceases to act. We have a sensation of this composition of gravity with a horizontal force when, in traveling upon a railway, our train running at full speed suddenly slows up. It seems to us at this moment as if our weight increased and as if we sank into our seat, just as a bird in full flight would fall if its hori zontal velocity were arrested.
It is not very easy, practically, to give a boat, through a motor that it carries, a hori zontal speed sufficient to allow it to raise itself upon the water: but such a result can be reached indirectly. The following is an experiment dating back to 1876, but not before published, that realizes it.
The apparatus is a rectangular boat placed upon four horizontal screws whose placed upon four horizontal screws whose
blades are slightly inclined upon the horizontal plane. A cranked shaft toward the zontal plane. A cranked shaft toward th
center of the boat receives the action of center of the boat receives the action of one or two men and transmits it to the four screws.
As soon as the latter are set in motion, the appa ratus rises, and at a sufficient rotary velocity easily attained, the box forming a boat is held out of the water.

As will be understood, the blades, slightly inclined upon the horizontal, realize the condition of a horizontal plane gliding at great speed upon the surface of the liquid. If a forward motion be given the float, we shall find ourselves in the condition favorable to such gliding.

The resistance to the rotary motion does not increase


APPABATUS FOR THE STUDY OF HIGH SPEED navigation.
with the speed of the forward motion because the relative current that results from such speed, contrary upon a half diameter of the screw, is favorable upon the other balf of the same diameter. By this process it might be possible to attain the limit of the speeds permitted to man upon the surface of the earth. The velocities produced by our motors, under the laborious conditions in which we are placed, are not very great. It would be necessary, in order to realize the displacements that our imagination dreams of, to be able to dispose of a horizontal component of the grav-ity.-La Nature.

## A PROPELLER LIFE BUOY.

In an inflatable rubber bag forming at once a seat In an inflatable rubber bag forming at once a seat
and a buoy, as shown in the illustration, is a metallic bearing sleeve for a shaft on whose outer end is a screw or paddle wheel, waist and shoulder straps preventing the person using the buoy from being washed off. The forward end of the bearing sleeve is forked, the forks being pivoted to an air-tight casing or buoyant chest, against the rear side of which the seat may be folded up. The casing also forms a partial support, and contains the mechanical propelling devices, having at its under side bearings for the horizontal propeller shaft and on its front side bearings zontal propeller shaft and on its front side bearings
for a vertical shaft on whose lower end is a screw for a vertical shaft on whose lower end is a screw
whose operation is adapted to uphold the buoy in the water. On the casing is stepped a mast, on which a sail may be set, and a downwardly extending frame supports a pedal shaft, by which may be operated, through a sprocket chain connection, a crank shaft baving a bevel gear meshing with a bevel pinion on the vertical shaft, the latter shaft also having a bevel pinion meshing with a bevel gear on the forward end of the borizontal shaft, both shafts and their screws or paddles being thus operated by the pedals and by


BARATHON'S PROPELLER LIFE BUOY.
hand cranks at each side of the casing. There is a rudder on the forward side of the casing, and a com pass is mounted just below a lantern supported on a rod in front of the mast. The pedals and crank handles are arranged to be folded, and the blades of the screws fold down upon their shafts, all parts of the device being designed to occupy as small a space as possible when not in use. This device forms the sup ject of a patent recently issued to M. Francois Bara thon, Sr., 21 Boulevard Poissonniere, Paris, France.

THE WHEEL VERSUS THE PEDESTRIAN.
The great distance covered by bicyclists with ease shows conclusively that the human walking apparatus although it may be the best possible contrivance for all the uses for which it was designed, is not to be compared with wheels, for the one purpose of getting uver the ground. A single observation of a wheelman going at moderate speed shows that, with an effort which in walking would result in two steps of say two feet each, or a total advance movement of four feet, with the wheel the advance movement would be two bicycle steps, or downward pressures of the feet, each resulting in a forward movement of seven and one half feet, or fifteen feet for one entire revolution of the pedal shaft, and this with less exertion than is required to take two steps. In fact, it would be easier for the bicyclist to make the fifteen feet on a level with one pressure of one foot than to take two steps.
Now, in view of these magnified steps made by the bicyclist, it would be interesting to know what the stature of a man must be, to make in walking the
same distance made by the bicyclist, with the same number of movements of the feet. Clearly the steps in this case must be seven and one-half feet each, which, at the lowest estimate, represents threa steps

"A STEP," IN WALKING AND ON THE WHEEL.
of an ordinary man. It would perbaps be nearer the mark to say four steps, but to be on the safe side wc call it three, and have made an illustration showing the comparative size of a wheelman and a pedestrian built to keep step with bim. The pedestrian must at least be eighteen feet high. The man with this great stature would, after all, fall far short of making the speed of the bicycle. There is nothing like rotary motion; the wheel would be the winner in any race. While the bicycle has the advantage over the extremely tall pedestrian, it is obvi ous that the tall wheelman has no advantage over the short one.

## AN IMPROVED BOB SLEIGH.

The attachment of the knee to the bolster of a bob sleigh is, by the improvement shown in the accompanying illustration, made very strong, while the runners lave free oscillatory movement, the movement of each runner being independent of the other. A patent has been granted for this invention to Harvey L. Eastman, Wabpeton, North Dakota. The bolster plate, one of which is secured near each end on the bolster, has at its center a transverse depres sion, forming in its bottom a semicircular socket, the plate being adapted to engage with a knee plate, or knee socket plate, which has two side bars and a semicircular socket with convexed upper faces, the sockets of the knee plates being faced the reverse of the sockets in the bolster plate. In plac ing the knee plates beneath the bolster the depressed or socket sections of the bolster plates are located between the side bars of the knee plate, and a pintle or short shaft is journaled in the socket sections of the plates, as shown in the small view, the socket section of each knee plate resting upon this pintle. Each knee is made of a single piece of Y -shaped metal, the upper portion of each knee being bolted to the end bars of the knee plates, and braces connect the standards or members of the knee.

eastman's bob sleigh.
has the further object of fostering the trade relations taken advantage of it to produce the amphitheater bas the then advantage of it to produce the amphitheate republics of Merico and Central and South America. also the promotion of commercial intercourse between lakes bave been constructed, and with few exceptions, the Southern States and the ports of Europe. Atlanta $\mid$ the buildings will have a water frontage. On these the Southern States and the ports of Europe. Atlanta
was selected as the site of the Exposition, which will lakes, electric launches and gondolas will ply, afford open on September 15 and close ou December 31, 1895. ling an agreeable mode of transit from one part of the the open on September 15 and close ou December 31, 1895. ling an agreeable mode of trands
grounds to anothe


CABALLERO'S AIR VESSEL
The Exposition bas received the indorse ment of the United States government, Con gress having appropriated $\$ 200,000$ for the Government building and exhibit. The Ex position has also received the indorsement of the legislatures and principal commer cial bodies of a number of States, and many of them will berepresented by State build ings and exbibits. Tbrough the State De partment of the United States, invitations were sent to all foreign countries of impor tance, and a number bave accepted, so that, besides the exbibits from the South ern republics, the management is assured of exbibits from almost every importan country in Europe. In addition to the United States Government building, there are twelve principal structures. The following is the list: The Manufactures and Libe ral Arts, Fine Arts, Agriculture, Auditori um, Administration, Fire, Machinery, Miner als and Forestry, Negro, Transportation Electricity, and Woman's. The leading ide is Romanesque, and the buildings are de signed with an idea of stability and sin The Exposition will be held in Piedmont Park, lo- plicity in construction, and the architectural effect will cated two miles from the center of the city of Atlanta. be produced by outlinesand proportion rather than by This park contains 189 acres, and more than $\$ 300,000$ detail and tawdry ornamentation. Mr. Bradford L bas already been expended in beightening the pic- Gilbert, of New York, is the supervising architect, and turesque features of the landscape, and about $\$ 2,000,-$ is the designer of ten buildings. Mr. Walter T. Down 000 in all will be expended to make the Fair. We ing, of Atlanta, furnished the design for the Fine Arts present berewith a copy of the official plan of the Ex- building, and Miss Elise Mercur, of Pittsburg, the de position grounds. The small numbers on the plan sign for the Woman's building. The dimensions of the show the elevation above the sea level, so that a fair buildings are as follows: Manufactures and Lib idea of the topography can be obtained. This billy eral Arts, 356 feet long, 206 feet wide and 90 ground adds greatly to the beauty of the park. It has feet high; Machinery, 500 feet long, 118 feet wide been much commented upon, and the Cbief of Con- and 60 feet high: Minerals and Forestry, 350 feet struction, who is also the Landscape Engineer, has $\left.\right|_{\text {long, }} 110$ feet wide and 50 feet high to center of the

dome; Agriculture, 304 feet long, 150 feet wide and 110 feet high to center of the dome; Electricity, 262 feet long, 85 feet wide and 109 feet to the center of the dome ; Transportation, 450 feet long, 150 feet wide and 68 feet high, the two end galleries 48 by 117 feet; Negro building, 276 feet long, 112 feet wide and 70 feet high ; Administration building, combining main entrance, fronting 240 feet on Piedmont Avenue, 50 feet wide a center and 3 stories high; Auditorium, including police department and express office, 200 feet long, 135 feet deep and 4 stories high, with mezzanine stories Fire building, 205 feet long, 50 feet wide, 2 stories Fire building, 205 feet long, 50 feet wide, 2 stories
high; Woman's building, 150 feet long, 128 feet high; Woman's building, 150 feet long, 128 fee
deep and 90 feet to the top of the statue on the central dome; Fine Arts, 245 feet long, 110 feet wide and 5 feet high. Several of the States will have buildings of their own. A succession of attractive musical programmes is being arranged for. A chime of bells, the largest ever exhibited in America, will be erected on a tower 150 feet high near the Government building.
As in both the Columbian Esposition and the California Midwinter Fair, the amusement features have not been neglected. The terraces between Piedmont Avenue and Jackson Street will be devoted to them The street curves along a slope with a continuous suc cession of picturesque structures, the adobe houses and bamboo huts of the Mexican and Guatemalan villages and the wigwams of the Indian are in striking con trast with the antique designs of theoriental village and the quaint and curious architecture of the Japan ese and Esquimaux, the German and the Chinese villages. Prominent among other structures will $; \mathrm{b}$ Hagen beck's arena of trained wild animals, the Vaude ville Theater, the Palace of Illusion; the Mistic Maze and the Scenic Railway, while at the end of the stree will be Buffalo Bill's Wild West Show.
The officers of the Exposition are Charles A. Collier president and director general ; Walter G. Cooper chief of the department of publicity and promotion Grant Wilkins, chief of construction and landscape engineer. A tlanta is a city of 110,000 people, and the committee in charge of public comfort, after carefu consideration, have decided to adopt the system which was operated with success at Philadelphia during the Centennial. The control of this business will be held by the Exposition company, and all of the available rooms in hotels, boarding houses and private residences will be registered. The same work will be carried on through the outlying towns, so that this will materially expand Atlanta's capacity for accomand sent broadcast over the country, and visitors from a distance will be encouraged to engage quarters in advance. In short the public comfort jureau will run the city very much as a hotel is run, and bicycle messengers will take the place of bell boys.

