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## photographic printing by machinery.

This new process of rapid printing consists essen tially of a roll of sensitized bromide paper a thousand yards in length by something over a yard in width, unwound in a room illuminated by red light, fed under two or more negatives, then automatically pressed upward by a platen against the face of the negative, at the same instant also ausame instant also auby the flashing of inby the flashing of in-
candescent electric candescent electric
lamps above the negatives, then moved along the proper distance for a fresh section to be exposed and finally wound up on an. other roller.
The roll of exposed film is next removed to another room and automatically developed, fixed, alumed, washed and dried, the finished pictures being wound up on a third roll from which they are cut to size and mounted on cards mounted on cas ald in the usual way. Actually to see
how easily and certainly this process works and learn of the obstacles that


Fig. 1.-AUTOMATIC PHOTOGRAPHIC PRINTING-THE EXPOUSİIG APPARATUS. plate is observed the exposing chanber suspended by a $\begin{aligned} & \text { quick movement equivalent to the length of the nega- } \\ & \text { tive plate or at any set distance, passing thence to a }\end{aligned}$ rope passing over a pulley, in the ceiling, and balanced
at the other end by a weight; this ariangemient per-
roll at the other end by a weight; this arıangement permits the whole to be raised above the negative plate, had to be overcome
quick movement equivalent to the length of the negawoll whose axle works in ball bearings, on which it is wound, the roll being rotated by an attendant. A reciprocating motion is imparted to the pull roll by means of a connecting rod attached to a crank shaft located under the feed apron, at the lower left hand portion of the machine.
The end of the connecting rod at the pull roll engages in a slotted lever, the upper end of which has a ratchet and pawl operating in teeth on the periphery of the pull roll. The end of the rod may be moved nearer the center of the roll in the slotted lever, and so regu late the throw or amount of rotation. A sprocket wheel at the opposite end of the pull roll is connected by a chain with the feed roll. It is evident, therefore, when the pull roll makes a half revolution rapidly, the feed roll is also simultaneously rotated, causing the same amount of paper to he unwound as is not only surprises but astonishes the old time photo- netting masks. In each side of the case are four $32 \mid$ taken up at the other end. Geared witit the crank grapher. It is, in fact, a new industry in the line of candle power incandescent electric lamps connected by shaft under the feed apron is a shaft having a caim for photographic printing and will be useful in hundreds flexible cords to a switch on the wall and to the auto- operating at the right moment the electric switch for of various kinds of businesses, where prints by hundreds or thousands from one negative are desired.
The accompanying illustrations sketched from the apparatus in operation give a very good idea of its construction and working.
Taking the exposing apparatus first, Fig. 1, the roll of unexposed paper supported on a shaft on the left may be seen hanging therefrom in a loose loop and enters the inclined apron, thence passes directly under the negatives, which are secured to the underside of a large sheet of glass by paper strips in the usual way. The glass plate is held in a removable frame which permits the negatives to be easily located and secured. When the plate is in position vignetting wasks are laid on top of the plate over the negative, and if, by a trial, the exposure has been found too long for one negative, thin sheets of waxed or tissue paper are interposed to weaken the light to the proper degree. Several negotives of a similar degree of density may thus be secured to the plate and each adapted to the light necessary for a proper exposure. Much care and nicety of judgment is required in this adjustment, as the success of the later manipulations hinges upon it. Above the negative


Fig. 3.-AUTOMATIC PHOTOGRAPHIC PRINTING-THE DEVELOPING APPARATUS.
fresh section of paper passes under the negatives and the operation repeated. The movement is quite simi ar to the platen of a printing press.

The roll, containing two or three thousand exposures, is carefully protected from white light and carried to the room in which is located the automatic develop ing machinery. (Fig. 3.)

It is a most interest ing sight to see the gradual development of the exposures here. As may be imagined, the exposed roll is set on supports at the right hand end of a long wood tank containing separate watertight compartments, and is carried over a roll into compartment No. 1, about $31 / 2$ feet deep, filled with 120 galions of an old solution of ferrous oxalate of potash developer. Referring to Fig. 4, it will be noticed that half way (Continued on p. 102.)

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## THE DIBCOVERY OF ARGON

Some six years ago the Right Hon. Lord Rayleigh undertook one of the most difficult of chemico physi cal measurements, namely, the determination of the densities of certain "permanent" gases. He established satisfactorily the densities of oxygen and hydro gen, but on undertaking that of nitrogen he was confronted with an anomaly, both curious and serious, which for some time he regarded only with "disgust and impatience."
Nitrogen to be weighed may be obtained from two entirely different sources-from the atmosphere, where it exists free, or from chemical compounds, such as ammonium nitrate, or nitric acid, in which it exists in combination with other substances. The air, as everybody knows, consists chiefly of nitrogen, oxygen, car bon dioxide, and water vapor. In order to free nitrogen from the other constituents, air was bubbled, first through a solution of potash, which detains the car bon dioxide, then through concentrated sulphuric acid, which is a trap for water vapor, and lastly over red hot copper, which is a famous oxygen "grabber," after which the nitrogen emerged into the globe pre pared for it, supposably pure. Red hot iron filings, or ferrous hydrate, may be substituted for hot copper; but whatever means were employed to separate the atmospheric nitrogen from its fellow constituents, Rayleigh found that the weight of nitrogen going iuto the globe, in each experiment, remained fairly and satisfactorily constant.
So far, so good; but when nitrogen from ammonium nitrate, nitric oxide, or any other compound, was con ducted into the glass globe, it weighed eleven milli grammes less than when it contained atmospheric nitrogen. Eleven milligrammes is not a great weight, about that of a pin's head, but it was quite sufficient to disturb the equilibrium of both his lordship's balances and-mind. It was not, however, until a year ago, after two years' work, that the result stood sharply and unmistakably out that "chemical" and "atmospheric" nitrogen differed in weight.
Now, admitting this difference to be established, an obvious explauation would be the presence of some im purity in the gas from either source. An elaborate investigation proved, so far as chemical science can prove, that the nitrogen derived from chemical sources contained nothing which could account for the discrepancy, and Rayleigh was thus obliged to ask himself the further question, "What evidence have we that atmospheric nitrogen is one substance, pur et simple ?" On referring back, great was his surprise to find that the question had been put, just as sharply and decisively, one hundred years ago, by that shrewd Scstenman, Henry Cavendish, who so advanced the science of his time; and furthermore, that no work had been done since. Cavendish not only asked the question, but endeavored to answer it by the following experiment :
A mixture of air and oxygen, together with a swall piece of potash, was passed into a $U$ tube inverted over mercury. Through the air so inclosed, a series of electric sparks passed continuously for days, and even weeks. Under these circumstances nitrogen unites with oxygen to form nitrous acid, which is converted by the potash into solid potassium nitrito. The mercury rises in the tube to take the place of the disappearing oxygen and nitrogen; but Cavendish found that, even after weeks of continuous sparking, a smal bubble of gas remained unabsorbed. That bubble, if Cavendish had only known it, was argon. Needless to say Rayleigh repeated the experiment. He then trans ferred the gas so obtained to a vacuum tube, and ob served the spectrum. It was different from anything else in the universe; and lo, argon was discovered! Cavendish cannot be awarded the honor of the discovery, because with his crude apparatus he could not feel certain that his residual bubble was genuine He merely concludes that "if there is any part of the phlogisticated air (nitrogen) of our atmosphere which differs from the rest, and cannot be reduced to nitrous acid, we may safely conclude that it is not more than ${ }_{120}^{\frac{1}{2}}$ of the whole."

In the method of Cavendish, as improved by Ray leigh, the mixed gases, air and oxygen, are fcd into an immense glass flask half filled with caustic potash Instead of the small electrie spark he uses an electric arc (from a current potential of 2,400 volts), between thick platinum terminals, situated about half an inch above the alkali. The mixed gases are absorbed at the rate of seven quarts an hour. The argon gradually accumulates, and when it is desired to stop operations oxygen only is fed into the flask. At the end, when the nitrogen is completely absorbed, the flame sud denly changes to a bright blue color. The excess of oxygen is then absorbed by potassium pyrogallate, so well known in photography, and the argon remain free from impurity
Soon after isolating argon, Rayleigh took Professo Ramsay into his confidence, who soon devised a chemi cal method which is equal, if not superior, to the fore going. This method depends on the peculiar fact that nitrogen, so inert with most substances, will unit
quite readily with magnesium to form a solid nitride

The apparatus consists of a closed system, containing soda, sulphuric acid, phosphorous pentoxide, red-hot copper and red-hot magnesium, through which the air wanders in a closed circuit until deprived of carbon dioxide, water, oxygen and nitrogen. The residue is pure argon. So far as the yield is concerned, the second method is preferable to the first, giving as much argon in eight hours as can be obtained in fourteen hours by the oxygen method.
Ramsay's method has lately been much improved by M. Guntz, who passes atmospheric "nitrogen" ove several iron boats containing electrolytic lithium, which absorbs nitrogen completely at a low tempera ture and collects the argon over mercury at the exit nd of the apparatus.
Still another method is to pass atmospheric " nitro gen" into a large flask in which there is an electric ar formed between magnesium terminals. The magne sium burns the nitrogen into solid magnesium nitride, and the argon remains
Now, what is argon? It is a colorless, odorless gas existing in the atmosphere to such an extent that, in a room containing 6,000 cubic feet, we should have about 0 cubic feet of argon.
Since we have thus a practically unlimited supply, can we put it to any economic use? Not unless we can make it enter into combination with some othe element; and happily enough, in spite of its name"lazy "-the famous French chemist, M. Berthelot, by means of the silent electric discharge, has succeeded in making it enter into a combination in which mer cury, argon and condensation products of benzine are concerned. In addition, argon has lately been found with helium in combination with meteoric iron.
Should Berthelot's compound turn out sufficiently stable to be isolated, there is a probability that it may serve as a gate through which our element may enter into innumerable other combinations possessing prop erties which may or may not be useful to the race.
The very discovery of argon, however, stands as warning to those who would teach us that science i bankrupt.
R. K. Duncan.

## ELECTRICAL ITEMS WORTH REMEMBERING

Dropping asteelmagnet, or vibrating it in other ways diminishes its magnetism
It is said that steel containing 12 per cent of mangaese cannot be magnetized.
Flames and currents of very hot air are good con uctors of electricity. An electrified body, placed near flame, soon loses its charge.
In cherning a secondary battery, the charging elec ro-motive force should not exceed the electro-motiv force of the battery more than 5 per cent
Lightning has an electro-motive force of $3,500,000$ volts and a current of $14,000,000$ amperes. The dura tion of the discharge of lightning is ${ }_{50} \frac{1}{0_{00}}$ of a second
The resistance of copper rises about 0.21 per cen or each degree Fah., or about 0.38 for each degree Cent.
A lightning rod is the seat of a continuous current o long as the earth at its base and the air at its apex re of different potentials
The rate of transmission on Atlantic cables is eigh teen words of five letters each per minute. With the "duplex" this rate of transmssion is nearly doubled.
The effect of age and of strong currents on German ilver is to render it brittle. A similar change take place in an alloy of gold and silver.
To obtain the number of turns of wire in an electro magnet, multiply the thickness of the coils by the ength, and divide by the diameter of the wir quared.
A test for the porosity of porous cells consists in fill ing the cell with clean water and taking the per cen of leakage. The correct amount of leakage is 15 per ent in 24 hours.
If the air had been as good a conductor of electricity as copper, says Professor Alfred Daniell, we would probably never have known anything about electricity for our attention would never have been directed to any electrical phenomena.
A perfect vacuum is a perfect insulator. It is possi ble to exhaust a tube so perfectly that no electric machine can send a spark through the vacuous space ven when the space is only one centimeter
For resistance coils, for moderately heavy currents, hoop iron, bent into zigzag shape, answers very well One yard of hoop iron, $1 / 2$ inch wide and $1-32$ inch thick, measures about 1-100 of an ohm; consequently 100 yards will be required to measure an ohm.
The voltage of a secondary battery must always be equal to or slightly in excess of the voltage of the lamp to be burned. For example, a 20 volt lamp will re quire 10 secondary cells, but 10 cells will supply more than 20 lamps.
Compression of air increases its dielectric strength Cailletet found that dry air compressed to a pressur of 40 or 50 atmospheres resisted the passage throug it of a spark from a powerful induction coil, while th discharge points were only 0.05 centimeter apart.
An accumulator with 17 plates, 10 by 12 inches, is
reckoned, in horse power hours, equal to about one horse power hour. Taking this as a basis, it will require 6 cells for one horse power for 6 hours, or 30 cells for 5 horse power for the same length of time.
To obtain the length of wire on an electro-magnet, add the thickness of the coils to the diameter of the core outside of the insulation, multiply by 3.14 , again by the length, and again by the thickness of the coils, and divide by the diameter of the wire squared.
Blotting paper, saturated with a solution of iodide potassium to which a little starch paste has been added, forms a chemical test paper for testing weak currents. When the paper (slightly damp) is placed between the terminals of a battery, a blue stain appears at the anode, or wire connected with the carbon or positive pole of the battery.

## THE BIOLOGICAL LABORATORY AT COLD SPRING

 HARBOR, LONG ISLAND, N. Y.The visitors who find their way into the bright, airy laboratory at Cold Spring Harbor, and are shown about by Dr. Conn, the director, can hardly fail of getting a pleasant impression of the place. But the full charm and value of the work done here and the esprit de corps of instructors and students can only be realized by one who has studied here for a summer. And most fortunate of all the students who have ever attended the sessions of the school are those who have come this year, for the comforts of living have never before been so ample.
I'he foundation of the school was due primarily to the energy of Professor Franklin W. Hooper, secretary of the Brooklyn Institute, under the auspices of which it was established and is still maintained. Prominent on its board of managers from the first have been the Hon. Eugene G. Blackford, Mr. John D. Jones and Dr. O. L. Jones, and their generous gifts contributed largely to its original equipment.
For the first three summers the work was carried on at the Hatchery of the New York Fish Commission, but under much inconvenience; the necessarily limited number of students found lodgings where they could in the vicinity. But with a director so able and enthusiastic as Dr. H. W. Conn, of Wesleyan University, who took charge of the work the second summer, the school was bound to grow. In 1892, Mr. John D. Jones, already mentioned as among the first benefactors, was instrumental in the incorporation of an association called the Wawepax Society, and it is to this organi-
zation that the school owes its present ample quarters.
The laboratory which they built, after Dr. Conn's plans, was occupied last summer. This year they have put at the disposal of the students two comfortable buildings for dormitories. The one for ladies, which contains a dining room and reading roow for the whole party, is especially pleasant. The buildings have been comfortably furnished by the Brooklyn Institute. Together with the lecture hall and Professor Conn's home, also given by the Wawepax Society, they form a picturesque group most conveniently situated with reference to each other.
Their location is delightful, for they stand on the hillside sloping to the head of Cold Spring Harbor, with wooded hills behind them and across the inlet, while in the distance stretches the Sound. New York is only thirty miles away, but the quiet of the place could hardly be more if we were in the heart of a desert.
Not only do we hear no market wagons, fog horns, trolley gongs or locomotive whistles, but not even a town clock disturbs us. The rest to tired nerves is almost equal in value to the benefit to be derived from the work; to some people it may mean quite as much.
The laboratory deserves fuller description. It is a pretty building, 72 feet long by 36 feet wide, finished exteriorly with shingles and interiorly with polished Georgia pine; a large brownstone fireplace partly fills one side of the main room. There are wide and high windows close together on every side, so that light and air are as abundant as possible.
Through the warm July days it has not been uncomfortable. Broad working tables fitted with drawers stand in range of the windows along the sides of the room in sufficient number to accommodate about forty students. There are six rooms fitted up for pri vate laboratories for the professors and investigators. Along the center of the main room aquaria are placed, through which fresh or sea water may be made to pass at will by turning a stopcock in the pipes above. Nothing in the life here is more entertaining than to watch that of the forms which for the time inhabit these aquaria. To-day we may find the sides of one beset by star fishes, little and big, their ambulacral feet clinging so fast that they will lose some ather than let go, if you attempt to move them. Be low them hermit crabs are looking out from snail shells of varying sizes; a spider crab is dining off her own eggs, which she picks out with her Iong claws, while another is feasting upon a dead brother.
Scollops are popping up and down in jolly fashion, and great clumsy whelks have their broad yellow feet
spread firmly upon the side of the aquarium where they are companions in exile.
In the next one, perhaps, there is a mass of squids' eggs in long, airy looking sacs, from which, one by one, minute independent squids now begin to swim into sight. Farther on we may see botanical specimens: delicate green or red algae, and beside them in the next aquarium is a pond lily plant, root, leaves and fruit all in sight. Yesterday one aquarium was full of beautiful sponges, of which several varieties are
found in the Sound. To-morrow some of these forms found in the Sound. To-morrow some of these forms
that we have watched with so much interest will give place to others perhaps even more curious.
These specimens are, for the most part, brought in by dredging parties who go out in the naphtha launch belonging to the laboratory. It is run by a man who knows just where to "let down the net" for everything these waters yield. The boat is swift and fairly comfortable, and the excursions upon it are among the most delightful and profitable features of the life here. The working day begins at nine o'clock in the morning, when Prof. Fernald, of the State College, Pennsylvania, gives a lecture in the course in zoology and Prof. Conn gives one to advanced students in his course in embryology. These last an hour, and then all pass to their places at the tables in the laboratory. Each student is provided with the instruments he needs for dissection, and with a microscope, if he has not brought his own. The morning is all too short for the work that is to be done-the verification of the lectures or the study of some forms kindred to those presented by the instructors.
Let us go about the room during one of these ex perimental hours. We may find some students watching the development of newly fertilized eggs of oysters or squids. Here a young man is working out the nervous system of a species of worm-no easy task. We notice that a group is studying the lobster. They are at various stages of progress; one lady is making careful drawings of each of the appendages, while another is already tracing the digestive tract, and a third is finding the chain of nerve ganglia and their connections. The instructors are going about from place to place, adjusting a lens for one student, directing a cross section here, advising a better mode of procedure, helping or suggesting, as the case may be, but always attentive and unflagging in interest.
Many students are taking two courses, and in the afternoon two more lectures are given; one in the course in botany, by Prof. Johnson, of Michigan University, the other by Prof. Conn, on bacteriology. The afternoon laiooratory work is largely botanical. Here is an enthusiast who has scarcely been seen since the day of his arrival without a quantity of mushrooms about him; he draws them, makes water colo sketches of them, dries them, labels them, calls your attention to their beauties and peculiarities-does everything but eat them. Across the room we find several students are making slides. Their skill and success is evident if they invite you to look through their microscopes, for you find they have captured sea anemones and hydroids with tentacles spread, and the delicate forms have all the interest of a living specimen, save that they are motionless.
The students may be divided into three genera classes: First, investigators who are working toward Ph.D. degrees it some college or university; second, teachers of science who have come to learn better methods, to get laboratory practice and to find out the latest opinions on unsettled questions in science; for example, whether both botanists and zoologists are the youming volvox. The third class ill the youngest students, who are still undergraduates in college, or are supplementing the work which they have just completed there, preparatory to teaching or
other practical science work. Most of these are from other practical science
Wesleyan University.

But whatever the attainments or objects of all these students, there is no discounting the zeal and enthusi asm with which they study. The generous willingnes to show what they find out so characteristic of the great scientists prevails here. Not a day passes but we see as interesting objects through other microscopes as our own.
The later parts of the day are devoted more or less to bathing, boating on the harbor or one of tha ponds close by, or to rambles in the tempting woo 1 s . The wheelmen are among us, of course, and come into breakfast or dinner with cyclometer records 'hat fill us with amazement, but which they assure us are quite within the bounds of moderation. Souretimes we have an evening of college songs, jolly, rcllicking and care-dispelling as nothing else can be.
Once a week an evening lecture, semi-»opular in its character, is given, and to this resident; and summer dwellers or visitors at Cold Spring Har'sor are invited Prof. Conn opened the course with a suggestive lec ture on "Evolution." Prof. Fernald followed with a charming account of "Three Months $n$ the Bahamas." This week we have had an illustrat,ed lecture on our common wild flowers by Mr. Van Brunt, of New York The beautiful colored photographs which he shows are
make, he says, " because the flowers are so full of life and move so much." But they have succeeded in getting pictures as poetic as they are true.
Reference has already been made to Prof. Conn's course of lectures on bacteriology. His investigations in this field, which have put him among the foremost bacteriologists, are carried on at the laboratory during the summer. Some ninety colonies of bacteria are under examination, the preparation of their culture media, their sterilization and that of the utensils used about them, the daily record of growth, multiplication, etc.-all this work is carried on under Prof. Conn's direction by his students and assistants. In time these ninety colonies will be differentiated and their value or deleterious effects will be tested.
Besides this work, the cultivation of Prof. Conn's famous "Bacillus Number 41 " is carried on here, and from here it is mailed to creameries far and near where it has been adopted. The fact is that the application of this bacillus to butter making is revo lutionizing the business, for not only does its introduction into the cream give a superior flavor to the but ter, but it also makes it keep better. Already, some Iowa creameries have made between $\$ 20,000$ and $\$ 30,000$ by its use, for the reason that whereas they were for merly not able to get their butter into the seaboard markets soon enough to command the highest price, now they do, for they can sell their product for fresh butter.
This practical outcome of investigation with the bacteria which thrive in milk can hardly fail to act as a stimulus to some students at.the laboratory to per severe in their patience-taxing study, and it is not unlikely that the world may some day see important re sults from their work. To the students least ambitious for renown or reward of any sort there is a stimulus in the thought of Mr. Benjamin Kidd that "in our time biology has been raised from a mere record of isoted facts to a majestic story of orderly progress.
Cold Spring Harbor, L. I., July 27, $1895 . \quad$ A. D

## A Great Gas Holder

The recent completion of the largest gas holder in America, in connection with the largest metal tauk ever constructed, is an event in the history of the gas industry worthy of notice.
The holder in question was built by Messrs. R. D. Wood \& Company, of Philadelphia, for the New York and East River Gas Company, at their works in Ravenswood, Long Island City, nearly opposite Sixty fourth Street, New York City. It has a capacity of five million cubic feet. It is the first holder of importance built in this country with the inner lift rising above the top of the guide frame when fully inflated.
The general dimensions of the holder are as follows :
First or inner lift...... . 179 ft .0 in. diameter by 48 ft .6 in. deep.

| First or inner lift...... . 179 ft .0 in . diameter by 48 ft 6 in . deep. |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Second lift.... .... | . 182 ft .0 in. | " |  | 49 ft .0 in . | " |
| Third lift. | $184 \mathrm{ft}$.6 in . | " |  | $48 \mathrm{ft}$.6 in . | " |
| Fourth or outer lift. | $187 \mathrm{ft} 0 in.$. | " |  | 49 ft 2 in | " |
| Steel tank... .... ..... 190 ft. 0 in. " " 49 ft |  |  |  |  |  |
| Guide fr | , 148 feet his |  |  |  |  |

The tank rests upon a concrete foundation, the space under the bottom plates being filled with a cement grouting run through holes in the plates after the bottom was lo wered upon the foundation.