## Paper Salls.

An innovation in yachting circles is now being talked of, nothing less than sails made of compressed paper the sheets beinz cemented and riveted together in such a way sis to form a smooth and strong seam. It appears that the first process of manufacturing consists in preparing the pulp in the regular way, to a ton of which is added 1 pound of bichromate of potash, 25 pounds of glue, 32 pounds of alum, $11 / 2$ pounds of soluble glass, and 40 pounds of prime tallow, these in gredients being thoroughly mixed with the pulp. Next the pulp is made into sheets by regular paper making machinery, and two sheets are pressed to-
gether with a glutinous compound between, so as to gether with a glutinous compound between, so as to
retain the pieces firmly, making the whole practically retain the pieces firmly, making the whole practically homogeneous.
The next operation is quite important, and requires a specially built machine of great power, which is used in compressing the paper from a thick, sticky sheet to a very thin, tough one. The now solid sheet is run through a bath of sulphuric acid, to which ten per
cent of distilled water has been added, from which it cent of distilled water has been added, from which it
emerges to pass between glass rollers, then through a emerges to pass between glass rollers, then through a
bath of ammonia, then clear water, and finally through felt rollers, after which it is dried and polished between heated metal cylinders. The paper resulting from this process is in sheets of ordinary width and thickness o cotton duck; it is elastic, airtight, durable, light, and possessed of other needed qualifications to make it available for light sailmaking.
The mode of putting the sheets together is by hav ing a split on the edges of the sheet, or cloth, so as to admit the edge of the other sheet. When the split is closed, cemented and riveted or sewed, it closes completely and firmly.-Marine Record.

HoLuAND disfranchises a citizen if he is absent from the country for ten years and during that time does not formally notify the proper authority that $h$ wishes to continue to be regarded as a citizen.
Great Britain does not so easily give up her claim to the loyalty of her subjects. A man may count upon her protection on the ground that his grandfather was by birth and allegiance an Englishman, even though he and his father wereboth born and bave alway
on foreign soil, but without being naturalized.

How is Vulcanization Accomplished 9 :
The chemical nature of caoutchouc is but little bet ter known to-day than it was sixty years ago, when the products of its dry distillation were examined by Greg ory. Recent study has shown that chief among these derivatives of caoutchouc is a liquid called isoprene which has the important property of spontaneously changing into rubber, on long standing. Artificial rubber is thus a chemical possibility. Whether we shall succeed in making it commercially from isoprene seems very doubtful. The manufacture of cheap iso prene is an exceedingly difficult task and we are not yet able to completely convert it into rubber. Chemi cally caoutchouc or pure rubber is an "unsaturated hydrocarbon: or in other words a compound of hydro gen and carbon possessing the chemical property of directly combining with other compounds and ele ments.
The chemical treatment of rubber in its manufacture is limited to vulcanization-the change effected by subjecting it to the action of sulphur at temperatures above the melting point of the latter or to solutions of chloride of sulphur in the cold.
The chemistry of vulcanization has never been thor oughly investigated or satisfactorily explained. It is often spoken of as due to the "absorption" of sulphu by the rubber or its formation of a "substitution pro duct" with sulphur. These terms express in a conveniently rague was the uncertain chemical theories regarding what actually takes place in the curing of rubber. It is fair to conclude that neither the vulcani zation with sulphur nor that by chloride of sulphur is in the least understood. Even such a simple question as that regarding the minimum quantity of sulphu required for vulcanization or the equally simple one whether the vulcanizing action of chloride of sulphu is due to the sulphur or the chlorine, are still object of controversy. It is, however, agreed that vulcaniza tion cannot be effected by less than two per cent o sulphur.
In investigating the chemistry of vulcanization the author worked with the cold cure process becanse it effects vulcanization under conditions more easily under control than is the case with sulphur and heat Rubber vulcanized by chloride of sulphur forms an addition product, the two substances uniting into a definite compound. Isolating this compound, the author was able by suitable means to entirely remove from it the combined chlorine, leaving the vulcaniza tion product intact and physically unchanged. any attempt to remove the sulphur from its combinatio with the rubber is unsuccessful and results in the tota destruction of the substance, thus proving that the vulcanization is entirely due to the action of the sul phur and not at all to the chlorine.
Rubber will combine with its weight of chloride of sulphur, forming a product containing twenty-three per cent of sulphur. This is the highest vulcanization product (i. e., containing highest per cent of combined
sulphur) that rubber is capable of forming. On the sulphur) that rubber is capable of forming. On the other hand, the lowest vulcanization product contains
dive per cent of combined sulphur. This is a homoeneous body and contains no uncombined rubbe It is not simply a mixture, in unaltered rubber, of a rubber sulpho-chloride. Between these products are eight other sulpho-chlorides of rubber, the whole forming a series containing from one to ten atoms of
combined sulphur. The great difference in the physical properties of the end membersof the series indicates that each of these ten varieties of vulcanite will have distinct properties to distinguish it. It is a matter of great practical importance to define clearly the specific qualities of each of these products. The vulcanization rubber, by chloride of sulphur, consists in the fo mation of one or more of these sulpho-chlorides of rub ber. The presence of chlorine is without influence on the state of vulcanization; it is merely the means in the chloride of sulphur which enables us to act on the rubber with a double atom of sulphur in an effective raboy.
The
The present process of vulcanization with chloride of sulphur does not admit of homogeneous vulcanization. A practical process based on the reaction beween rubber and chloride of sulphur will ultimately displace the processes now in use for curing all kinds of rubber articles. The present sulphur cure is an ex ceedingly crude, unreliable, antiquated and unscien tific process kept alive by our ignorance of the chemis ry of rubber. The process is essentially in the stage to which the work of Goodyear, Hancock and Parke dvanced it.
In the original paper Mr. Weber gives in detail the ests and analyses which support his conclusions re garding the chemical theory of vulcanization. He has dealt very ably with the purely scientific aspects of the problem and promises something in the futur n the practical questions involved in a new method. While the actual difficulties are many and great they are not believed to be insuperable. Certainly there is more need to-day than ever for some improve ments in vulcanization methods capable of giving such

* Abstract of paper by 0. . . Weber in the Jourail of the Society of
complete control of the process that any one of the bove named series of ten vulcanization products can be obtained at will: or any desired combination of them, as circumstances may require.


## To Prevent Drifting Sands.

Some years ago the Federal government expended 60,000 in planting beach grass along the ocean side o the tip of Cape Cod, in an effort to prevent that drift ing inward of the beach sands which threatens Prov incetown with entire destruction. But the work was undertaken upon too small a scale, and the inhabitants of the town did not realize that the growth of the grass would have to be fostered, so that most of it has perished and the advance of the sand drifts continues. The State of Massachusetts has, however, now taken the matter in hand, through its harbor and land commission, and Mr. Leonard W. Ross, of Boston, has been retained as advisory forester. Mr. Rossproposes to adopt expedients similar to those successfully begun more than a hundred years ago to save lands on the shore of the Bay of Biscay: and expense will not be spared, for the harbor of Provincetown is the only one that affords shelter to mariners along many leagues of stornyy coast. His method will be based upon that by which Nature herself once defended the point of the promontory. Her thick plantations of beach grass were backed br Her thick plantations of beach grass were backed b:
low forests of pitch pine, which were cut off for fuel by Iow forests of pitch pine, which were cut off for fuel by
the early settlers. These will be renewed, and, according to the Boston Transcript, a nursery has been already established for the propagation of the Scotch broom, Genista scoparia, which, with silver poplars, white willows and locusts, and an undergrowth of smaller plants, will be used to form windbreaks. Austrian and Scotch nines will be tried, and also the maritime pine, the alder, the European white birch, the hornbeam, the cockspur thorn, and the tamarix.

## Do Gulls Follow Shipn

On a late trip of one of the steamers plying between Portland and San Francisco the question came up among the passengers as to whether the gulls which appeared around the ship each morning were the same birds as had been with the ship on the day previous. To test the matter a line and fish hook were procured and with a bait of salt pork the fishing for a sea gull was commenced. The first cast of the line was successful, a big gray bird swooping down on the bait. He was hauled aboard and found to be uninjured, the book having caught in one of the glands of the beak, rom which it was readily loosened. After detaching the hook a strip of red flannel was brought and care fully tied around the gull's left leg by one of the sea nen of the steamer, the bird being then turned loose Circling for a moment in the air, the gull started ooward the distant blue streak which denoted the coast line, and it was generally allowed that each day brought a new contingent of gulls to follow the stee mer and pick up the waste scraps from the table; but on coming on deck after breakfast the next morning there was the flannel-bedecked gull to be seen, the most clamorous of all the birds. To test the gull's reasoning power, if it had any, the same line and bait was drifted astern, the gull caught the day before being one of the first to strike for it.

Remarkable Lakes in British Columbia.
Little Shuswap Lake is stated to have a flat bottom, with a depth varying from 58 to 74 feet, measured from the mean high water mark. The deepest water found in the Great Shuswap was 555 feet, about six miles northward from Cinnemousun Narrows, in Seymour Arm, though the whole lake is notably deep. Adams Lake, however. exceeds either of the Shuswaps, as its average depth for twenty miles is upward of 1,100 feet, and at one point a depth of 1,900 feet was recorded. In the northwest corner of this lake, at a depth of 1,118 feet, the purpose of the scientific explorers was defeated by the presence of mysterious submarine currents, which played with the sounding line like some giant fish and prevented any measurement being taken. It is a complete mystery how the currents could have been created at this depth, and scientific curiosity will no doubt impel either public or private enterprise to send a second expedition to the scene this summer to endeavor to solve the riddle. As the height of the surface of this lake is 1,380 feet above the sea level, its present bed is, therefore, only 190 feet above the sea, although distant 200 miles from the nearest part of the cean. Dr. Dawson and his associates believethat the heds of some of the mountain lakes in the region are many feet lower than the sea level-Vancouver World.

Photographs of the Harlem Ship Canal-a Correction.-In our issue of June 29. 1895, we should have stated that our illustrations of the opening of the Harlem Ship Canal were made from photographs by Mr. E. Muller, of Brooklyn, New York. The pictures speak for themselves, and show Mr. Muller to be a superior paotographer in this line of work.

## EXPERIMENT ON THERMO-ELECTRIC CURRENTS.

The classical experiment by means of which are rendered evident the currents that traverse a circuit formed of two metals when the solderings are at various temperatures becomes more striking when. instead of mounting a magnetized needle upon a pivot placed in a fixed circuit, the circuit is, on the contrary, rendered movable, the magnetic field being in an invariable position. The idea of this reversal of the experiment is farfrom being new, since it is upon this principle that is based the radiometer devised by Dr. I'Arsonval, and greatly improved in its construction by Mr. C.V. Boys. This radiometer is a very delicate instrument of measurement which requires exceeding care and great manual skill for its construction: but the apparatus that weare going to describe operates perfectly as a demonstration instrument, without the necessity of much attention being bestowed upon it.
It consists of a simple wheel placed in equilibrium upon a needle and which the thermoelectric currents set in motion under the action of a magnetic field. This wheel is constructed with the greatest ease by bending into a circle a fine wire of an alloy of nickel and copper, found in the market under the name of white bronze or superior German silver. This alloy, when soldered to copper, has the property of giving considerable thermo-electric electromotive force, much less, doubtless, than that of bismuth or antimony, bui it has the ad vantage of possessing a high point of fusion in addition of possessing a high point of fusion in addition
to that of being able to be drawn out into to that of being able to be drawn out into
fine wire-a condition essential for the operating well of the apparatus, the solderings of which become heated or cooled instantaneously.
The rim of the wheel having been closed by solder, there is fixed upon it a certain number of diameters of very fine copper wire insulated from each other, and which are soldered after their extremity has been wound around the Germansilver wire. One of these diameters receives in its center a small disk of metal in which a slight depression has been formed. The wheel having been placed upon a needle, through the intermediun of this depression, is regulated by means of little banners suspended from some of the radii. and which, while lowering the center of gravity of the wheel, permit of displacing it at will and rendering it horizontal.
Let us suppose, now, that we heat one of the solderings by means of a candle. A difference of potential will establish itself between the opposito solderings, and an electric current, traversing the diameter that ends at the soldering, will return, in bifurcating itself, through the rim. If we place a horseshoe magnet in such a manner that it shall embrace a portion of the diameter, in the half opposite the hot soldering, the magnetic field will act upon the radius at right angles with its direction. Since, however, the action upon the rim is exerted in the direction of the radius, it would be null even were the bifurcation unequal, and the wheel will begin to revolve under the action of the couple produced.
'The revolution, which is slow when somewhat coarse

## The New Lighthouse at Cape Charles.

A new lighthouse has just been completed at Cape Charles on the northern entrance to the mouth of Chesapeake Bay, and on August 15 will display its great light for the first time. The new structure will replace the present light, which stands nearer the sea, and for years has flashed every few seconds at Cape Henry light on the south side of the bay, twelve wiles distant. The new lighthouse is constructed on the skeleton plan, and looks very much like those seen off the


## EXPERIMENT ON THERMO-ELECTRIC CURRENTS.

Florida coast. The great revolving lens stands 180 feet high, and throws flashes of light at intervals, visible by a man standing on the deck of a vessel twenty miles at sea. The old lighthouse will continue to stand, and will serve as a day mark for vessels bound along the coast. The new light illumines the entire horizon and will show a group of four and a group of five white flashes every thirty seconds; thus, four flashes and a dark interval of about three seconds; five flashes and a dark interval of sixteen seconds.