The tor, of the tank shell is stiffened by a horizontal plate gi: der, 48 inches wide, which serves as a walk around che tank, extension plates being placed back of eaclis standard to perinit passage.
Wr.an the holder is fully inflated, the crown is over $40 \mathrm{ff} \dot{\mathrm{t}} \mathrm{t}$ above the top girder and is reached by means of ic chain ladder kept taut by a weight on its lower en $\mathfrak{d}$, working in guides. When the holder is filled with g 4 s , the crown is 240 feet above the level of the rround.
The largest holder of the world is that built by Messrs. Clayton \& Sons for the South Metropolitan Company, at East Greenwich, London, and which possesses the enormous capacity of $12,200,000$ cubic feet. It consists of six lifts, of the following dimensions :


The depth of the masonry tank is 34 feet, 13 feet of which is below ground and 21 feet above.

## Curves of Least Resistance.

A novel method of determining the curves of least resistance in water and air was recently employed at Newport News, and was described in the American Engineer of July by M. Moulton, S.B. The idea was to make the water and air themselves shape the model, and accordingly rectangular blocks of ice were towed in the water, and the alterations in their shape and in the pull necessary to keep them moving at a certain speed carefully noted. The method proved quite suc cessful, and the experiments will be continued until complete data are obtained. Wax was the material used for the models moving in air, and the air current were heated sufficiently to gradually melt the wax.

## AN IMPROVED LAWN MOWER.

In the lawn wower shown in the illustration the knives are driven by crank and pitman connection with the ground wheels, the driving mechanism being located entirely within the outer face of the irame, and there being no projections to collect the cut grass. The improvement has been patented by Mr. Edward Ingleton, of Pottstown, Pa. The axle carrying the ground wheels is journaled in depressions of the side or cheek pieces of the frame, the wheels being cupped on their outer faces. The wheels are loosely mounted,


## NGLETON'S LAWN MOWER

and ratchet wheels on the axle adjacent to the hubs ar adapted for engagement by adog on each wheel, th dogs turning the axle when the mower is pushed ahead and slipping over the ratchets when the mower is drawn backward, the cutting mechanism being then inoperative. In each of the side pieces is a horizontal depression or well having near its center an opening. The shaft of the cutter is journaled in the inver walls of the wells, and on the shaft are spiders which carry the spiral cutting knives, extending from the inner face of one side piece to the inner face of the other side piece, the knives being thus protected from obstacles at the sides of the machine and adapted to cut a swath of nearly its full width. An internally toothed gear on each end of the axle, within the flanged portion of each ground wheel, as shown in the small sectional view, engages a pinion on a short spud axle, and each pinion has a crank disk connected by a pitman with a crank disk on each outer end of the knife shaft, the en tire driving mechanism being thus inclosed and pro tected, permitting the machine to be run very close to trees, flower beds, etc. At the lower forward portion of the frame are rollers, and the handle is suitably pivoted to the rear portions of the side pieces

THE "HOME TRAINER" FOR TESTING BICYCLES.
The delivery in perfect order of bicycles purchased by customers is, in the cycle trade, an occurrence that is unfortunately too rare. All cyclists who read thes lines will recall the disagreeable surprises that a badly


THE "HOME TRAINER" FOR TESTING BICYCLES.
keyed crank, too taut a chain, etc., has caused them upon unpacking a machine shipped from the factory It is because a bicycle, which seems at first sight a very simple machine, is in reality very complex. Even if it is put together with extreme care, there is no guarantee, before it has been tried, that all the parts of it are in perfect unison. The union of excellen pieces may form a detestable machine.

Now the testing of a bicycle at the factory presents inconveniences and difficulties. One of the first is the soiling of the pneumatic tires, which the customers like to receive with an aspect of absolute newness and which a trial in a factory begrimes beyond remedy.

On another hand, one of the principal difficulties of such trials consists in the want of sufficient space, especially at Paris, where considerations of rent have a genuine importance and where a hall thirty or forty yards in length by twenty in width devoted solely to the running of bicycles before sale would constitute a luxury. a happy application to the trial of machines of what is known as the "Home Trainer," an apparatus well known in cycling and that permits the bicyclist to train himself at home, even in his bed room. cylinders, hollow in the center and rolling with slight friction upon the extremities of their central axis in a wooden frame. Above the cylinders there is a plat form that permits the tester to mount upon the ap paratus in order to place the machine, which a sup given the pedals a few kicks, he lets go of the sup equilibrium as in the ordinary use of the bicycle. cycle is here at the same time the motor of the three rests, and, through the endless chain running over the carries along the steering wheel of the bicycle.
All the parts of the machine therefore operate a they would do in the hands of the purchaser. The wheels too much play? If so, he remarks it at once and sends the machine back to the mounting shop. He sees whether the handle bar is well screwed in the matic tire bursts as soon as the machine begins to roll from the place of manufacture, would prove very em barrassing to the purchaser, besides making him very angry.
We would recommend the use of this machine, then to all bicycle ínanufacturers.-La Nature. paratus designed to serve as a hose tower, fire escape, adapted to be coiled upon the truck or readily extended to any necessary height, the pitch of its inclination being easily regulated. The improvement has been patented by Mr. Francis M. Painter, of No. 609 Pin Street, St. Paul, Minn. Fig. 1 represents the appara tus with the ladder extended to the upper floor of a building, Fig. 2 being a bottom plan view showing the connection between the ladder sections, and Fig. 3 transversely on the truck is a drum whose body is tions, and the druw is on a shaft with end cog wheels which a wrench is applied to turn the drum to wind up the ladder, pawls preventing the shaft and drum from turning back. To raise the ladder and unwind it from the drum, cables are secured to and adapted to be wound on the drum with the ladder and unwound as the ladder is $r$ aised. These cables extend over guide pulleys and are secured to a drum whose shaft is connected by gears with a
squared shaft to receive a winding
crank. The lower end of the ladder is hinged to the drum at one edge of one of its facets, the several sections of the ladder being hinged together on the inner side, as shown in Fig. 3, to enable them to fold compactly on the drum, and each ladder section hav ing at one end and on each rail an arm overlapping the rail of the adjacent section and fitting in a side socket therein. On the side of one of the rails oppo site the arm is a bolt sliding in keepers, as shown in Fig. 2, the bolts being automatically moved when the ladder is raised or lowered, each bolt being connected by a rod to the next ladder section below. A guide comprising opposite end frames and auxiliary me chan ism straightens and adjusts the ladder as it is raised, and at the top of the ladder is an adjustable cross bar carrying the several nozzles and hose, the nozzles being held in place and the hose held to the

In the manufacture of the Rochet bicycles, we have

This apparatus, of which our figure gives a very exact representation, is formed of three large wooden port holds in equilibrium at the moment of the start ing or stoppage of the bicycle. After the operator has porting bar and rolls in place, keeping the sam

It will be remarked that the driving wheel of the bi cylinders. It moves by friction the two upon which it touthed wheels seen at the bottom of the figure, like wise actuates the front cylinder and consequentl tester rides it for about five minutes. Has one of the head, and whether the pedal bracket, the pedals, the keys and the nuts need tightening, etc. Sometimes an air chamber pinched between the felly and the pneu Such an accident, happening on the first day of using the machine, sometimes at two or three hundred miles

## A HOSE TOWER AND FIRE ESCAPE.

The illustration represents a fire department ap geyser, and truck, and which has a collapsible ladder representing the sections partially opened. Mounted faceted to facilitate folding on it the ladder secengaging other cog wheels with squared shafts, to
ladder by keepers. When the ladder is raised, the cross bar may be adjusted so that the nozzles wil point as desired, and the hose are provided with coup ings at frequent intervals, as many sections of hose as it is desired to use being connected with the engine supply pipe. The ladder isalso provided with a speak ing tube made up in sections and with a gong near each end. A car for use in rescuing people from a building, and adapted to be raised or lowered opposite the windows, is suspended from a guide pulley at the top of the ladder, the cable passing down over a drum

painter's hose tower and fire eicape.
journaled in the truck frame, the car being raised or owered by winding or unwinding the cable by turn ing the drum. The car may also be used as a plat. form on which the firemen may stand, and in the ront part of the truck frame is a hose reel on which extra hose may be wound.

A TOOL FOR CLOSING WATER PIPES.
When it is desired to close pipes where a stop cock cannot be used to shut off the water, in making re pairs, the tool shown in the illustration is designed to facilitate the work. It has been patented by Mr. John J. Meyer, of No. 22 East One Hundred and Thirty ourth Street, New York City. The hollow stem of the tool has at one end a head and its opposite end is screw hreaded, and adjacent to the head are collars clamping between them an expansible washer. One of the outer collars is connected by a sleeve with inner collars clamping a second washer, the inside collar being engaged by a tube surrounding the stem, and there being on the outer end of the tube a wing nut engag ing the screw-threaded outer end of the stem. To pre vent the stem from rotating while the nut is being urned a pin may be passed through an opening in the outer end of the stem, and an opening in the sleeve connecting the washer clamping collars communicates with an opening into the bore of the stem,to allow the escape of any water which may leak past the first washer. When a pipe is cut or broken off, the tool is quickly nserted in its broken end, allowing only one gush of water to escape, when a few turns upon the wing nut orce the washers into tight engagement with the inner walls of the pipe. This tool may also be used


## GEYER'S PIPE CLOSER.

for closing gas pipes. To remove the tool without considerable loss of water, a stop cock of the ordinary construction may be employed, and its casing slid ver the tool before or after its introduction inte the pipe, a suitable connection being made between the casing of the stop cock and the pipe.