## THE CORNELL CREW IN ENGLAND

That one of the youngest of our great educational institutions should this year has sent to England a crew to row for the Grand Challenge Cup, in a race on the historic Henley course, against the best crews of that country, attracted wide attention, as is invariably the case with such friendly international contests. Our illustration, from the Daily Graphic, represents the crew in their boat for practice on a day preceding the race. Their average age was 21 ; average height, 5 feet 11 inches; average weight, 160 pounds. The race was rowed on July 10, being one of a series of trial races, in which the crew of Trinity Hall, Cambridge University, were the opponents of the Cornell crew. The course was a mile and a fifth long, and the Cornell crew led in the race for nearly a mile, when their opponents passed them and won the race by the large lead of seven lengths. The race attracted almost unprecedented crowds of sightseers,

Corrosion of Aluminum.
In order to ascertain the effects of the weather upon ordinary sheet aluminum, Professor A. Liversidge has had two shallow dishes made of one twenty-fifth inch age metal, of the best commercial quality, and exposed on the roof of the laboratory, University of Sydney, from November 23. 1893, to December 7, 1894, or fifty-four weeks. The metal was made into basins so as to catch rainwater, and to give the salts, etc., which it might hold in solution, an opportunity to act upon the metal. The metal soon lost its brilliancy and became somewhat rough and speckled with large light gray patches; it also became rough to the feel, the gray parts could be seen to distinctly project above the surface, and under the microscope they presented a blistered appearance. This incrustation is held tenaciously, and does not wash off, neither is it removed on rubbing with a cloth. The raised parts are considered due to the formation of a hydrated oxide. Contrary to expectations, the cups had not lost weight, but had even increased. One weighing $13 \cdot 91 \mathrm{grm}$. had increased by 0.104 grm., and the other, weighing 13.865 grm., increased by 0080 grm . After boiling in water for some hours, and rubbing, the first still showed an increase of 0.77 grm . and the second of 0.055 grm . To ascertain the effect of common salt, a plate of the same metal, 3 by 4 inches, and weighing 19829 grm., was repeatedly dipped in a solution of sodium chloride and allowed to dry for three months: this lost 0.019 grin., and after washing and rubbing dry 3.59 grm.

One reason for making these experiments is that Mr. H. C. Russell, F.R.S., the government astro nomer, some years ago tried aluminum cups for a rain gage, but found that they were so quickly corroded through that he had to relinquish the use of the metal (if they had been gilt they might, however, have answered well enough). It is a verg common thing to see aluminum recommended on account of its lightness and its assumed permanent luster; this assumption being due to the statements repeated from book to book, that aluminum is unaltered by exposure to the air, to the action of water, hydrogen sulphide, and only slightly by dilute acids. The absolutely pure metal may be permanent in the air, but the best aluminum ordinarily attainable is, in this respect (in Professor Liversidye's opinion), little, if at all, superior to zinc. The conmercial metal does not retain its luster, but very rap idly acquires the appearance of old zinc. Recently it has also beenfound that aluminum is acted upon by sea water. Hence the claim, often advanced, that alum inum is a metal resembling goid or silver in the property of not oxidizing, rests upon the very slenderest foundation.-The Optician

## Bicycle Insurance Risk

It is now quite a business to insure bicycles, tricycles and unicycles. The insurance is written on the machines themselves, guaranteeing their owners against damage by accident or loss by theft. The possible hazard in this business, it is suggested, will be largely affected by the style of dress which may become popular


## THE CORNELL UNIVERSITY CREW ON THE THAMES, ENGLAND.

wire is used, becomes very rapid, on the contrary, with fine wire. which, consequently, should be selected by preference in order to render the experiment as striking as possible. Wire of from one-tenth to two-tenths of a millimeter is perfectly adapted for a wheel of from eight to ten centimeters diameter.
This transformation of calorific into electric and mechanical energy is, it seems to us, the simplest that can be imagined.-La Nature.
and there were not wanting, in England or on this ide of the Atlantic, energetic criticisms attributing the failure of the Cornell boys mainly to their style of stroke. It was what is known as the short, quick stroke, in which the oarsman exerts his strength on the oar when the latter is nearest to a right angle with the boat and favoring a quick recovery, but avoiding the beginning and ending of a long stroke, where the oar blades approach the sides of the boat.
amons lady devotees of the whee Another intimation finding some currency is that the accident insurance companies have found the cost of carrying individual accident risks largely increased by the more general use of the bicycle, and it is hinted that the medical examiners of the life insurance companies may before long have something to say as to the effect of stooping and chest contraction from bicycle riding upon this class of risks.

## A SECTIONAL SIDE LAUNCH DOCK.

On the west bank of the Mississippi River, seven miles below St. Louis, is the dock shown in the accompanying illustration. The river boats are flat bottomed, and seldom draw over four feet, and the structure is especially well adapted for docking such vessels. Steamboats of 1,000 tons have been raised on the inclines, and boats measuring 360 feet in length, 50 feet in width, and 9 feet depth of hold, have been taken up for repairs. Extending some distance beneath the water are heavy timber ways, shod with iron 8 inches wide, forming tracks with inverted $V$ faces on which move eight cradles, in whose lower timbers are solid iron wheels that run upon the rails, other wheels running on each side of the ways. At the upper ends of the ways is a shaft running the full length of the dock, and opposite each pair of ways and back of the shaft is a countershaft with sprockets on each end, as shown in Fig. 2, the countershaft being revolved by a worm and gear through a pair of bevel gears, one of which runs loose on the main shaft, and is thrown into or out of motion by a clutch con nection with the main shaft. Large carrior chains, nection with the main shaft. Large carrigr chains,
having links 9 inches long, of $11 / 4$ inch iron, pass over

## The Philosophy of Hoeing.

Few who have had considerable experience in the work of the garden will be disposed to question the utility of the hoe in the production of various crops, however much they may differ in their estimate of the measure of its usefulness. Unlike some other imple ments, the use of the hoe is not limited to.any particular purpose; it is able to render services of a varied character, and some of these services would appear to be not fully appreciated. By some cultivators it is be lieved to be of value chiefly for the assistance it is enabled to render in the repression of weeds; but valuable as it undoubtedly is for that purpose, it is equally use ful as a means by which the soil may be aerated and the moisture conserved. In a season of drought, like the one through which we are now passing, it is of importance to conserve the moisture in the soil as far as possible, and there are two means by which the evaporation from the surface may be checked. One is to mulch with partly decayed manure, refuse straw, or any other vegetable matter in the preliminary stage of decay, and the other the maintenance of a loose surface. We fully appreciate the advantages of liberal mulchings, but in a summer like this but few culti-
which, under more favorable conditions, they would be supplied, and the roots are injured, some by direct exposure to atmospheric influences, and others by being deprived of the necessary volume of air, the compressed state of the soil consequent on its being dried preventing the air passing readily through it. A layer of loose soil will effectually prevent cracking and materially assist in checking evaporation, and there is no means by which the surface can be so readily loosened as by the hoe. Much of the time that is taken up in watering crops in some gardens might be more profitably emplosed in loosening the surface soil, and in seasons like the present the constant use of the hoe should be regarded as not less essential than in seasons when weeds are abundant.-The Gardeners' Magazine.

New Russian Patent Law Contemplated
The minister for finances in Russia is at present en gaged in preparing a new patent law for the Russian empire. The existing law allows patents for the term of three, five and ten years only, with no extension after the expiration of the term chosen. The con templated law provides for the grant of a patent up to


A SECTIONAL SIDE LAUNCH DOCK.
the sprockets and follow the sides of the ways down to and around idler pulleys at the lower ends of the ways, under water, there being a double chain and sprocket for each way. Another chain is passed around the lower end of each cradle, over pulleys which serve as eveners, and the ends of this chain are carried back a suitable distance and hooked on to the large carrier chains, whereby possible inequalities of movement in the large chains will be prevented from exerting twisting strains upon the cradle. As shown in our illustration, vessels may be and are built upon the upper portion of the ways without interfering with the use of the cradles and lower ends of the ways for docking and repairing other vessels, and, on the completion of a new boat, it is only necessary to run the cradles up under the work, properly support the new construction in connection with the cradles, and lower it into the water. Mr. Henry Adkins is the superintendent in charge of this dock, which is owned by the St. Louis Sectional Dock Company.

Now Astronomer at Lick.
Professor William J. Hussey, of Standard Univer sity, Illinois, will succeed Professor Barnard as as tronomer at Lick Observatory. The appointment of Barnard's successor comes within the province of the regents of the university.
vators can obtain sufficient material with which to mulch the whole, or, indeed, any considerable proportion of the quarters under crop ; but all who have a hoe may, by keeping it in constant use, obtain the advan tages, but in a lesser degree, to be derived from a coat ing of vegetable matter. To be in a position to fully appreciate the value of the hoe in conserving moisture it is necessary to take into consideration some of the physical properties of soils and the changes that take place in them under certain conditions. Soils in a moderately tine state of division have the power, by means of capillary attraction, to draw up water from below to the surface, as proved by what takes place when a flower pot filled with soil is placed in a saucer containing two or three inches of water. The water ises to the surface of the soil, and when this be comes hardened from any cause it is acted upon by the full power of the sun, and evaporation proceeds at a very rapid rate. In the process of drying under the infiuence of the sun strong loams and clays shrink materially, and presently the surface commences to crack, and if the drought continues, the crevices extend two or three feet below the surface. When this is the case the evaporative surface is enormously increased as the moisture escapes in the forin of vapor from the sides of the crevices as well as from the surface, the plants are deprived of much of the moisture with
welve years, at a yearly fee extremely low for the firs years as compared with the existing outrageously high charges. Statistics show that during the last five years about 291 patents were annually granted, divided as ollows:

|  | Rassian subjects and foreigners residing in Russia. | Foreigners residin outaide of Russia. |
| :---: | :---: | :---: |
| 1890 | .......... 23 per cent. | 77 per cent. |
| 1891 | 19 | 81 |
| 1892. | . 23 | 77 |
| 1893. | 25 | $\pi$ |
| 1894. | ..... 24 | 78 |

Thus fully three-fourths of the patents granted were issued to foreigners and only about one-fourth to Rus sians.
The figures indicate a lack of inventive genius on the part of the Russians.