## The New Graving Dock at Southampton

The ceremonies of opening the new graving dock a outhampton, England, took place August 3. The Prince of Wales and great crowds celebrated the event It is the largest single graving dock in the world, being 750 feet in length on the floor and is so constructed that it could be made 250 feet longer. The entrance has a width of $871 / 2$ feet at the sill level and 91 feet at cope, the dock width being $1121 / 2$ feet.

IMPROVED COMPOUND REVERSING ENGINES. In recent numbers of Engineering an illustrated description has appeared of the extensive works of the Glasgow Iron and Steel Company's works at Wishaw, which are known throughout the world for the excellence of their iron productions. Of plates alone, some thirteen hundred tons are turned out weekly. We herewith give an engraving of the engines pertaining to the plate rolling mill of the establishment, for which and the following particulars we are indebted to Engineering:
These engines, massive in design, were constructed by Messrs. Duncan Stewart \& Company, Glasgow. The cylinders are 52 inches in diameter by 60 inches stroke, and the engines are geared in the ratio of about 2 to 1 . The large spur and pinion wheels are made of steel, and have straight teeth covered over with a neat, serviceable, plated hood fitted with steps and handrail. The engines are fitted with piston valves and reversing straight-link motion. The eccentric rods have adjustable brasses for taking up the wear. The valve adjustable brasses for taking up the wear. The valve
motion is reversed by a steam cylinder, with regulatmotion is reversed by a steam cylinder, with regulat-
ing oil pressure cylinder of the most modern type, ing oil pressure cylinder of the most modern type,
having steam and handling gear worked from the having steam and handling gear worked from the
platform. The engines are also fitted with a reservoir oil tank fixed on the platform, from which pipes are
the fingers: when the older clerk would plan dis agreeable surprises for the boy, in the educational line, utilizing for the purpose his superior knowledge of drugs like cowhage, hellebore or capsicum pods, or setting him to work on a batch of mercurial ointment, supplying him with the freshest of lard and highly enjoying his perspiring efforts to incorporate the coy and elusive mercury.
However, the mill has taken the place of the mortar, and the clerk no longer makes mercurial ointment, nor powders crude drugs, and he now charges the soda fountain from a cylinder and saves his shirts. Occasionally the accidents of the druggist partake of the comic, as when a young friend of ours, just ready one Sunday evening to go out with his best girl, was called upon to prepare a pint of "black oil" and, adding the acid sulph. all at once with a vigorous shake to the other ingredients, was transformed instantaneously from a well dressed and scented beau to a lugubrious specimen of disappointed hope and illsmelling clothes. The spot on the ceiling long showed the center shot of the prescription.
A large bottle of stronger ammonia, in the hands of a clerk who was on a step ladder, having been broken by an unlucky tap against a step, no little irouble and pain was caused by some of the contents running
had lit been in the way. During the same week we saw in another store the effects of an explosion of a tube of nitrite amyl, where thousands of particles of glass were blown into the near-by woodwork. The pharmacist was almost directly in front of and near the tube when it " went off," but most fortunately for his countenance, not to say eyes, he had moved his head to one side at the moment of explosion-a close call.
Probably sulphuric acid has left its mark in the form of scars upon more druggists than has any other article in his line. We once knew a clerk in an Eastern city who broke in handling it a carboy of the acid, and was pretty thoroughly saturated with the fluid. It was sheer good luck in his case that the back door opened upon the Erie Canal, into which be jumped instanter, saving his flesh though losing his trousers. The same establishment furnished another victim a little later, who in pouring acid from the carboy into a pitcher (the old way), splashed his face with a little acid, which struck the corner of his eye. The pain caused him to quickly jerk the carboy to an upright position, which movement threw out an additional quantity of the caustic fluid upon his arm, which was bared to the shoulder. This accident left our friend with a bad scar on his face and caused running sores lasting many years upon his arm. Instances of similar accidents


IMPROVED COMPOUND REVERSING ENGINES.
conducted to each of the main shaft bearings. Steam can also be turned into the oil pipes to clean them out, should they get choked at any time. Sight-feed lubricators are also provided. The engine bed plates are strong and massive, having a large base for fixing down to the foundations, which are of concrete. The main stop valve is fitted with a screw-stop by-pass without opening the large valve. Disengaging gear is fitted to the main shaft, so that the clutches can be thrown out when required.

Some of the Trials of Druggists.
The California Druggist says: The life of the phar macist is not always free from adventure nor his path from thorns, and even though he may gather in seven hundred per cent profit on an emetic or a dose of salts, there are contingencies in his business that the average merchant does not share. From the time when the druggist's boy burns holes in his shirt with acid, charging soda fountain, to the haling of him before the county judge, as proprietor, for repeating a "prescription" once too often, he must ever be on his "prescription" once to
The time was-we know a few old fellows who re-member-when the long green vial was in common use, and when the thin glass was fain to crush in the process of corking, entailing painful consequences to
down the iront of him, beneath his loose overalls. It |might be multiplied indefinitely, and almost every old was no fun for the young man, though his companions drug store could furnish reminiscences of startling extook it that way. This was in a wholesale store, and plosious and sudden combustions more or less serious a somewhat similar accident befell another of the boys, in their effects, but which the progress of pharmaceu again by the step ladder route. In taking down a bottle of nitro-muriatic acid, some of the acid was spilled directly on the top of his head in some unaccountable way, and such a mass of capillary stickiness resulted! The near-by water faucet and the ready resources of the chemist prevented very serious consequences. Not so easily, though, did the packer escape when agutta percha bottle of hydrofluoricacid, which he was pressing into a small space in a box of goods, threw out its stopper, sending a small quantity of the acid into his eye. The incident furnished another instance of the value of the gold-medal chemist, whose promptness and skill saved the victim from blindness. A still more serious trouble came upon a poor fellow we knew whose position as under-porter obliged him to repack Paris green. Disregarding instructions as to protecting his nose and mouth thoroughly from the dust, he inhaled enough of the poison to render him a physical wreck. For a long time he was under pension from his employers, till death came to his relief.
Recently we were shown a rough hole in a drug store shelf, made by the top of a bottle of peroxide of hydrogen which exploded beneath and which would just as readily have gone through the druggist's head
tical knowledge is rendering less and less frequent.

## Seasoned Railway Cars.

The Railway Master Mechanic says: The quality of the "well seasoned" wood ordinarily employed in freight car construction was nicely demonstrated recently by the reweighing of some cars which were built by a carbuilding concern nearly two years ago, and which could not be accepted by the road for whom they were built because of its financial straits. When completed they were weighed and the weight stenciled on each car. When disposed of a few months ago they were again weighed for some reason and each car was between 1,000 and $2,000 \mathrm{lb}$. lighter than when placed on the side track. The drying out process was, we trust, complete. This incident provides an argument in favor of a standard freight car, or at least standard dimensions for all the principal timbers of a car, for then the roads could insist on drier lumber being used, while as things are at present no builder can purchase in advance a stock of material which can be utilized without excessive waste, and he has, there fore to obtain the best seasoned lumber available at the time the contract is made.

## PHOTOGRAPHIC PRINTING BY MACHINERY.

 (Continued from first page.)up from the bottom of this compartment is a subnerged roll. Running down vertically in the center of the sides of each compartment is a slotted way to guide the axes of small, loose, brass rollers which carry the paper to the bottom and freely revolve as the paper moves forward.
Over the division of each compartment is an actuating roll, all being geared to a worm screw running along the top edge of the long tank its entire distance, which gives every roll the same speed.
The paper, after passing over the submerged roll (Fig. 4) and down again, thence up out of the tank over the roll between the first and second tanks and down into the fresh ferrous oxalate developer in this tank, shows the images half developed out. The electric lamps overhead are a non-actinic red.
Coming out of the second tank, the images are fully developed, thence the paper passes on into the third vat, containing dilute acetic acid, which dissolves out all of the iron left in the paper from the developer, and acts as a check to further development, thence in the next vat the paper is washed with water: next it passes into a fixing vat containing a solution of byposulphite of soda, is again washed in the following tank, then it passes into a vat of alum water, which hardens the film, and finally goes through two or three vats of water, receiving a final spraying, as shown in Fig. 4.
From the last spraying it is led onto an endless canvas carrier into a long inclosed chamber filled with a current of warm air, heated by a gas furnace noticed near this end. At the end of this heated chamber the paper comes out perfectly dry, and is rolled up with the pictures all on it. When the run is complete the roll of pictures is un wound, they are cut off to the respective sizes desired, and mounted in the usual way.
While the paper is traveling over the several rolls, attendants with sponges sponge off any airt or light material which may cling to the surface as it is drawn up from the solutions. At the further end of the trough the paper with the pictures upon it may be seen traveling upward.

A very curious anomaly is the mixture of white and red light in the developing room. The two lamps over the developer and roll where it is unwound are red, while all the others are white. There is just enough red to neutralize the white at the beginning. Thus it makes the brightest dark room we call to mind, and was a surprise in art of photographic manipulations.
There are twenty-seven rollers on the large box tank and the tank itself is not far from one hundred feet in length. The paper travels through the tanks at the rate of ten feet per minute, and it is possible to arrange enough cabinet negatives in the exposing machine to expose 245 cabinet pictures in a minute. But an ordinary day's work of ten hours yields 157,000 cabinet pictures.
We are informed this is the only machine of its kind in this country, and but one other is in Germany. The work which we saw made by it was very satisfactory and uniform.
In dealing with such large quantities of material, uniformity appears to be easily attained, and the ap plicability of a similar machine, properly modified to


Fig. 4.-THE DEVELOPER TANK.
the development of negatives and films having had reasonably unifor!n shutter exposures, may be a pos sible outcome of this invention.

For the foregoing particulars we are indebted to the Automatic Photograpn Company, No. 25 West,Twentyfourth Street, this city, through whose courtesy we were permitted to witness all the details of this remarkable and interesting apparatus and plant.

## The Use of Naphtha

The greatest care should be observed in the use of naphtha, which while a most valuable agent to clean delicate laces, light silks and ribbons, is a very dangerous liquid. It is so extremely volatile that ignition will take place even when it is removed by the distance across a room from a light, and it should never be used except in the daytime. Articles cieansed by this means should be promptly and thoroughly aired; it is a good plan, the Commercial Bulletin suggests, when the weather permits, to do the cleaning out of doors, leaving even then the things cleansed outside for a longer airing.
The need for this was recently emphasized to an up town woman, who washed a number of gloves, some
laces and ribbons, and, fearing to leave them around the room, as she was called away before they were aired, bundled them into a box, which she shut up in a trunk in a closet.
Later, she sent a maid to get them out, who took a lighted candle to the closet for the search. When the trunk was opened, a slight explosion followed almost immediately. Enough of the gas from the naphtha had been generated and held in the confined space to ignite as the candle flame approached. No serious results followed, fortunately, but the warn ing remains.