## Razor Sharpener.

It now appears that the razor sharpener described in our issue of June 22 is not a French invention, but is of American origin. It is due to Captain Charles A. Worden, Seventh United States Infantry, and is made by the Worden Machine Company, 26 Cortlandt Street, New York City. The invention has been pat ented abroad, however, and this accounts for giving the credit of the invention to France instead of thi: country.

## MOUNT RAINIER, WASHINGTON

In February, 1893, a tract of fifteen huudred square miles of mountain and forest land surrounding Mount Rainier was, by Presidential proclamation, set aside as a forest reserve, under the title of the Pacific Forest Reserve, although a portion of this reserve, on the south side of the mountain, has become quite widely known as Paradise Park. The mountain is a volcanic cone, a portion of the Cascade range, over 14,000 feet high. Radiating from the summit is a system of glaciers, varying in size from four niles long and a mile in width to those only half a mile long and a quarter of a mile wide, these glaciers being the fountain heads of the Carbon, White, and a half dozen other rivers, the drainage being entirely westward into Puget Sound and the Columbia River. For a vertical distance of about 8,000 feet down from its summit the mountain is covered with a glittering coat of ice and snow. The beautiful park surrounding the mountain attracted more that 700 visitors last year, and it is safe to say that. when its marvelous attractions become generally known, it will vie with the famous Yellow stone Park in attracting sightseers and pleasure seekers. Our illustration is from a handsome volume entitled "Sketch. es of Wonderland," by Olin D. Wheeler, published by the Northern Pacific Railroad Company. This road passes through many scenes of great beauty and wonder, of which Rainier is but a single example.

A Novelty in Optical Lanterns. An English inventor has recently brought out a new style of optical lantern in which, with the aid of an assistant, the lecturer standing near the screen can manipulate the slides, thus avoiding the possibility of a slide being shown at the wrong time and the wrong way up.
In connection with the slide shifting and dissolving devices, be has a wooden box containing fifty cells divided by thin metal partitions, with an open transverse slot in the bottom of each cell half the length of a slide. When a slide is placed in a cell, it bridges over the open slot.

The box of fifty slides, each placed in proper pusition, is pushed in under the lantern. To manipulate, the operator turns a crank, which in turn operates a piston, causing in turn operates a piston, causing
the latter to rise verticully through the latter to rise verticully through
the slot in the bottom of the slide the slot in the bottom of the slide
cell and push the slide upward, holding it in position to be shown on the screen. When the lecturer desires to change, he presses a pneumatic bulb connected by a pipe to a small air pump on the lantern. which releases a device and permits the piston and slide to drop, the slide falling into the original slide cell, at the same time the entire box of slides is automatically pushed backward a distance equal to one slide cell, bringing slide No. 2 into position to be pushed up and shown, which movement is repeated for each slide. A celluloid eclipser is also moved automatically between the slide and the lens when a change is to be made.

Such a contrivance will be appreciated by lecturers desirous of economizing and of having pictures shown in the right order. Th attachment is capable of being put on any lantern

## The New Torpedo Boats.

By an act of Congress approved March 2, 1895, provision is made for constructing three torpedo boats, the cost not to exceed $\$ 175,000$ each. The act providing for the building of these boats places them subject to the bids of contractors of the Pacific slope, Mississippi River and the Gulf of Mexico only, unless the bids show that they cannot be built at these places at a fair cost, in which case the secretary is at liberty to either build them at any of the government navy yards or ask for bids from any of the well known shipbuild ingfirms. The time linuit for construction being fifteen months from the date of signing the contract, the vessels will be ready for use by the end of 1896.
The speed called for in the contract is 26 knots per hour, which is 3 knots slower than the latest British torpedo boats. The dimensions of the new boats are to be as follows: Length on load water line, 170 feet; beam, extreme, on load water line, 17 feet; mean normal draught, 5 feet 6 inches; normal displacement, 180 tons: indicated horse power, 3,200 .


MOUNT RAINIER, WASHINGTON.

Retouching Surraces.
We have lately had the benefit of the experience of a photographer who has been commissioned to copy oil paintings in various parts of the country, and we think that a few hints, as to his working and manner of weeting the various difficulties in which this kind of work is so fertile, will be interesting and useful to many of our readers. Naturally, the first query we put to him was as to the actual value in practice of sochromatic plates. "They are invaluable," we were at once told. It is not found necessary to use them in all cases, but, as so many unexpected results are liable to crop up, there is no harm, and much possible benefit from using them solely for the work. A little practice will soon show when a screen is needed, and to get the best results it is desirable to have two or three of different tones and depths of yellow, according to the predominance of yellow, green or red, or the extent to which they are present in proportion to the rest of the picture. It is an open secret that the process block nakers, who obtain such beautiful and apparently impossible transcripts of most difficultly photographable pictures, do not produce a negative with the desired

There are many different methods of treating negatives previous to retouching. We have varnishes, ordinary and special, for retouching, retouching mediums, and preparations of one sort and another for bringing the surface of the negative film into a proper or comfortable condition to "take" the pencil, but we never, or hardly ever, hear anything of any attempt to bring the film itself into apt condition in the course of development; yet, to any one who has tried the experiment, it must be very quickly palpable that a very reat power lies in the hands of the operator or devel oper of plates to assist or retard the retoucher in his work. As most of our best retouchers prefer to work first upon the film itself and to "finish" after varnish ing, it may very well repay to give some little atten tion to the preparation of a suitable retouching surface by chemical means or by treatment of the film during or after development.
To illustrate what we mean, let a comparison be made between the surface of two negatives, taken upon precisely the same kind of plate, one of which has been simply developed, alumed, and washed, the other intensified with mercurs. The one will present a hard polished surface, upon which it is absolutely impossible to produce any practically useful impression without having recourse to a retouching medium, or, more probably, to varnishing first. The other, while exhibiting an equally hard film, will offer a "tooth" to the pencil and a surface for working on that throws any retouching medium or varnish that we have ever met with far into the shade for any but very hard work; in fact, we question whether on a fairly good chemically prepared film such as this, more "lead" cannot be got on than on any varnish or medium now in use. The surface, in fact, presents an actual "grain," fine, it is true, but sufficiently marked to take the lead and to go on taking it after the first application, which is more than most of the varnishes and mediums will do, as with them the first touch, light or heavy, settles the whole business, and, short of revarnishing, nothing more can be done. Grain varnishes have been tried, but, so far as we are aware, have not proved a very marked success, owing to the difficulty of getting a sufficiently fine and, at the same time, pronounced grain. We speak now of a mechanical grain, formed by the addition of some pulverulent waterial to the varnish; but in the old collodion days a different class of grain was obtained by adding chemical substances to the varnish, a practice not now permissible, owing to the comparatively tender nature of the gelatine film. The so-called matt "retouching varnishes" come under one or other of these heads, but they are really more fitted for application to the reverse side of the negative than to the film side for ordinary retouching.
But by suitable treatment of the gelatine film before drying, or it may be simultaneously with development, it seems to us that a far effects at once. More frequently a negative, as good ; better result may be arrived at than by any of the
effects at once. More frequently a negative, as good as can be, with the aid of yellow or other screen, is
first obtained, and a good print made from it. This print is then worked up, by a skilled hand in black and white, in such a way as to suggest the exact effect of the chiaroscuro and of color value of the original. It is then an easy matter to make a grain negative. from which to make the block. This, however, being treatment of a subsidiary nature to that which we are spec
fice.

## ice.

"What is the greatest difficulty you have to contend with ?" we asked. "Reflections and dirt," was the ready reply. As to the latter, we were told that the amount of actual dirt on the surface of the average oil painting was surprising. That it must interfere with the brilliancy of the negative is self-evident. Every owner of oil paintings ought to have his pictures periodically-not less than once a year-sub jected to a simple sponging with clean rain or distilled water by an experienced hand. Most pictures would be uninjured by any amount of judicious cleaning of this kind, but an occasional one might be met with which, if at all cracked, would ouffer from the application of water.-British Journal.
better result may be arrived at than by any of the
methods in common use. It is true we cannot resort methods in common use. It is true we cannot resort that treatment, when admissible, affords every satisfaction the retoucher could desire, and unfortunately the beneficial action of the mercurial salt cannot be secured without its other effects. There are, however. other means which may be resorted to for producing fine grain without in any way injuring the negative. -British Journal of Photography.

## A Golden Brick.

The government assay office at Helena, Montana, s receiving a great deal of gold from the mines of the Northwest, and lately cast a brick eleven and one-half inches long by five and one-half inches wide and three and one-half inches deep. The weight was 1,437 ounces, or nearly 120 pounds troy, and the value, at $\$ 20$ per ounce, was $\$ 28,740$. The question being asked why the gold is cast into such large and unwieldy masses, the answer given is that if it were run into small ingots for transportation to the mints, in case of a hold-up of the express, the road agents could nut get away with and conceal a large brick so readily as they could the smaller bars or ingots.

## Qorrespondence.

Remarkable Mental Energy and Memory To the Editor of the Scientific American :
In a recent issue of your valuable paper reference was made to a remarkable case of the development of the memory in a blind person. Such instances analytically considered sometimes become not only interesting and instructive, but very suggestive.
The power of the human mind in blind persons to produce and retain before itself, as if on a menta blackboard, so to speak, vast arrays of things, po sitions, and figures, almost as tangible and fixed, so far as being there to refer to for the time is concerne as the real blackboard before the eye of the sighted, is astonishing.

Permit me to give a case which is regarded as very remarkable. Professor John A. Simpson, of Raleigh, director of music in the North Carolina institution for the education of the blind, though blind from child hood, is one of the best educated men in the State. He is a graduate of the institution he now serves, as also of Trinity College, North Carolina, from which he re ceived regularly the degrees of A.B. and A.M., not withstanding there were at that time, some twenty-five or more years ago, no embossed text books of any value; and hence he was compelled either to have the prescribed course of studies read to him, or to copy the books laboriously by the use of an embossed alpha bet. His studies there and since were of necessity car ried on largely without the help of teachers, and he was thus forced to compare oneauthority with another and otherwise test his own work at every step.
In this thorough manner he has gone over the whole field of puremathematics, from algebra to quaternions, omitting nothing and working out every problem mentally. In the same way he has mastered severa ancient and modern languages, and has by his own work accumulated a very valuable manuscript library in Latin, Greek, French, German, Italian, and Spanish. His life has been devoted mainly, however, to music; his task being to train his blind pupils to become teachers of the sighted, and in this he has been emi nently successful.
As pianist of a local philharmonic society, he has accompanied entire cantatas, masses, and oratorios without error and with finished precision. Once, when a schoolboy, he multiplied mentally, without the aid of any apparatus whatever, a number consisting of twerty figures by another number equally large. At another time he conmitted to memory the whole of Milton's "Paradise Lost." He has frequently read very difficult pieces of music white sitting at the fireside
and then gone to the piano and performed them without leaving out a note. He can readily detect, locate, and rectify any ordinary defect in a pipe organ; take the largest and most complicated of them to pieces, re pair their most delicate parts, and tune them to exact ness; and he is frequently called upon to do such wor in the city.
T. C. W.

## Star Trails.

The extreme sensitiveness of the modern photographic dry plate and its ready adaptability to the purposes of celestial photography has opened to the student of astronomy an exceedinyly interesting lin of research.
Perhaps the simplest and most easily accomplished work of this character is the photograpning of star trails. All that is required is to point the telescope with its attached caınera, or simply a camera, with a sensitive dry plate in the focus of its objective, toward tion of the earth will do the rest.
The stars, so far as concerns this work, are fixed and at rest. The earth, with the telescope or camera, is revolving. As a consequence the position of the sensitive plate with respect to the image of the star is constantly changing, the plate sliding, as it were, beneath it.
And with what a beautifully smooth, equable motion is the plate drawn along-no jar, no tremor, no irregu larities. The lines made by the stars are as sharp, clear and uniform as those of the finest steel engraving.
If the camera be directed toward the celestial pole, the trails will be arcs of circles, longer or shorter, according to the time of the exposure of the plate and their angular distance from the pole.
The farther a way we go from the pole, the arcs traced by the stars form portions of greater and greater cir cles, until we finally come to the great circle, the equator, whose stars trace perfectly straight linesstriking examples of the "Copernican system."
In December, 1893, the writer made a series of negatives, beginning at the pole and extending to the equator. The lens used for this purpose was one hav ing an aperture of $31 / 2$ inches, with a focal length of only 11 inches, giving a field of great brilliancy.
Upon the circumpolar negatives the trails of some fifty stars nearer the true pole than Polaris are
found to have impressed their images. Yet the pole is found to have impressed their image
unmarked by even the faintest star.

Directing the camera toward the celestial equator,
and giving an exposure of one hour, a very different set of trails present themselves. During this hour the constellation of Orion, with adjacent stars, have trailed their images across the plate.
This constellation is well situated to exhibit the de parture from a straight line, as traced by a great circle, and the gradually contracting circles as the poles ar approached.
Delta, the northernmost star in the belt, being only twenty-three minutes of arc south of the equator, may be taken as fairly typical of an equatorial star, and
one whose trail will be almost exactly a straight lineat least so far as an unassisted eye observation is con cerned. Upon looking at these trails in the direction of their length, it will be observed that the deflection from a straight line, although very slight near the equator, is yet pronounced enough at the distance of six or eight degrees to at once attract the attention. The brilliant first m agnitude star Rigel, in Orion's knee, traces a portion of a circle with the south pole as a enter.
The equally brilliant Betelguese, in the shoulder, The a curve in the opposite direction.
The difference in photographic action due to color between Rigel and Betelguese is very noticeable. To the unaided eye both starsare of apparently the same magnitude, yet the intensity of chemical effect of the light from these $t$ wo sources is quite marked, as evidenced by their trails; the latter star, visually the equa ofly.
Marietta, Ohio, June, 1895.
W. C. Gurley.

## a Review of Railroad Invention.*

Hew instances of great industrial development pre sent a more orderly sequence of progress from smal things to great than does the mechanical history of our railwars. There have been but very few sudden and general "revolutions." It is rather a story of in telligent and, in the sum, successful working out of competent means to meet evident needs.
Neither speed, safety, nor comfort is possible in rai
Neither speed, safety, nor comfort is possible in rail
road work without a thoroughly good track. and it is road work without a thoroughly good track. and it is
only within the last twenty-five years that any general only within the last twenty-five years that any general
effort has been made to secure excellence in this respect. The strap rail soon proved its inadequacy, but the invention of the fish plate, in 1844, by Robert Barr was the first step in the direction of a substantial track. The " $T$ " rail was brought out by its inventor, R. L Stevens, in 1830. Blake, with his rock crusher, pro vided the means of securing cheap and abundant stone ballast, and Howe and Fink, with their bridge trusses, had already pared the way for the huge iron and stee viaducts of later days.
Leaving out of the question, as apart from our immediate subject, the immense advantages secured to railroads by the introduction of steel rails and the greatly increased sections, which were so largely due to the labors of Ashbel Welsh and O. Chanute, the fac tor in the rapid movement of railroad service which has marked the last quarter century was, necessarily, the locomotive. Probably the two contrivances which contributed most immediately to the rapid and enormous development of the American engine were the pivoted truck, first introduced by J. B. Jervis, on the Delaware \& Hudson Railroad in 1831, and the
equalizing lever, invented by Joseph Harrison, of Phil adelphia, in 1838; for these two improvements gave to our locomotives their most notable characteristicsflexibility and adjustment to the peculiar conditions of their operation. As far back as 1836 Campbell, of Philadelphia, built the first eight- wheeler: in 1847 the Norrises, of the same city, made a ten-wheeler for the Reading Railroad; in 1863 Rogers, of Paterson, turned out the first "mogul;" in 1866 Mitchell built the first out the first "mogul;" in 1866 Mitchell built the first
consolidation; the following year Norris, of Lancaster, consolidation; the following
In 1836 the Cumberland Valley Railroad introduced the use of rude sleeping cars on its night trains. In 1859 Mr . Pullman brought out the first cars furnished with berths and lavatories, wherein could be more or tit less dimly discerned the progenitor of future Pullmans and Wagners, and in 1864 they were followed by the frst true sleeping cars. The " ppearance quickly became ropular, and was followed, in 1869, on the Chicago \& Alton Railroad, by its natu ral developmerst-the dining car. Oncea railroad had sleeping, dining, and parlor cars running on its trains, with their exclusiveness and higher rates of fare, it was an easy step to hitch a number of them together, with out any ordinary coaches at all, and so construct a strictly "limited" train. This was first done in 1872 on the Pennsylvania Railroad. Of the several in ventions entering particularly into the building of leeping cars, perhaps the two most important are the method of lowering and raising the upper berths and the vestibule connections. The priority of inven tion in both these appiiances has been disputed, but it is only recording facts, and not expressing an opinion, to note that the suspended upper berth was first used
*C. P. Mackie, in the Englineering Magazine, New York, July. Con-
in 1864 by Pullman and the vestibule in 1886 by the same inventor, although as far back as 1857 a covered
way between cars was in use on the Naugatuck Rail road in Connecticut.
The firstradical improvement in coupling coaches so as to hold a train solidly together was, in genera application, the Miller platform and coupler, which came into somewhat general use in the later sixties, and at once robbed passenger trains of their last re maining resemblance to a string of coal hoppers. Wm Martin, of Dunkirk, is believed to have originated th method, now so general, of heating the train with steam drawn directly from the engine, although there has been the usual patent wrangle over this idea. W C. Baker, in 1867, brought out his excellent plan of hot water circulation in connection with his safety heater and did as much as any one else to establish an equable and wholesome temperature in passenger coaches. To a German inventor, Mr. Pintsch, we are ind $\epsilon$ bted for the first practical application of illuminating gas to car lighting, although other good systems have been produced since the introduction of the Pintsch light in 1877. Finally, the gradual improvement in trucks, the invention of the paper wheel by Allen, and the bor owing of the large spoked wheels of our English riends, the nice determination of spring resistances, the production of car seats fitted to the lines of the human body rather than to those of a wooden manikin. and other similar minor improvements, all contributed sensibly to the attainment of that degree of comfort which has become so habitual to us that we rarely give a thought to the manifold steps by which it was se ured.
The first really practical and efficient method of sig naling was secured when the "block system" of pro tection was imported from England. This, with the mechanical improvements made by Saxby \& Farmer and the electrical ones added by Sykes, was the origin of most of the really successful signal work done on our railroads. The exceptions are the ingenious and elaborately perfected system of electro pneumatic sig nal control invented by George Westinghouse and as sociates, and the well planned "disk" or "banjo "sig nal system invented by the elder Hall. Both system re automatic. We have purposely left to the last what, in the opinion of every unbiased railroad man in our own and foreign countries, is the crowning indi vidual triumph of American railroad invention, and its most distinctively native production-the Westing house air brake. Dating in its first form from 1868, this apparatus fairly leaped into prominence in the nextfew years, and, spreading from the locomotive back to the ntire passencer train soon invaded the freight service, and is now as common on freight cars as it was on pas senger coaches not many years ago. In the production of this appliance both inventive and technical skill o the highest order was required, and the result was in comparably the greatest contribution to railroad man agement that has been offered since the first locomo ive wheel was turned by steam.
The lines on which our inventors have to do their future work would seem to be far more clearly defined than ever before. There is no engineering reason why speed of 100 miles an hour should not be maintained on fast trains; the objections are commercial rathe than technical. The chief obstacle lies in the ponder ous and wasteful mechanisms needed to generate the equisite amount of steam under even the best present methods. The remedy will be found when electrica energy can be generated in a simpler and less expen sive manner than hitherto, and signs are not wantin that the inventor is at hand.

## How to Build a Road.

Seeing the necessity for a good road between Flor ence and their beautiful little city of Fiesole, the authorities of the latter place issued titles of nobility which were inscribed in a "book of gold," and fo which titles good round sums were asked-from three hundred dollars up, according to the dignity of the title.
Counts, barons, and marquises were created by cores; a man who taught dancing in England became baron and a young clerk in a banking house bough the right to be called duke.
The road is a fine one, and as the carriage rolls alon it, the visitor tries to fancy what it must have been ike to go bumping along in the great sort of wicker basket, without wheels, that used to be drawn by two axen.-Boston Commonwealth.

The American Journal of Photography truthfully ays the importance of steady and useful employment especially by the young, can hardly be overestimated. The unemployed are generally the most unhappy and the most liable to wrong doing. The person that is busy will have less time or inclination to find fault with others or to engage in disreputable affairs. Keep em ployed. Do something useful. Work for small wage if you cannot get more. Or work without pay rather than be idle. Such a person will not long lack em ployment, neither will he work long without fair compensation.

## tHE PARADISE BIRDS RECENTLY DIECOVERED IN NEW GUINEA.

Of all the families that constitute the order of the Passerines, that of the Paradiseidæ is assuredly the one that has already furnished ornithologists with the largest number of extraordinary forms and the one that has still in reserve for them the most astonishing surprises.
In his book entitled "The Wonderful Birds," Lisson, in 1835, mentioned but fourteen species of birds of paradise, of which he had been able to study specimens in the collections of the Museum, and living inmens in the collections of the Museum, and living in dividuals of which he had observed in their native south coast of New Guinea. At present, on the contrary, we reckon no less than eighty-two species of birds of paradise, which, for the most part, are represented in the galleries of the Jardin des Plantes. Some of these species, it is true, merely reproduce, with slight modificaiions, the types of species known of old, but others differ in toto from the classic forms, and, by the singularity of their plumage, ex ceed anything that the imagination could conceive of.
Who would have supposed that there existed such a bird of paradise as the $P$ aradisornis Ru dolphi, in which the orna ments, that is to say, the large tufts of feathers that deck the sides, exhibit a magnificent ultramarine colorinstead of the yellow or red of the ordinary birds of paradise? Who would have expected the would have expected the discovery, in the north of New Guinea, of the extra-
ordinary Pteridophora ordinary Pteridophora Alberti that Dr. A. B. Meyer, of Dresden, was the first to make known, and of which a detailed description was published a few weeks later by the writer, in the Bulletin of the Museum? This para tis bird differs from dise bird differs from all those that have been
known up to the present known up to the present
by being provided with odd ornaments consisting of two long appendages inserted on each side of the head, back of the eyes, and carrying a series of horny plates, of a shining bluish white upon their upper surface and of a uniform brown beneath.

Upon each appendage, which is at least double the length of the bird, there are forty of these plates, which are quadrangular and which increase in size to a certain point and then point, and then gradually diminish in the last third of the appendages.
These latter and the plates have been aptly compared to the fronds of certain ferns by Dr. Meyer, who has for this reason given the bird the generic name of Pteridophora; but they also re phora; but they also re
semble those flag-carrying ropes that deck pleasure craft in nautical fetes. In reality, they are feathers of the category of those that have been called enameled feathers by Dr. Fatio and that are met with also in the king fishers, in certain tanagers and in the irenas, Asiatic sparrows of blue and black livery nearly akin to the orioles. These feathers are generally, or rather appear to be, blue or green, for, in reality, they have not those brilliant colors, which they owe solely to the play of light upon a layer of enamel formed in each vane of large, nearly super ficial cells.
Seen hy transparency, they are simply horn colored. This is what weobserve also in the large head feathers of the Pteridophora, the plates of which, naturally brown, shine with a nacreous luster.
It was already known, of the siflets, for example,
that certain birds of paradise might have the sides of the head ornamented with long, profoundly modified feathers, the shaft being deprived of vanes, save in its terminal portion, so as to resemble loose sprays terminating in a small flat appendage; but the vanes had never been seen, as in the Pteridophora Alberti, want ing on one side of the feather and completely soldered on the other side, save at certain points regularly spaced, so as to constitute a series of horny plates. These plates, however, are only an exaggeration of the expansionsthat are observed at the extremity of certain feathers of a wading bird of Madagascar, the cock of Sonnerat, and a sort of cuckoo of the Philippines; or, again, at the extremity of some of the wing feathers o the Bohemian chatterer, in which they have the aspect of drops of sealing wax.