## Last of the Philadelphia Cable Car

A few days more will witness the ending of the cable system as a means of passenger transportation in Philadelphia. Within a week every remaining cable car on the Market Street main line, the last link in the cable system, will be displaced by trolleys. The passingof the cable cars marks a step in the progress of street railway facilities in Philadelphia. When the system was introduced, it was looked upon as a solution of the problem of rapid transit, and on the strength of this opinion the Philadelphia Traction Company invested a fabulous sum, estimated to be in the neighborhood of $\$ 8,000,000$, in equipping the Market Street, Columbia Avenue, and Seventh and Ninth Street lines. But while they were an improvement over the jogging horse cars, they by no means proved satisfactory, and it is with no regret that the cable system has followed the horse car line in giving place to the trolleys. The cost of construction of the cable lines was enormous in comparison with the equipment of the trolley lines, the cost of operation was greater, and the service ren-


## Fig. 2.-DETAIL of Exposing apparatus.

dered was less efficient. As a consequence, the cable cars have been forced out of service by the system which has demonstrated its superiority. The machinery at the power stations, now lying useless and idle, represented to the Traction Company an immense amount of money, and it would appear on the surface to be a sheer waste of hundreds of thousands of dollars to dis pose of all the gigantic driving gear for a mere song to be broken up for scrap iron. Yet it is useless for any other purpose, and the Traction Company has disposed of it all to a scrap iron firm for the best bargain it could obtain-the great winding drums, around which the greased cables passed, and the heavy driving ma chinery, weighing thousands of tons, all of which are to be converted into iron and steel junk. Of all the machinery in the immense plants, the engines and boilers are alone valuable above the price of old iron. -Philadelphia Record.

An Automatic Letter Registering Machine
There were in the United States on the first of Jan uary 69,912 post offices, and every postmaster is obliged, when requested, to register letters and other mail matter offered, on payment of a charge of 8 cents therefor, and give the sender a receipt. This does not make the government responsible for loss, bu facilitates tracing up such mailed matter when nec essary. But the taking of a letter to a post office to obtain registry and a receipt therefor from the post master or his assistant requires time, and is often at tended with not a little inconvenience. To obviate this difficulty a coin-controlled registering machine applicable also for other purposes, has been invented and patented in the United States and various foreign countries by Count Detalmo di Brazza Savorgnan, of Rome, Italy, at present residing at the Hotel Savoy, New York City.
The machine has a locked registering table and let-ter-receiving box, to be unlocked by a coindropped in a slot, which sets in motion mechanism for weighing and numbering the letter or package and dropping it into the letter box, also correspondingly dating, num bering and delivering a receipt therefor. A duplicate register, accessible only to the post office officials, is at the same time made upon a paper band within the machine, this band being formed into a book, and the machine having devices by which it becomes inopera tive when the supply of record paper is exhausted The mechanism for controlling the different move ments and operations so that they must occur in regu lar sequence is described in full detail in the patent and the Patent Office has allowed twenty-six claim for novelty in the invention. It is designed, by the
aid of this improvement, to render it possible to register a letter almost as conveniently as one now drops it into a letter box, these machines being provided at suitable places, as in the leading hotels, large office buildings, etc. We understand that the New York post office officials intend to place one of the machines, when completed, on trial in this city.

## Atlanta Exposition Notes.

Mr. A. Macchi, Commissioner-General for Europe for the Cotton States and International Exposition, has returned to America to superintend the installation of the exhibits from the European countries, which comprise splendid products from Belgium, France, En land, Germany, Austria, Hungary, ltaly and Russia The exhibition of foreign-made bicycles is likely $t$ prove of particular interest. A fine opportunity of comparing the foreign machines with those of Ameri an make will beafforded. Manufacturersin Englard, France and Italy will send bicycle exhibits. Great Britain has been quick to appreciate the advantages of exhibiting at the fair, as she consumes largequantitie of the products of the cotton States.
The exhibit of the mineral resources of the United States to be made at the Atlanta Exposition, under the direction of Dr. David T. Day, of the Geological Survey, will be, the doctor says, the most thoroughly representative and best classified exhibition of the nineral resources of the country.
The feature of the exhibit will be four oil paintings, each 120 feet long, showing four sections of the Appala chian range of mountains, drawn on the scale of one foot to a mile. By these paintings every mineral and al vein in the Appalachian system will be seen, and
the picture will show at a glance the immense
wealth of the region in these products.

## Signal Service Wanted.

The Board of Police Commissioners of New York City, at their meeting July 26, adopted the following resolution upon recommendation of Commissioner Andrews :
"With a view of selecting a police telephone and signal system for the use of this department the board invites all persons interested in systems of this kind which have been in successful operation to submit to the board information in regard thereto.
"Such propositions as are made, the board an nounces, must include a perfect system of elec-
trical and telephone communication between the sta tion house and parts of the precinct; it must be simple of construction and capable of being readily under stood and operated, yet be strong and durable and nvolving all the modern improvements in the line of police signaling.
"Information for the use of the board should first be submitted in written form, accompanied by such draw ings and illustrations as may be necessary for a pre iminary investigation of the merits of the varions sys tems. Later the board expects to be able to afford opportunity for the practical operation and comparison under the supervision of the officers of this department of such of the proposed systems as are deemed worthy hereof.
" In extending this invitation it is expressly understood that the department has at the present time no fund available for the establishment of a system, or even for experimental purposes. All expense must, therefore be borne by the parties offering their systems for in vestigation, and in no event can there be any liability upen the police department.'
An adequate police signal system will cost about $\$ 500,000$.

Test of the Gun Lift Battery
The members of the Board of Ordnance and Forti fication witnessed the test of the new gun lift batter at Sandy Hook on August 7. The battery is the firs one with a guu lift completed and in operation in the United States and was the first to be officially tested. It forms part of the defenses of Sandy Hook. The battery is composed of two modern twelve-inch guns which are mounted on the new gun lifts, which differ from the Crozier-Buffington disappearing gun carriage heretofore tested, in that they lower the guns some distance below the parapet and are worked by hy draulic machinery, and not automatically by the recoi of the gun. The disappearing carriage, so called, is only lowered a few degrees below the parapet; the guns, which are mounted on the gun lifts, are placed on the top of a conical mound, the sides of which can be swept with rapid fire guns; the battery is worked on the "pair' system, that is, when one gun is being fired, the other of the nair is being loaded below and is raised for its discharge when its mate disappears In the test ten shots were fired, five from each gun of he parr. After deducting the time lost while waiting or passing vessels to get out of range, the ten shots were fired in about thirty-eight minutes.

In China, "the land of opposites," the dials of clock are made to turn round, while the hands stand still.

China is nothing unless she is primitive, and although the factory which forms the subject of these remarks is not exactly situated in Chinese territory, as it is in the Portuguese settlement of Macao, it is, to all intents and purposes, a Chinese factory, for it is owned and worked by Chinese. The premises comprise several large sheds with earthen floors, and one or two better built rooms, used as storehouses. The factory gives employment to several hundred Chinese men and women. I was accompanied on my visit by Mr. A. A. Pettigrew, a son of Mr. Pettigrew, of Cardiff Castle, who is at present (May) on a tour in the East. The tobacco is not grown at Macao, but at a place called Hokshan, about forty or fifty miles to the northwest of the former town, on one of the numerous mouths of the Sikiang or Canton River. When the plants are properly dry they are done up into bales about $21 / 2$ feet long, 2 feet wide and 1 foot deep, and sent down to Macao in junks. On arrival at Macao, these bales are stored in the premises of the factory until such time as they are required for the manufacture of tobacco.
The first room we entered was devoted to stripping the leaves from the stalks, these being discarded in the manufacture. Women, sitting on the floor on their haunches, were busily engaged in this operation when we entered. The sight of us did not distract the wo men's attention, but several young children who were present on our arrival scampered away to distant corners like mice into a hole. The dust from the to bacco lea ves got! into our noses and throats and caused us to sneeze and cough, much to the delight of our celestial onlookers, as evidenced by the loud outburst of laughter which followed our discomfiture. Strange to sav, we did not hear a sneeze or a cough from any of the Chinese while we were in the factory. After the leaves have beeu stripped from the stalks, they are carried into one of the sheds in large bamboo baskets by men, then spread on a wooden floor and damped with water. When sufficiently damp they are made up into layers about $21 / 2$ feet long, 2 feet wide and $21 / 2$ inches thick and placed on boards.
The next process is to make each layer into a solid cake. This is done in the following way: About a dozen layers, with a board $11 / 2$ inch thick between each layer, are placed on the top of one another and then pressure is brought to bear upon the whole lot by means of a lever of the second order, in the shape of a thick pole. One end of the lever is fixed firmly with strong ropes, and this constitutes the fulcrum; the weight or the resisting substance is the tobacco, and the power is applied at the other end of the lever by means of stout ropes, which pass round a wooden axle that is securely fastened, to the ground.
When the tobacco leaves have been properly pressed, the cakes are taken out and cut crosswise into strips 4 inches wide and the two ends cut off, as they are not sufficiently pressed. The next step is to tie half a dozen of these strips together by means of ropes. The This is done by means of a plane, very similar in shape to an English carpenter's plane.
The strips of tobacco are stood up on end on the ground and kept in position by boards made for the purpose. As the strips are only about $11 / 2$ foot high, the men have to work the plane in a half stooping position, a most uncomfortable way of working from an Englishman's point of view. However, the Chinese do not appear to mind it, as they work away contentedly from morning to night. The shavings of the tobacco leaves are the tobacco ready for smoking. Every man puts his shavings, as he takes them from the plane, into small heaps, weighing about a pound each, inclos ing at the same time a ticket with the name of the firm
on it in the center of each heap. These small heaps are then put into papers, the two ends of the papers being left open. The packets are then weigned and a little more tobacco is added or taken a way, according to
whether the packet is too light or too heavy. When the packets are of the proper weight they are put into another paper, both ends closed up and then packed in boxes ready to be sent away.
There is a good deal of order in the way in which the factory is worked. Women are only employed in stripping off the leaves from the stalks, men do all the rest of the work. There is one lot for damping and pressing the leaves, and another batch for cutting the pressed cakes into strips and tying them up ready for planing. The planers only make the tobacco and put it into heaps, a separate lot of men put it into the firs papers ready for weighing.
The men who weigh the tobacco pass it on to others who put it into the second paper, and these finally hand it to the packers.
The tobacco is of a dark brown color and is only used, so far as I know. by the Chinese. It has the reputation among them of being a particularly good brand, and the factory is said to be one of the largest in South China. It was very amusing to see the workers at 12 o'clock, as this is the time they take their midday meal. As soon as the clock struck twelve,
In less than
five minutes tables were produced from unlooked for corners, basins of rice and other foods were placed upon them, and the men were busily engaged in emptying them by the aid of chopsticks. All the workmen took this meal in the same place as they had previ ously been working in.-W. J. Tutcher, Botanic Gar den, Hong-Kong.-The Gardeners' Chronicle.