BIRDS OF PARADISE OF NEW GUINEA. teridophora Alberti (Aylng) and Parotia Carolæ (perching). Both half natural size,
them into a nearly horizontal plane or pointing them forward when the bird struts, of letting them gently fall when it is at rest, or of permitting them to float in the wind like streamers when the bird flies from tree to tree, as shown in our engraving.
Like many of its congeners, the Pteridophora is a mountain species. Of its habits we unfortunately know nothing. All that we can suppose, from the presence of fragile feathers, more thantwice as long as the body, upon the head of the male, is that the Pteridophora does not seek its food upon the ground that on the contrary it puses a great part of its exist the un then near the summit rather than amid the foliage, imitat ing in this the habits of many other paradise birds
Along with the Pteridophora, the Museum has ob-
tained from Mr. Van Renesse van Duivenbode two other birds of paradise one of which is a male of the Amblyornis ornata or gardener bird, while the other is a male, in mating plumage, of the species that has just been describ ed by Mr. A. B. Meye under the name of Parotia Carolx. The Parotix ar the paradise birds com monly called sifilets. The oldest known species of this genus is the $P$. sex pennis, the "coran-na" of the Papuans wholive upon the Arfak Mountains to th northwest of Geelwinc Bay, amid the woods at mean altitude of $4,000 \mathrm{fee}$ above the level of the sea The males areclad in a su perb mantle of black vel vet with purplereflections. Upon the throat they hav a metallic plastron of in comparable luster, upon the head a diadem of white feathers, and upon the nape of the neck a disk that is at least as brillian as the gorget. The fe males have none of thes markings, but on the con trary have brown, black and gray plumage, with transverse bars upon th chest
In 1885 , Mr. Ramsay made known a second spe cies of Parotia (P. Lawesi) which came from the As trolabe Mountains, situ ated not far from Port Moresby in the south of New Guinea. This species is distinguished from the $P$. sexpennis or common sifilet by several characters. The males, in fact have the caudal feathers notably shorter, the mantle black without purple reflections, the diadem white, tinged with red behind, and the neck of a steel blue with violet reflections, and not of a golden green with blue reflections, as in the Parotia sexpennis. On the other hand, On the have the lower females the body of a more or less bright russet with black stripes. The Parotia Lawesi was found again later on(1889) by Mr. A. P. Goodwin, an English natwould offer nothing remarkable. It would be a vulgar uralist who had joined the expedition directed by Sir sparrow of the size of a blackbird clad in a brown and black livery, set off with a little golden yellow upon the wings and the lower part of the body, and recalling the livery of the other paradise birds only by the velvety aspect of the head and neck feathers. Moreover, the females of the Pteridophora Alberti in ust exhibit this modest physiognomy, doubtless quite similar to that of the sifilets, and it is likewise thus that the males present themselves, except at the season of courting. The long plumes that they carry so proudly are temporary ornaments that fall at a given moment and free the bird of an inconvenience that must be quite sensible by reason of the exaggerated length of these appendages. These latter, it is true, must be slightly movable. At their base are inserted cutaneous muscles that are capable of spreading them apart, bringing
uralist who had joined the expedition directed by Sir William MacGregor, governor of the British possessions of New Guinea and the object of which was the ascension of Mount Owen Stanley.
After having ascertained the presence of this species of paradise bird upon the sides of Mount Belford, at an altitude of 13,000 feet, Mr. Goodwin succeeded in capturing several individuals upon another mountain of the same region at a corresponding altitude. He was even enabled to study the habits of this bird at close range, since the encampment of the expedition was in the immediate vicinity of one of the places where the birds cometo play their gambols. These paradise birds, in fact, arc accustomed to assemble to the number of six or eight at certain epochs at a point of the forest where the ground is free from brush and herbage, and to engage in a sort of play, or
perhaps passages of arms, in which the males display the splendor of their adjustments to the eyes of the females.
Such, probably, are also the habits of the Parota Carolæ, which, upon the Yaour Mountains, to the southeast of Geelwinck Bay, replaces the Parotia sexpennis, of the Arfak Mountains, and the P. Lawesi, of New Guinea. The Parotia Carolæ, represented in the foreground of our engraving, is of a little more massive form and of larger dimensions than the $P$. Alberti, the size of its body, moreover. being exagger ated by the amplitude of its velvet mantle. Upon its breast there is a wide plastron formed of scaly feathers, regularly imbricated and having a metallic luster. However, the reflections of these scales are not the same as in the Parotia sexpennis. Instead of gold and green, it is ultramarine and lilac that here prevail and produce a still more agreeable effect to the ese. The nuchal plate is not so large as in the common sifilet and the feathers of the forehead present another arrangement. They rise on each side, in a double crest, fringed with silver white and slightly inflected within at its upper edge. These crests, which slightly recall the cephalic disks of the male of the Astropia nigra, form, in uniting in front, a sort of balf open bivalve shell, that allows us to see a reddish-brown, silky plate that represents the little silvery cap of the common sifilet. This plate extends much further behind than in the $P$. sexpennis. As an offset, the fillets that detach themselves from the side of the head are a little shorter and terminate in slightly less developed appendages.
We shall not dwell upon the Amblyornis inornata, for we hope to have an opportunity of speaking in more detail of the very curious habits of the gardener birds of New Guinea and Australia. The three speci mens with which the Museum has just been enriched are natives of the same locality as those very recently described by Dr. Meyer.

At this monent ther is an extraordinary emulation annong museums and naturalists for the acquisition and description of every new bird of paradise whose skin is brought to Europe, and such emulation is of a nature to stimulate the zeal of explorers.-E. Oustalet, in La Nature.

## Magnets. Mr Pictet Mas described in

 Mr. Pictet has described in Comptes Rendus the fluence of low temperatures on the attractive power of permanent magnets. The results obtained are briefly summarized as follows: The magnet experimented upon was made up of three horseshoe magnets and weighed $493^{\circ}$ grammes. It was magnetized and made to carry its armature for two years, when it was found capable of lifting 4,275 grammes. After this it was left without its armature for 11 years, and its lifting capacity dropped to $3,226 \cdot 5$ grammes.For the low temperature experiments the magnet was immersed in a bath of alcohol capable of being maintained at any desired degree, and the attraction between magnet and armature was measured by means of a balance. The tests began at +30 and ended at -105 Centigrade, and showed that the force of attraction increases more and more as the temperature decreases. The results of four series of observations gave:

| Temperatare <br> of magnet. | Force of <br> Degrees. |
| :---: | :---: |
| +30 |  |
| attraction. |  |

Another Stride in Electrical Invention
A lamp that will burn for six hundred hours is the invention of George L. Roberts, an electrician, who sold to a tobacco company, for $\$ 80,000$, the advertising rights of some of his electrical devices. The lamp of which Mr. Roberts is the inventor is charged with sand, into which two wires are run, which connect with one of the regulation bulbs used on all electric chandeliers. The battery is therefore the sand, but the method of charging it remains a secret with Mr. Roberts. Mr. Edison, after seeing Mr. Roberts' lamp, remarked that he thought he knew all there was to know about electricity, but Mr. Roberts had made a discovery which puzzled bim greatly. Mr. Roberts presented Mr. Edison with some of this remarkable sand, hut with no fear of having his secret discovered, for analysis happens in this case to kill all traces of the secret discovery. The cost of recharging each lamp is seventeen cents. A friend of mine who has a contract with Mr. Roberts, having bought from him the rights of one of his inventions, tells me he would not have believed the tale of the lamp, had he not seen Mr.
tumbler, inserting two wires into the sand, and con necting the wires with an ordinary electric burner which burned brilliantly.
Mr. Roberts made his discovery in Minneapolis, in a urely accidental way. He was experimenting with acids in his laboratory and on the table was some sand, over which two wires had fallen and crossed themselves. By an accident a bottle containing a cer tain acid was overturned and some of the acid ran into the sand at the point where the wires crossed The result was a series of electric sparks. At present Mr . Roberts is quite a sick man and is in Michigan for his bealth. Another of his inventions is to mak seventy-two changes of color. in the hair, dress tights, shoes and so forth, of a dancer while she is in motion. The mechanism works by clockwork and the light gleams through the fabrics from a direct current Mr. Roberts married a daughter of Pillsbury, the grea Minneapolis miller.-The Telegram.

## From Wheon's Photographic Magazine.]

Photographic Notes.
The So-called Enamel Photo Engraving Process is now much practiced in France. A printer at Rouen pre fersusing the Talbot-Kline process modified by the use of the screen. He takes a print on carbon paper made from a lined negative, develops it on a copper plate which, when dry, is afterward immersed for a few minutes in a solution of perchloride of iron at $40^{\circ}$ then for a few minutes in the same solution at $38^{\circ}$ The results obtained are very satisfactory.
The Theory of the Lined Screen was explained at the Academy of Sciences by M. Ch. Fery. This professor does not think that the effect obtained by the distance of the screen from the sensitive surface is due to diffraction. He explains it by what is called in physics the theory of the geometric shadow, pointing out that the phenomenon of irradiation should be taken into account in defining the result obtained He proposes the following formula : $\mathrm{e}=$
is the distance of the screen from the sensitive surface, a the width of one of the opaque lines of the screen, the focallength of the objective, $D$ the diameter of th useful opening of the diaphragm
For an objective furnished with a normal dia For an objective furnished with a normal dia
phragin $\frac{b}{10}$ we have sensibly $e=3 a$, which gives $e=$ o mm. 3 for a screen having fifty lines to the centi meter.
From experiments that we have made this figure is too small even for negatives that are very soft. It is true that M. Ch. Fery adds: "The want of true sur face in the photographic plates does not enable us to easily obtain the parallelism of the lines and of th sensitive surface." It would be preferable to slightly
increase the ratio $\frac{b}{D}$ by a smaller diaphragm, so as to
obtain e larger
We believe that the phenomena of diffraction should be taken into account, as it is by it that it is possible to explain the curious effect of the eating a way of the angles of the squares which converts a square point, when the screen is placed in contact with the sensitive surface, into an almost round point when the screen is placed at a distance.
Albumenized Paper is at the present time neglected, wrongfully so, in our opinion, by amateurs. We have the proof of this in the International Exposition of the Photographic Art organized by the Paris Photographic Club. For 520 of the 620 prints exhibited the printing process used for obtaining the image was given, and we give the following results which characterize the tendency of amateurs:


At this exposition were found exhibitors from al countries (England, America, Germany, Italy, Russia and France), and everywhere we see the tendency to use platinum, bromide, and carbon, that is to say, that which gives durable impressions

The now general employment of small instrument and the ease afforded for procuring enlargementshave been the cause of the utilization of gelatino-bromide paper. As regards platinum paper, the facility and the rapidity of the development have made its use general, as it gives with weak impressions most beauti ful portraits in the hands of our Parisian artistsNadar, Hoyer, Reutlinger \& Son, Otto, etc.