## Advancement in Dental Surg

Some eight or ten years ago a now famous dentist of San Francisco made a wonderful stir among bis scientific brethren by conceiving and performing the operation of implanting a tooth in the jaw of a patient, and by so doing filling a vacant space caused by the forceps.
Since then, after much experimenting and an endless amount of theorizing upon the several subjects of transplanting, replanting, and implanting of teeth this wise in vestigator acknowledged that of all his ope rations in this branch of dental surgery, for one reason or another, he had to expect failure in about twenty five per cent of his cases.
His method was, after making an incision through the gum, to prepare a socket in the alveolas, or, in the event of its being absorbed, in the maxilla; then the tooth, which had been carefully kept in an aseptic condition, was ligated securely to the contiguous teeth and the patient was instructed to protect it from in jury or shock, and to refrain from using it in mastica tion until a union should take place between the im planted tooth and the bone.
The principal consideration of the old operation wa the preservation of the pericementum; and pages of dental magazines and hours of time have been devoted to the vital importance of preserving this membrane or at least a part of it, as the success in consolidation depended uponits presence.
Now, other dentists, while admiring the success of this "Father of Implantation," commented upon the failures and fell to speculating upon the fact that one case would be a success where success was hardly to be expected, and other cases would fail in spite of ery precaution that could be taken.
The principal enemies of the old methods were two -first, complete absorption of the root, and second, a tendency to remain loose in the artificially prepared socket-and it appeared for many years as though the tissues would not tolerate an implanted tooth except under the most favorable conditions, so much so that even to this day there are leading dental s
The above objections naturally limited the performance of these cases to the most progressive students among the practitioners of dentistry, and also confined the class of patients to those who would consent to the experiment, or to those cases in which the patient could
not grow accustomed to an artificial denture of the egulation pattern.
Through an accidental discovery by a prominent Parisian dentist, the importance of the preservation of the pericementum was completely disproved. This remarkable specimen was a jaw where a deciduous between the first bicuspid and first permanent molar its position being such that the second bicuspid was nable to assume its position in the dental arch and emained buried in the alveolas.
Upon the unerupted tooth the traces could be plainly seen upon the roots of the deciduous tooth, they hav ing been first absorbed by the process of development of the permanent tooth; and as the crown could not be dislodged, resorption took place and the remainder of the deciduous roots became a part of the alveolas by becoming solidly soldered to the bone, which led to he conclusion that such an absorbed root will become part of the jaw, provided, however, that it can be retained in an immovable position until the union takes place.
Experimentation followed, which led to proof of the non-necessity of the pericementum, and also that by a partial decalcification of the tooth root many of the obstacles in the way of the success of the old method would be overcome; as the cellular structure of the ementum is quickly and easily acted upon by the reorbing or soldering action of the bone cells of the axilla.
Since the truth of the above statements has been clearly proved, by the fact that if such an implanted tooth remains undisturbed for a few weeks it is impos sible to extract it as other or natural teeth are extracted, another decided improvement suggested itself to a prominent dentist of San Diego, Cal., which was in the use of roots of teeth alone for implantation, and after he solidification had taken place, attaching a crown of porcelain of proper color, size, and shape to fill the vacancy. It is a well known fact among dentists that
no two teeth that have grown in different heads are no two teeth that have grown in different heads are
alike in color, shape, and size, and only about one tooth in one thousand can be used without showing marked contrast to surrounding teeth.

* By Dr. D. Cave, of San Diego, Cal. In the National Popular Review.

The method pursued by me differs materially from ny of the old plans, and is substantially as follows : The tooth is first carefully selected for its adaptation to the case in hand. The crown is severed from the oot, which is then deprived of its pericementum and shaped to suit the operator.
The nerve canal is thoroughly cleansed and a platina tube is fitted into it, the apex of the root being filled and hermetically sealed.
It is then treated to a bath of boiling bichloride so lution, after which it is decalcified by a solution of hy drochloric acid and neutralized with ammonia.
A cap of gold is made to fit the exposed end of the oot and to this is soldered a dowel of iridio-platinum; this being secured in position, the root is dipped into a solution of iodosalol and allowed to crystallize.
This is all the treatment necessary. The root being now ready for implantation, a saturated solution of cocaine is used hypodermically to anesthetize the tissues surrounding the site of the proposed implanta tion, and a section of the gum is removed with a small tubular knife
The artificial alveolas is prepared, the instruments used being a set of specially prepared bone-cutting in sruments, driven by an Edison electric motor at a high peed.
The root is then fitted into place; the entire opera tion of cutting, drilling, and fitting being accomplished in from five to seven minutes.
After a lapse of from four to six weeks to allow the soldering process between root and alveolas to become complete, the gold cap and dowel are removed and a porcelain crown is attached which has previously bee trimmed to articulate with the antagonizing teeth.
The operation, when complete, presents a most natual appearance, both as to color and form, no gold be ing visible except by very close examination.
One of the incidental features of this process is that the gums adapt themselves to the form of such an implanted root, orat least have a very strong tendency to do so, and will always adhere closely if there is no othe opposing force than the new root; whereas, in the old process, all tendencies were toward absorption and shrinking away of the gums, leaving more and more of the tooth root exposed. This has been partially overcome, in some few cases, but the majority of them are as above stated.
The operation as here described is absolutely painless from start to finish, there being no soreness nor pain at any time during or after the implantation.

## Insects Which Are Man's Friends.

The lady bird, so quaintly marked that it is hard to find two of them just alike, is one of the gardener's best friends, yet hundreds of them are killed because people in their ignorance don't know what a helper they have in this pretty, buxom little insect. A few days ago a writer in the New York Tribune visited a friend who has a garden full of all sorts of flowers, and back of these there is the kitchen garden, with ows of currants and raspberry bushes. The leaves of both these shrubs were covered with blight or lice hat were as green as the leaves on which they ived and thrived. Hunting about the bushes were a number of lady birds. The woman in her ignorance was killing these right and left, thinking they were doing all the damage, and when told they were her best friends was incredulous. A few minutes' careful watching, however, showed the small buy busy eating the smaller green pest. Small yellow pyramids showed where she had laid her eggs, which in a day or two would hatch. The woman saw and believed, and in future the lady bird has a sure refuge and a welcome in her patch of flowers and fruit
Another insect that is forever being killed owing to the ignorance of the general public is the dragon fly, also known as the needlecase. He is one of the most useful insects of this climate. In his larval state he subsists almost entirely on tiose small squirming hreads which can be seen darting about in any stil water, and which hatch out into the sweet singing mosquito. As soon as the dragon fly leaves his watery nursing ground, and, climbing some friendly reed, throws away the old shell and flies away, he is helping man again. His quarry now is the house fly. Not ong ago the writer saw one of these insects knocked down in a veranda, where he had been doing yeoman's service, and the children and women seemed delighted, although they shrank back from the poor wounded dragon fly. They all thought he had an awful sting at the end of his long body-a cruel injustice. When the writer took the insect up there was general wonderment, which was increased when a captured fly was offered him and he ate it greedily. The boys of that household will never harm a dragon fly again.

## A Ferris wheel in London.

The great wheel at Earl's Court. Lcridon, built upon the same general plan as the Ferris wheel at the World's Fair, has been completed and was opened to the public on July 6. The top of the wheel is 300 feet above the ground and about 40 minutes are required

The Psychology of a Jury in a Long Trial.*
Take twelve men from active life, confine them in a court room six hours a day, and expect them to observe closely, remember and reason soundly on the evidence offered, with no guide except some general principles of law and equity. They are also expected to exercise judgment and discrimination of facts that require training in the most favorable surroundings. In reality the ordinary jury is selected from active working men unused to confinement, and unable to think and reason continuously on any topic outside of their everyday life.
They are untrained to discern the probable facts in a contested case, and understand the real from the apparent in the arguments of counsel. The confinement of the court room, its bad, vitiated atmosphere, with the changed diet of hotels in a long trial, make them still more unfit. A grouping of some facts will make clear the purpose of this note. In a recent murder trial seven farmers on the jury were confined five days in the court room and hotel. They all suffered from indigestion, and two of them were ill in bed for some weeks after. One of these men was a Second Adventist, and the counsel referred to the certainty of the sudden coming of the end of the world and the strict accountability of each one, and urged an
tion in the power this position brings them, and are governed in their judgments by the flattery of counsel. When told they have excellent judgment and will decide in such a way, they follow this advice, evidently. |There are always men with a mental "twist" or bias in the average jury. In good surroundings and in good health this would be conroundings and in good health this would be conbecomes a dominant factor. Strong religious, temperance and political views intrude themselves, whenever the man becomes at variance with his surroundings, and its natural physical and psychical influences. Lowering and changing the degree of health and functional activities makes him more intolerant of the divergent views of others. After the second or third day of a trial, appeals to these conceptions and efforts to make some facts apply along these lines are always effectual. Emotional, impulsive men, who are controlled largely by the surroundings, are always objects of concentrated interest by shrewd lawyers. In the first part of the trial they are not so influential as later, when the mental status has dropped down; then they may become infused with certain conceptions of the case, particularly for punishment or acquittal. The morals of a jury on a long trial are lowered markedly near the end of the case. If undue influence is used or
the great dam of the peryar, india.
The Peryar work is that of turning the water of the Peryar River, flowing westward through the wellwatered mountains of Travancore, in South India, eastward through the sterile plains of the Madura district. Six miles west of the eastern brow of the Travancore Mountains the great dam is being erected by which a lake is being formed that is to turn and empty its overflow into a tunnel already cut through the eastern brow, a tunnel 5,700 feet in length by $71 / 2$ feet high and 12 feet broad.
The first illustration shows the dam with the lake. So recently has the lake been formed that the partly submerged trees are seen sticking out of the water some of them still struggling, as it were, for their some
life.