The Eastman Company has placed on sale a smal apparatus of relative cheapness-the flat folding kodak. When it is shut it has the appearance of a lady's small satchel and contains the necessary supply for making forty-sight negatives. The rolls of pellicl
are placed laterally, so that the apparatus is very flat. Etoile.-Messrs. Poulenc Brothershave just placed on sale a synthesis pyrocatechin, bearing the mark Etoile. This is a perfectly pure product. as is everything that his house sells bearing its stamp. Here are the ormulas recommended :

| Solation A. |  |
| :---: | :---: |
| Sulphite of sods. | 20 grammes. |
| procatechin. . | ..... 10 |
| Water. | .... 500 |
|  | Solation B. |
| Carbonate of potash, pure | . 100 gram |

1. For plates of short or medium instantaneous ex posures in a bright light, take 1 part of $A, 1$ part of $B$ part of water.
2. For quick, instantaneous plates, or those obtained in a defective light, take 1 part of $A$ and 1 part of $B$ Stereo-jumelle.-Colonel Mossard has constructed a small apparatus which be calls stereo-jumelle, and which has for its object to give the stereoscopic im pression of the subject. For this be places the two prints one above the other, instead of placing them a the same height; to examine them and to obtain the impression of relief it is necessary to place before the eyes a little appliance formed of two very short tubes presenting the appearance of a very short opera glass this is the stereo-jumelle. In each tube is placed a small prism, which by refraction causes the two prints to coincide and makes the image appear in relief. Thi same instrument may serve, if furnished with magni fying lenses or other appliances for enlargement, for the examination of ordinary stereoscopic prints.
Artificial Caoutchouc, more or less resistant, made by dissolving four parts of nitro-cellulose with seven parts of bromo-nitro-toluol. By changing the quan tity of nitro-cellulose it is possible to obtain a sub stance having elastic properties andgreatly resembling caoutchouc and even gutta percha. It is also possible according to the Revue de Chimie Industrielle, to sub stitute for the bromo-nitro-toluol the nitro-cumol and homologues.
The Boring of Glass by using essence of turpentine as a lubricant for the point of the drill. This method is helped by adding a little camphor to the essence used It is also proposed for the same purpose to use acetic acid as a lubricant, in which a small quantity of alun has been dissolved. As it may be necessary to use thi method for certain appliances, we think it well to point method
Pictures in Colors. - M. Auguste Lumiere bas pointed out a modification of the process proposed by Messrs. Cros and Ducos du Hauron for obtaining colors by the superposition of three monochromes. In the preceding methods three carbon prints were su perposed, but the difficulties offered by the adjust ment were very great. In the proposed method three coatings of bichromatized gelatine are used, each coat ing being separated by a coating of collodion, which serves as an isolator. After the spreading of each coat ing of bichromatized gelatine it is exposed (when dry and before spreading the coating of collodion) under one of the three monochrome negatives obtained ac cording to the method indicated by M. Ducos du Hauron. The bichromate is afterward eliminated by washing and the plate is immersed in the dyeing bath, where by imbibition, according to the process o M. Cros, the colored monochrome is obtained. After drying another coating of collodion is applied, and the operation is again proceeded with as in the first case, by using a second dye appropriate to the second negative used. The third coating is finally spread as the preceding one and so on, the superposition of the three monochromes giving the colors of the original.
The Process for Obtaining Countertypes with the aid of solutions of bichromates has demonstrated that this substance does not destroy the latent image, as differ ent authors have stated. M. Leon Vidal has endeav ored to find if certain modifications in the mode of operating were not the cause of this error. He found that the bichromates act as retarders, and that by using these solutions it is possible to obtain negative that are more pure and free from the gray fog than is seen when the sensitized plates have been exposed to the light for a very short time, or when the spontane ous reduction that is frequently observed in very rapid plates has taken place. By immersing the sensitive plates in the bichromate at 1 per cent, after exposure to light, the latent image is not destroyed, but a greater degree of latitude may be obtained in the duration of the development, and, consequently, a greater degree of certainty will be obtained for giving to the negative the requisite density without fear of fogging.

AFTER the storm of July 13 one hailstone was found in a garden on Van Dien Avenue, Ridgewood, N. J. measuring full four inches in diameter, two inches thick at the center; the form being saucer shaped rounded on one side, the other side flat. Of the many large hail stones that fell, this one was distinct, from its size and perfection in saucer form. Its weight was not ascertained.

RECENTLY PATENTED INVENTIONS. Mechanical.
Valve Gear.-Frank J. Chriest, Fort McPherson, Ga. This gear is designed to give the desired stroke and a very high speed to the valve, permite of adjustment for lost motion, and permits more steam to passinto one end of the cylinder than into the other,
if deaired. A nut bock is connected with the valv, and adapted to receive an intermittent slliding motion rom the eccentric, permitting of the valve remaining open for a long time at the end of the stroke, during the
time the eccentric is moving into estreme positions and back, before a sliding of the valve again rakes place. The exhaust can be opened quickly, left open a long time, and still close at the proper moment.
Wrence.-Edward I. Morey, Durango, Col. This is a aimple form of wrench, of such construcfion that when the wrench is in use the ratchet mechan ism will be relieved from undue strain. As the distance between the jaws of the wrench is increased the handle is lengthened and the amount of leverage increased, the silding section of the wrench
die where it is most needed.
Wedge.-William I. Harmon, Mount Vernon, Washngton. This inventor has devised an im provement in wedges for felling and spiliting timber, the
wedge having a wooden body and a metal trame wedge haring a wooden body and a metal frame, the urrounded by a metal band. The trame has opposite beveled sides incasing the body, and provision ts made for the expansion of the wooden body laterally in the

Lifting Jack. - Harvey Holahan, Harves, In. This jack bas a novel lever and pawimechanism for raising and lowering the rack or ratcher lifting bar, and 19 adapted for general use or Poremployment
as a car jack. In a hollow standard is pivoted a lever to which is pivoted a lifting pawl, a locking pawl beingpiv. ted to the standard and a ribbon epring connecting both spring, and by the different adjustments of the slide the spring is held onder different tensions as required to act on the pawle.
Coal Elefating Apparatus.George Haies, New York City. This invention provides nadjustable support for an automatically filling coal shovel, the elevator portion being quickly projected over
a vesel or remored ont of the way. The apparatuas provides forthe complete control of the: Bhovel by the ope ator in illing, transerring and emptying it
Hoop Flaring Machine.-Max H. Ritzwoller, Peoria, nl. For evenly flartug and bending which permits hoops of different gages to be flared aniformly and freely, inexpensive hoop clamping attachnents beeng readily applied to the shatts have each a fixed head member formed with a cir cular socket in its clamp face, an opposing yielding
clamp head having a similar socket, and a washer held lamp head having a similar bocke, opite facesilling th between the heads
socketa in the heads.

## Agricaltaral

Rotary harrow.-James G. Ferrill, Satesille, Ark. This is an improvement in harrows ha ing two toothed rotary sections hinged to a transverse
coupling bar in such manner as to permit them to be olapling bar in such manner as to permit them to be
placed in horizontal or vertical position, for work or for moving the harrow to and from the feld. It has an cted cros8 barr there being an inner annular member on the cross bars and pendent tooth members loosely connected with the

Planter.-Caleb E. P. Hobart, Cherokee, Iowa. This is an improvement apon a formerl
patented invention of the eame inventor, the plungers or patented invention or the eame inventor, hie plangers or
followers in the eeed pocketa oeing so made as to relieve the fender or Emoothing device from undue friction by a possibe overcrowding of the pocketa, provision being
also made for a more complete covering of the eeed when dropped. A greater number of seed droppers 18 employed logether with a abifting wheel forthe shaft operating the droppers, the wheel having marking shoes serving as check rowe, whit
when neceseary


#### Abstract

\section*{Miscellaneous.}

Filtering Saccharine Juices.William Eassie and Otto Schmidt, Kealia, Kauai, Hawail. rhisinvention provides a sand filtering apparatus consisting of a Dattery of tanks ananged in inclined series he eeveral tanks, transfer plpes and yalves connecting he eeveral tanks, transfer plpes and valves connecting the tanke, and inclined tronghs with rotary spiral conveyers being arranged to wash and convey the aand from one to the other. A carrier belt and an endless elevator belt with buckets carry the washed sand to the higheat ank Metallic Ceiling.-Valentine Moeslein, New York Citt. Thiscelling is so formed as to permit of conveniently fastening the panels in place on a netally furring frame sedired the the use of wooden furring stripg, at the same time forming perfect and very secure jointa. The improvement covers a furring trame having longitudinal and traneverre estrips, each provided with a rail, and panels formed with flanges eace provteed whith riall, and panelis tolbe crimped on the rail, are and Windmill Regulator. - Frank C. Rathbun, Ethan, South Dakota Vanees are pivoted in the cating adapted to cary the wheel in different vertithe casting adapted to carry the wheee in ditferent verti- cal planes and at different distances from the bore of the casting, a connecting rod having its ends pivoted to the vanes, the improvement being applicable to all windmills which have a horizontal axio, and being adapted to hold The wheel steadily $n$ the wind, while it works antomatt. becomes too heavy. Hinge.-Arthur H. Gilman, Aurelia,


niently applica ble to lids, covers and doors or piano casee and other ornamental articles. It is very strong, and en-
ables the cover or other part to degewise egginat the part to which it to hinged learing a perfectly smooth oater surface. A pair of leaves have their adjacent ends equally curved in opposite directions, and pivoted connecting levers arejeach pivoted at one
end to the adjacent curved end of one of the leaves. air of braces is connected of one of the to leaves. $t$, leares
levera.
Cutter for Welt Trimmers. Gnitaf A. Hultin, Chicago. n. For simultaneouals inseaming, this inventor has devised a simple and chea cutter, comprising a head having parallel rows of peripheral knives, the rows being of dissemilar lengths. and he longer knives having their cutting edges inclined ootwardly and downwardly from the edgenextto.the shorter
knives. The cutter is readily ground and made to trim knives. The cutter is reailiy
Typewriter Ribbon Mechanism. Fred w. Overhiser, Cola spring, N. Y. This invenwo tas devised means of aubmancally reversing
ment of the inking riboon, and for a transerse move
 connection with the reveraing mes am. While the on of it is automatically brought in contact with the type, insuring uniform wear. An automatic reverse and transverse feed attachment is provided, applicable to any machine in which the ribbon ts fed
Firearms Pneumatic Firing De-nce,-Irsaiah n. Simpoon, Bnmewick, Me. The firear nd with b 1 f the cylinder is a partition with an opentigg for the pasage of the frimin pin. The latter is on a p punger or forward to fire the cartridge by forcing air into the rear end of the cylinder through a pipe extending to the oat ide of the stock, the operator being able to blow into he pipe with sufflcient force to propel the piston for and an
Calendar. - George W. Shirk, Van Orin, III. This is a perpetand calendar for indicating the ear, mon an and ay or the mon hior a number of yeara no suomaticaly adjusta the day indicator when the month-Indicating dial is moved. It is deeigned to be and is of such shape and dimensions as to permit its face obe utlized to display businees carlo and other adver