The buildings on the knoll in the center are the resi dences of the engineers. The cutting between the houses and the spur of the mountain in the left foreground is to be the water escape when the dum is raised to its intended height. It was a great task to cut that down in the solid rock. The stone taken out has been utilized in the construction of the dam, being carried down to the river bank by a gravity railroad running to the buildings at the foot of the dam and conveyed thence by moving buckets suspended on


THE GREAT DAM OF THE PERYAR, INDIA.
acquittal of the prisoner, which was done. The effect of confinement, overeating, and bad, poisoned air, with mental strain to accommodate themselves to the unused requirements of the position, react on the brain, making its operations more unstable and uncertain. After the third or fourth day the judgment of an average juror dwindles into caprice and changeable whims. A certain number will become possessed with a dominant idea concerning the case, which will grow under any circumstances irrespective of all reason or judgment. It becomes literally an "obsession," that is, not changed, although another view may be accepted for present purposes. Others will be thoroughly confused and mentally demoralized, and incapable of coming to any conclusion. The evidence will be a chaotic mass, from which they are unable to extricate themselves. The longer the trial, the more bewildered they become, and at last follow the lead of the majority in despair of anything better. Another class becomes more and more indifferent to the merits of the case, as their physical condition deteriorates; their only interest is to reach the end of the trial ; like the former class, they sit listless, neither seeing nor hearing anything with intelligence. At the close they join the majority in any verdict. Another class of superficial, vain men take great satisfac-

* Read before the Psychological Section of the Medico-Legal Society Nov. 12, 1894, by T. D. Crothers, M.D., superintendent Wal
if such influences are purchased, the time to do this is when the effects of confinement, bad air, food and derangement of the physical system appear. However honest a jury of average men may be, a change of surroundings and physical vigor will react on their conceptions of right and wrong and strangely incapacitate them. If any of the jury are invalids, or have been confined with dietetic or neurotic diseases in the past the changed conditions of the jury room are very likely to bring out some entailments of this condition, stil urther complicating their mental soundness. Pessimistic men who are in ill health are always ready to recognize guilt and inflict punishment in every case. Their ideas of justice are always based on vengeance and punishment. The suspicion of crime is always a reality and evidence to the contrary is deception. Many of these men in excellent physical surroundings would act and reason with fairness, but change the sur roundings and degree of health, and they are unsound and unreliable. The psychology of a jury on a long trial furnishes a range of facts that, when understood the verdict of these men could be predicted with great certainty, no matter what the evidence may be.
Prof. Durand, in an article in Cassier's Magazine discusses ship propulsion by storage batteries, and concludes that for the same amount of energy storage bat teries at present weigh about 550 times as much as coal and occupy about 220 times the space.
cabres that are stretched from point to point wherever material is needed
It was at this workshop below the dam that the most serious accident of the whole enterprise occurred
Mr. Taylor, the superintending engineer, was standing over a large horizontal wheel that conveyed the power from the turbine to the buckets, when a bucke came moving along overhead. To avoid the bucket he moved aside and fell on to the horizoutal wheel and was caught and mangled. He lived but a few hours after.
The dam rises from a width of 138 feet at the bottom to 22 feet at the top. Stone masonry on each ide, with a solid mass of cement within, is the method of construction. As it rises it is to extend over the hill at the further end until its length will be 1,300 feet. At present the length is about 1,000 feet. The iver at the bottom was originally about 300 feet wide.
One of our illustrations shows the top of the dam with the swarms of coolies working on it.
The quantity of water in the dam varies greatly In the driest months it diminishes to something like 100 cubic feet a second, with occasional small freshets of 1,000 to 3,000 cubic feet a second, of short duration. During the monsoons it increases to an average of 2,000 cubic feet a second, rising at times to 20,000 or 30,000 cubic feet a second. The largest recorded flood was in November, 1873, during a cyclone, in which 28
inches of rain fell in two days. The discharge then was estimated at 120,000 cubic feet a second.
The following are further particulars kindly fur nished by A. T. Mackenzie, Esq., one of the engineers When finished the dam will be 178 feet high, 12 feet wide at the top, with a parapet 4 feet high and 4 feet thick, and will contain $5,000,000$ cubic feet of masonry.
The bed of the river is solid rock; so there are no underground foundations, and the dam is actually 178 feet above the lowest water level
The present height is 136 feet and $4,200,000$ cubic feet of work is already done. The depth of water is 89 feet, but the escapes are now stopped and the lake is being allowed to rise to 128 feet depth, where a new set of escapes are ready for it
The area of the lake will be 14 square miles and the outflow through the tunnel 1,600 cubic feet per second Its maximum depth at the dam will be 174 feet.
The tunnel has been driven all the way through hard syenite, with no slips or soft places, and is a very straightforward and uneventful tunnel.
Leading to and from the tunnel is about a wile in all of open rock cutting, 25 feet wide and from 30 feet depth to nothing.

An average of over 4,000 people were employed on

## Building a Levee with Force Pumps.

Captain George McC. Derby, the able young engi neering officer who has charge of the federal engineers in New Orleans, has announced that the attempted feat of building a levee with force pumps on the great dredge, the Raw, was successful. Captain Derby, believing that levees could be built by this means, at tempted the experiment on the levee at Nine-mile Point, opposite Carrollton. Captain Derby cannot state yet what the real result of his experiment exactly is, as the present attempt was made with a view to discover a method rather than to avoid expense. Four attempts were made by the engineers. The levee existing at Nine-mile Point before the Ram went to work was of small section and low height. It was desired to enlarge it to a size almost as great again as it then was. The Ram was stationed about 400 feet away, and the piping was laid to the work, so as to permit the pumps to send a stream of sand and water, scooped from the river bottom, to the work. This stream was delivered at a height of about ten feet, and the volume of water was so great that the consistency of the mass was very thin. Captain Derby first threw up a small levee behind the original one, and attempted to fill in the space between the two. It was found that the silt
was readily deposited, while the water ran off, leaving
unflled, thus forming between the toe of the upper terrace and the board defending the outer edge of the lower terrace a sort of cup, into which the overflow from any subsequent crevasse was caught and held. This method was found to work perfectly. Of course, in an enterprise of this kind, its practicability depends on the cost per yard of work done by the dredge. The Ram is very powerful, having been built under contract to deliver 300 cubic yards of material 300 feet distant from the dredge every hour. In practice it was found that she could deliver about 2,000 yards per working day of ten hours. The total cost per cubic yard of a levee built by the Ram to a height of 10 feet will be 3.91 cents per yard. Hitherto the price of levee work has ranged from 10 to $121 / 2$ cents on an average per cubic yard.-New Orleans Picayune.

## The 'Tourah Prison.

The chief prison in Egypt for male hard labor convicts is at Tourah, about eight miles south of Cairo, where the adjacent quarries, which once furnished imestone to the builders of the great Pyramids, supply unlimited scope for labor six days a week. There are 950 convicts, and though 100 of them are "lifers," there are others whose term is only for six months. Strict discipline is maintained by sixty five warders,


THE GREAT DAM OF THE PERYAR, INDIA.
dam and tunnel during the last season. Besides the coolies there are three steamers, four turbines from 180 horse power downward, and a large number of portable steam engines, boilers, etc. It is to be finished before April, 1896.

The total cost of the work, including distribution works in the Madura district, will be 83 lacs of rupees, or between three or four millions of dollars. Besides this, the British government pays the Rajah of Travancore 40,000 rupees annually for a lease of 999 years In return for this the British government is allowed to take all timber comprised in the watershed of the lake, for use on the works, but not for sale or export. It also obtains fishing rights in the lake-a concession worth exactly nothing. It is altogether a very poor bargain for the British government.
But the conception and completion of the work reflects lasting glory and honor upon the enlightened spirit of the British government and upon the skill of all the engineers connected with the Peryar. The illustrations are from photographs taken by Rev. W. P. Elwood, missionary of the A. B. C. F. M

Madura, May, 1895.
J. S. Chandler.

MAXIM'S cavalry gun, which fires 700 shots a minute, weighs but thirty pounds and can be carried strapped to a soldier's back. The gun he made for the Sultan of Turkey fires 770 shots a minute, but it is a field piece on wheels.
a thick, heavy mass of solid earth. As soon as this who are unarmed and do not carry even a stick or topped the rear embankment, an effort was made to raise the barrier by increasing its height from the deposit made from the pumps. The material was, however, too dense and glutinous to be worked fast enough, and a crevasse occurred. This method was then abandoned. A framework of lathes, covered with jute bagging, was substituted for the small rear levee, it being thought that the water would pass readily through the bagging and the silt be retained. The re sult was fairly satisfactory, but very expensive. Planking was then substituted on timber frames, but the stream ate out the toe of the framework and the fluid escaped. The last method was very ingenious. It was found both cheap and efficient. Captain Derby took a plank a foot wide and pinned it on edge about 12 feet away from the toe of the old levee. The board was driven alsmall distance into the turf, in order to prevent the material from seeping under and escaping. The pumps were started, and in a few minutes a terrace was formed as high as a board, the water escaping ove the board. Then a second board was set on the terrace a few feet nearer the old levee. This, too, was filled in, forming a second terrace. It was found, however, that when each terrace was filled up entirely to the height of its defending board, a crevasse was likely to occur when the next terrace was built, and the work ran grave chances of being demolished. Captain Derby obviated this by leaving four inches of each terrace
who are unarmed and do not carry even a stick or
whip; but by night there are nine sentries and by day there are four, who patrol the roof and the outside of the prison, and who know how to use their loaded rifles with deadly aim. These sentries are blacks from the equatorial provinces, and have prevented more than one attempted escape. Nearly all the convicts are natives of Egypt, the blacks only supplying five per thousand and the Nubians averaging only two per thousand. Any extra bad characters among the convicts, such as the ringleaders of attempted revolt or escape, are locked up at night in solitary cells to lessen their chances of contaminating their fellows. As a whole, the convicts are by no means of a ruffianly type, and their physiognomies are very like those of the ordinary peasant. In this country, where crime is at such a minimum and where even the lunatics are as quiet as sheep, it is not too much to hope that education and improved environment may one day do much to improve the lot of the townfolk, from whom the convicts are mostly drawn. The "ticket-of-leave" system has not?yet been introduced into Egypt, and would certainly be worth a trial, for at present there is very little incentive to well-conducted convicts to lead a peaceful, hard-working life within the prison bounds. Every visitor cannot fail to be struck with the very healthy, well-fed appearance of the prisoners, and on inquiry I was told that there were only fourteen on the sick list. -The Lancet.

## Sorrespondence.

## The Lilac Borer

To the Editor of the Scientific American :
Kindly inform me what the specimen is sent by me in a separate package marked borer in lilac bush.
This fellow, or one of his near relatives, seems to be destroying every kind of shrub and tree around my summer residence. Some branches of trees, and very large ones at that, have been sawn through, as it were, and completely destroyed.
The one sent you was taken from the center of a lilac bush's branch. Now the main thing is: What to do to kill this pest and destroyer of trees and shrubs.
You will confer a great boon on me and the people in this vicinity by informing me about this borer and his destruction.
H. J. Doll.

Buffalo, N. Y.
little bundle of silk and suspended around the waist, so to speak, by a thread of silk.
An interesting fact in connection with this butterfly is that in the Southern States, more particularly, but reaching as far north as New York and Wisconsin, a dimorphic form occurs in which the yellow of the wings is replaced by a dull black, this variety being known as glaucus Linn., and confined to the female sex. The caterpillar rarely occurs in sufficient numbers to be injurious.-C. V. R.

## PHOTOGRAPHY OF THE RETINA.

This apparently impossible feat has been performed several times, having been first accomplished in 1893 by M. Londe, a member of the French Societe de Photographie. We translate from Gaea, Leipsic, May an account of an improved method used with great success by Drs. Grebe, of Cassel, and Greeff, of Berlin.
"The eje to be photographed, $\mathbf{A}$ (see illustration), is furnished with a water cell. W, according to Gerloff's system, to avoid reflection from the cornea. Before it a clean plate of glass, $S$, is so placed that the rays from a source of light of the desired intensity can be thrown by it into the eye. At $P$ is a sensitive plate that is sheltered from outer light by means of a box, $K$. The box can be closed by a pneumatic shutter, V. On the plate, $P$, arecross lines which, when the plate is illumi nated by the red lantern, $L$, can be seen by the eye.
"The feat is performed in the following manner The eye is brought to perfect rest by means of a head support. Then the glass plate is so turned that a pro visional point of light above appears to lie in the middle of the shutter, $V$. Then in perfect darkness the shutter, $V$, is opened and the eye is focused on the cross wires of the red-illuminated plate. Everything is now ready for the photography, which is accom plished by flash light.
"The procedure can be understood without further explanation. With a minimum of light quite a large picture may be taken directly; the focusing is the

sharpest imaginable, because it is done with the ey itself. Thesmaller the picture, the sharper will be the outlines. Near-sighted eyes are very good for photo graphing."-Literary Digest.