Line Reel. - Charles A. Koerner, Evansville, Ind. A reel conventent for holding chalk ines is formed of wire bent at the corners to produce end
fanges and to form eyes between the corners at the end portions of the body, a spinde extending through the eyee forming an axle, and there being a handee In align-
ment with the axle. The device is very cheap and efflment w
cient.
FUNNEL.-Edward N. Gaudron, Brook Inn, N. Y. For conveniently alling lamp founta, bottlees, valve mechanism comprising a valve and a piston, the valve controlling the inlet of the liquid from the fannel body to the nozzle, and the piston controlling the valve
to close it, the piton bemg operated by alr from a com preesea dir chamber
Clothes Drier.-John Drum, Spo kane, Washington. This is a device adapted for attachplaced on the drier. Bands clamped on the pipe sustain outwardly extending arms on which the clothey are Lung, the arme being preferably formed of twisted wire and their ooter ends being connected by bare ale
dapted to carry clothes. The arme of the drier may be olded down parallel with the pipe and out of the way.
Tea Chest.-Tylar B. Thompson and Charles T. Hull, Missoula, Montana, and John H. Will man, San Francisco, Cal. This chest has an opening in
one side at the bottom adapted to be closed by a temp rary plate or cover, a shelf on the inside of the chest, and a drawer below the shelf, the drawer having a curved
front and illiding door. The improvement is designed to front and illding door. The improvement is designed th
displace the ordinary wooden lead-lined chest, holding its contents so they will not deteriorate or be wasted, and being will
the tea in lota
Metal Frame and Stock. - Albert Wanner, Jr., Hoboken, N. J. This invention provides a
Trame for stands, mirrora, plateaux etc... having a back member to which is secured a face member to form an nner and an onterflange, legs being secured to the back member at the outside, while the outer flange overhange he legs and the inner fange forms a stop for the article ramed. The stock may be readily bent to the eahape de sired withoot being dis
bend or fiex irregularly.
Vehicle Seat Lock. - Thomas L Pfleegor, Burringame, Pa. This lock may be attached to an Y Prm of ahifting eat, automatically locking and pre-
venting the body of the vehicle from spreading when the eeat is in position. Opposite projectrog angle arma are
seat attached to the forward and rear portions of the seat rier, and a face plate on the vehicle bas openings to re ceive the arms, while a spring on the face plate has its
free end extending partially across one of the openIngs, and engares one of the ame when the seat is placed in position.
Spring Horse Shoe.-Albert J. Walker, Jacksonvilie, Fla. This shoe permits the ani aimal may fully deevelon his anat witrow, so that the animal may fully develop his gait without danger of
oreness. An elastic bridge piece connecta ends of the side portions of the shoe, the bridge piece being bent up rearwardy at an angle to the side portions and having its lower edge above them. The bridge piece made fast to ft suugly on the surface of the hoor
Water Closet Seat.-Patrick J. Ca- ing support from a wall or partition.
Notr.-Copies of any of the above patents will be end name of the patente, title of invention, ind date send name of
of this paper.

NEW BOOKS AND PUBLICATIONS
Select Organizations in the United
States. William Van Rensselaer
Miller, editor. New York: The
Knickerbocker Publishing Company.
896. Pp. 347. Small 4to, illustrated 1896. Pp. 347. Small 4to
with

The present work is intended to supply a long felt A club in a metropolis is a necessity to the social and business man as common ground on which to meet one's Priends. The wide scope of the present volume has
made it possible to include such organizations as Daughters of the Revolution, the American Library AB ociation, the Loyal Legion, the American Whist League, he Knights of Pythias, the National Academy of
Sciences and others. The work also embraces political, sporting, athletic, amateur dramatic, literary, musical, historical and patriotic, bicycle, kennel, and yacht clubs. The contributors include some of the best mann clab men in the United States, the portraits half tone portraits, the printing and binding are of the very best.

Biological Lectures Delivered a THE MARINE BIOLOGICAL LABORA TORY OF WOOD'S HOLL IN THE SUM
MER SESSION OF 1894 . Boston $\begin{array}{lll}\text { Ginn \& Company. } & \text { 1895. } & \text { Pr. } \\ \text { 287. } & \text { vii } \\ \text { 2vo, illustrated. } & \text { Price } \\ \$ 2.65 .\end{array}$ The first volume of these lectures was offered in 189, and the reception which this and the succeeding volum every lecture of the present volume deals. Nearly every lecture of the present volume deals with th
problem of organic development. The lectures are by such well known scientists as Professor A. E. Dolbear the late J. A. Ryder, C. O. Whitman and J. Loeb. J. M. Macfarlane's lecture "The Organization of Botanical Museums for Schools, Colleges, and Universities "is very
timely, but is unfortunately very short. Other lectures are "On the Limits of Divisibility of Living Matter," bryological Criterion of Homology,"etc.

## SCIENTIFIC AMERICAN

BUILDING EDITION
JULY, 1895.-(No. 117.)

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elegant plate in colors showing a residence at Bridgeport. Conn., recently erected for Christian
M. Newman, Esq. Three perspective elevations and floor plans. Cost 85,500 complete. Architect Mr. Samuel D. P. Williams, Williamsburg, N. Y. handsome residence at Glenwood, N. Y., recently
erected for Wm. R. Innis, Esq. Two perppective erected for Wm. R. Innis, Esq. Two perspective
elevations and floor plans. An attractive design.
modern cottage of attractive design recently erected at New Rochelle, N. Y. Perspective elevation and at New Rochelle, N. Y. Perspective. Architect, C.
floor plans. Estimated cost $\$ 3,00$.
B. J. Snyder, New York City. Design in the American order of architecture.
A sommer cottage at Great Diamond Island, Me., re cently erected for Edward L. Goding, Esq. Two perspective elevations and floorplans. Cost $\$ \approx, 500$
complete. A picturesque design. Mr. A. Dorticos architect.
. An attractive dwelling at Oakwood, Staten Island, recently erected for Mrs. Margaret Dutche. Cost $\$ 3,800$ complete. Two perspective elevations and
foor plans. Architect, Mr. Herman Fritz, Jr., floor plans.
B. A Colonial dwelling at Springfield, Mass., erected for Messrs. J. D. and W. H. McKnight, at a cost of $\mathbf{8 6}, 000$ complete. Two perspective elevations and
floor plans. A pleasing design. Architect, Mr. G. floor plans. A pleasing desig.
Wood Taylor, Boston, Mass.
Colonial house recently erected at Groton, Mass., in the style of Longfellow's home. Perspective elevation and floor plans.
$\&$ De Goll, New York.

## \& De Goll, New York.

finest hotels in the world. Architect, Mr. Jacob Rothschild.
9. A cottage in the Colonial style, recently erected for Margaret Deland at Kennebunkport, Me. A picuresique deeign. Perspective elevation and floor plans. Mr. Henry
10. Suggestions in corner decorations.
iscellaneons contents : Hoop poles.-How to drive rats away alive.-Dumbwaiters and elevators, 1llus-
trated. - Saws. - Translucent fabric.-Improved spring hinges, illustrated.-Ventilated school wardrobes, illustrated.-Hanger for storm sash and screens, illustrated.-The hygienic refrigerator, illustrated.-Improved door hangers, illustrated.-
Improved steam heater, illustrated. - Concrete Improved steam heater, illustrated. - Concrete - A firet class hot water heater, illustrated.

The Scientific American Building Edition ls issued wo large quarto pages, forming a large and splendic Magazine of Abcbitbctire, richly adorned with elegant plates and fine engravings, illustrating the most
interessing examples of Modern Architectural Construcinteressing examples of
tion and allied subjects.

## on and allied subjects.

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"C. S." metal polisb. Indianapolis. Samples free. tave machinery Trevor Mpr. Co., Lockport, N. Y. Presses \& Dies. Ferracute Mach. Co., Bridgeton, N. Handle \& Spoke Mcby. Ober Lathe Conchagrin Falls. 0 . Will sell patented office specialty for 8300 . New, good. Screw macbines, millink macbines. and drill presses.
fie Garvin Mach. Co., Laight and Canal Sta.. New York. 'rie best book for electricians and beginners in elec-
ricity is "Experimental Science," by Geo. M. Hopking. sy mail. 84 ; Nunn \& Co., publishers, 361 Broadway, N.Y


HINTS TO CORRESPONDENTS.
Names and Addyess must accompany all letters,
orno attention will be paid thereto. This is for our
information and to Beferences to former articles or answers should

 houes manufacturing or carrining the same.
Special militen Informailon on maters of
personal rither than general interest cannot be
expected without hamuneration
 price.
Winer.
marked ornt for labeled.
(6582) F. E. W. asks: 1. With what ve locity will water issue from a nozzle with a pressure of
1251 b . to square inch ? If the nozzle is 116 mch in diameter, how many cubic feet will be discharged in an hour 9 A. The spouting velocity of water from a perfect nozzle, at 125 lb . pressure, is 8,100 feet per minute,
with a discharge of 10 cubic feet perhourfrom a $1-16$ with a discharge of 10 cubic feet per hourfrom a 1-16
inchnozzle. 2. What diameter should a jet or impact inchnozzle. 2. What diameter should a jet or impact
wheel (Pelton type) be to run at 2,800 revolutions per wheel (Peiton type) be to run at 2,800 revolutions per
minute, on a jet of this pressure \& A. A wheel should be minute, on a jet of this pressure a. A whees diameter for the speed and pressure stated. . Have you a Surr A. Articles on Edison's apparatos mor the production of electrictity alrect frum coal will be
for found in ScIENTIFIC American, vol. Ivii, No. 9, and SOPPLEMENT No. R26. A thermo-magne
motor is shown inSopplemert
(6583) C. A. R. asks how to label bot tles. A. Thesand blast and other mechanical engraving nethods are altogether out of the question for any but satisfactorily and legibly with a diamond. We have then, nothing left but paper labels, and, as an adhesive preparation for such, experiment has shown the following formula to be about the best: Gum arabic, $1 \mathbf{o z}$. gum tragacanth (pulverized), 1 oz.; acetic acid, 40 min. water, hot: then add thoz. Dissolve the gums in the difficulty as reands ther labels is the figcerine. The nex of ordinary writing ink. A bottle labeled nitric acid with a good bold black ink, may, in a few hours, bea nothing but a label with a few yelle w stains upon it to
(6584) J. W. B. asks how to bleach
 dinary beeswax by exposure to the influence of the sun and weather. The wax is siliced into thin flakes and
laid on sacking or coarse cloth, stretched on frames, laid on sacking or coarse cloth, stretched on frames,
resting on posts to raise them from the ground. The wax is turned over frequently, and occasionally sprinkled with soft water if there be not dew and rain sufficlent to moisten it. The wax should be bleached in about four weeks. If on breaking the flakes the wax still appears yellow inside, it is neceesary to melt it again, and flake nd exposelta second tine to ten oftener, before it be comes thoroughly bleached, the time required being liminary process, by which, it is claimed, much time ie saved in the subsequent bleaching; this consists in pase ing meltediwax and steam through long pipes so as to ex pose the wax as much as possible to the action of the steam: thenee into a pan heated by a steam bath, where it is stirred thoroughly with water and then allowed to settle. The whole operation is repeated a second and
third time, and the wax is then in condition to be more readily bleached.
(6585) C. F. asks for a formula for gran . A. Oil of almonds, 166 pt.; sperma ceti (pure), 3 oz.; white wax (pure), $21 / 6$ oz.; melt by a
gentle heat and add op otto of roses, 12 drops. Pour the liquid into a marble or Wedgewood waremortar con taining about 1\%9 pt. or luke warm water, and agitate the whole briskly with the pestle until the oleaginous portion is well divided. Then throw the whole sud denly into a broad vessel containing 1 or 2 gal. of cold
water. Next, throw the "granulated cream" on piece of muslin extended as a filter and shake and drain plece of of the water out of it as possible. Lastly, put
as much
it into china or earthernware pota. It is used as ordiit into china or earthernware pots. It wos as (6586) H. N. M. asks for a formula for Areproof ink and paper. A. The pulp for the paper composed of vegetable fiber, 1 part ; asbestos, 2 parts
 either writing or palnung, and fg mang ground, 22 drm. copal or otherresinons gums, 12 grn.; sulphate of iron $2 \mathrm{drm.;}$ tincture of nutgalls, 2 drm.; sulphate of indigo 8 drm . These subetances are thoroughly mixed and 8 drm. These
boiled in water.


July 16. 1895,
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