## Cycle Notes.

A. Mercati, secretary of the Hellenic Committee of the International Olympic Games, which will be revived at Athens April 5 to 15, 1896, announces that the management will provide four international bicycle races, which will be run on a new track, which is to be built for the purpose. The programme of the races is as follows: There will be a 2,000 , a 10,000 meter, a 100 kilometer, and a 12 hour race. The two former races
will be without pacemakers and the last two with pacewill be without pacemakers and the last two with pace
makers. The rules of the International Cyclists' Asso makers. The rules of the Inter.
The volunteer service, or militia, of Great Britain includes about 7,000 bicyclists. For several years the signal corps of the Connecticut militia has been equipped with bicycles. In Belgium the bicycle is utilized for the quick moving of troops. General Nelson A. Miles recognized nearly a year ago that in the next great war the bicycle will become a most import ant machine for wilitary purposes.
Something new in the way of a bicycle trip is claimed for the journey made by four riders near Virginia City Nevada, recently. They started in at the mouth o the Sutro Tunnel on two tandems and rode through the tunnel to the shaft station on the 1,750 foot level of the Consolidated California and Virginia Mine, a dis tance under ground of $41 / 2 \mathrm{miles}$.
Bicyclists in Hillsdale County, Mich., have found a new diversion in chasing woodchucks over the prairies on their wheels and running them down. Given a fair distance to run before striking cover, the bicyclist usu ally wins and gets the woodchuck.
To clean the bicycle chain, remove it from the machine and soak it in turpentine for several hours, then clean it with a brush, as an old tooth brush, link by link, and after this dip it in clean kerosene oil and dry thoroughly with cheesecloth. See that both sprocket wheels are thoroughly cleaned and then replace the chain. Do not use oil on the chain, as it produces a clicking sound. Use graphite or any of the various chain lubricators now on the market.
The best way to clean the bearings of a wheel is to take them out and then remove all dirt and rust from
them. Keroe日e may be used to remove the gritty
substances from the bearings. The kerosene should be poured into the oil well, the wheel being kept revolving constantly. Old clothes should be worn at this job, as the kerosene is likely to splash them. The cleansing fluid can best be poured into the bearings by the aid of an ordinary oil can. Lubricating oil should be run in after the kerosene has been drained off.
An electric bicycle lamp is now being introduced into New York City. The lamp is provided with a current frow a storage battery, which furnishes sufficient cur rent to actuate the lamp for about twenty hours. The total weight of the battery and lamp is about $21 / 2$ pounds. The battery can be recharged at authorized agents' stores for ten cents each.
A fair estimate of the bicycle output of 1895 would be 350,000 wheels of all kinds.
A twenty-four hour bicycle contest at the Herne Hil track ended July 27. The winner, Mr. Hunt, covered 458 miles and 1,459 vards, and Mr . Bennett 447 miles 75 ards. Fifteen men started, but only four finished. A middle-aged woman in an old wrapper and sun bonnet was an odd figure as she rode her bicycle to her neighbor's along a Connecticut road recently. The keeping of a horse is no longer an absolute necessity to life far from a railroad station.
A milkman of Wissahickon, Pa., uses a bicycle in serving his early morning customers. He has in vented a little rig for strapping a milk can safely to the machine. Tricycles have been used a long time by milkmen, especially in England; but this is probably the first instance of the rather unstable bicycle being used or this purpose
The bicycle is being put to practical use in Philadel phia. In addition to policemen being mounted on wheels, the messenger boys in the outlying districts have been provided with bicycles and the service ren dered is very efficient, as calls can be answered in less than one-half the time it has previously taken.
An interesting bicycle will shortly be placed on exhibition. It was made by a South American mechanic from a pattern of a wheel which he saw in a magazine In three weeks this native blacksmith completed a bicycle of a safety pattern which weighs 32 pounds. The whole machine is made in the best possible man ner. The tires are made of leather tubes filled with hair and are as easy riding as cushion tires. This is the first wheel ever built in South America by a man who never saw a bicycle.
"The use of the bicycle has expanded and developed from a salutary athletic exercise into a great social obsession. It has seized upon every class of society, both sexes, all ages, and every condition of life. It is both sexes, a thes, and every condition of life. It is
taken up by the well because it makes them feel better, taken up by the well because it makes them feel better,
by the invalid because it makes them feel well, by tired by the invalid because it makes them feel well, by tired
people because it rests them, and by the rested because people because it rests them. and by the rested because
it makes them feel tired. The fat ride to get thin and the thin to get fat. It has displaced the horse. It has made the simple and ancient custom of walking most unpopular; it bas cut down the function of the steam car and competes successfully with the suburban trolley. The doctors have taken it up and expressed their approval of it, and we are far from saying a word in opposition. The bicycle has come to stay, though not with quite the omnipresent activity which it now enjoys. Already we notice grave and reverend seignior in our profession riding along the cobble stones in thei golf suits instead of lying comfortably back in their victorias. Time that used to be spent in serious scien tific pursuits at the hospital, in the laboratory, and at the desk is now shortened in order to enjoy a ride up the Boulevard. The bicycle has cut down the scien tific activity of the New York profession at least fifty per cent already."-The Post Graduate."

## A Tale of Co-operation.

A coal mine at Monthieux, near St. Etienne, in the Department of the Loire, was abandoned by its owners everal years ago because it could no longer be worked at a profit. The discharged niners, finding themselve without work, formed a co-operative concern and ob tained a title to the abandoned mine. They then se o work, and by opening new veins, by observing stric economy and unflagging industry, made the mine pay. Now note the result. The mine workers in the neigh borhood, engaged with their employers in an eternal wrangle over wages, sought, and in many cases'secured mployment in the co-operative concern. The found ers of the latter, however, would not admit the new comers on equal terms with themselves. When it cane to the question of wages, for instance, they would not pay the new men the same rates that were paid to the men who by extraordinary efforts had turned a worth less hole in the ground into a paying piece of property. When the new miners resisted and created a disturb ance, the aid of the police was invoked and the disappointed element was dispersed. No doubt they looked upon themselves as the victims of capital and the slaves of a mushroom bourgeoisie. To an outsider it only illustrates that thrift, industry, and perseverance lead to success, and that men exhibiting these qualities are not likely, whether wage earners or capitalists, to allow hiftlessness and indolence to run a way with the fruits of their laiors,-N. Y. Tribune.

Che-Foo, where the CHE-F00.
dreaty of peace between China and Japan was signed, and which is still called YenTai, is one of the most frequented ports of the northeast of China. Situated at the rear of one of the bays of the Gulf of Petchili, Che-Foo is near the two places that have been most spoken of during the recent war viz., at thirty miles from Wei-hai-Wei, and opposite the strong position and the great arsenal of Por Arthur.

It was here that in 1876 had already been signed be tween England and China the agreement through which three new ports were thrown open to foreign commerce. The signing of the treaty of the 8th of May last between the two hostile brothers of the extreme East is a new historic date for Che-Foo. Let us recal that at the time of the Chinese European war the French forces occupied Che-Foo withont resistance on the 8th of June, 1860.
Well populated (it having 120,000 inhabitants, ac cording to the consular reports of 1891), like all Chinese cities, Che-Foo has two physiognomies-an eastern and a western. In summer it plays the role of one of our fashionable bathing places, such as Trouville or Brighton. This port, whither come the foreign colonists from other points of the coast, bears the name of Yen-Tai or Yang-Tai. It is very pretty, with its villas provided with verdure-clad verandas, situated one above another upon the hill that is surmounted by the semaphore, or strewed along the shore, handsome and easy of access. One of our engravings represents this part of the truly picturesque semaphore point. There will be remarked alongside of the signal apparatus a pagoda of fine proportions whose roof rises well into the air. The postage stamp vignettes have widely dis tributed this silhouette, which is very familiar to the travelers of all nations who put into the commercia port of Che-Foo. The trade is active, both by junk


ONE OF THE GATES OF CHE-FOO.
with other ports of China and by merchant ships with the other parts of the world. America and Russia send petroleum hither and England sends cottonades and metals.
The importation of opium is considerable, and the most notable exportation is that of raw silk. At about properly so called, which is surrounded by a wall of which one of our engravings gives one of the motifsWhich one of engre a high gat In the interior ther is truly a sor of lookout. In the interior there is a truly Chinese swarming of beasts and people, and of merchandise and detritus, that mingle their goings and comings, their colors and their odors in the little narrow streets with low houses and with sunken earth that is swampy after a rain and covered in dry weather with a thick stratum of dust. The remains of fish and rot ten fruit and the odor of opium and tobacco smoke prevail everywhere. It is a living party-colored picture in a suffocating atmosphere.
Let us return to the quarter that spreads out at the edge of the sea. It was here in a simple inn, with the European sign "Beach Hotel," that the treaty of peace was signed by the Japanese and Chinese plenipotentiand With its likewise English vis-a-vis, the Sea View Hotel, the view of the sea in which are anchored the French, English, German, Russian, and Italian ships in observation, and in this scene that our correspondent $h$ as sketched from nature one might think himself at Portsmouth at, for example, the time of the last interbational naval review.
The few groups of idlers here and there, the palan-
quins to the left that a wait the coming out of the dip lomats, and the picket of honor of Chinese soldiers, who are guarding the door behind which so great in terests are being regulated, give the scene its local color. These Chinese soldiers with their brightly colored uniform, their drawn sabers and their strange shaped halberds, exhibit a more decorative than mar


A STREET IN CHE-FOO.
tial appearance, and under their straw hat their im passive face expresses scarcely anything but the ennu of a long faction.-L'Illustration.

## The Pasteur Institute.

The returns published by the Annales de l'1nstitut Pasteur for the first quarter of the current year show hat during that period 345 persons were under tieat ment for the prevention of hydrophobia, of whom $\$ 86$ were French and 69 foreigners. Of this total 23 were bitten by animals experimentally proved to be mad 224 by animals declared by veterinary certificate to be so, and 98 by animals only suspected to be so, the bites having been inflicted in 329 cases by dogs, in 15 by cats, and in one by a donkey. Only one death is reported as having occurred during the three months-namely hat of Johnson Stewart, 48 years of age, a native of that of Johno Glasg w, when bech to be wad after a post 8 by a dog which was declared to be mad after a post mortem examination made by a veterinary surgeon came to the Pasteur Institute on the 11th, and was under treatment up to the 23d. On that day, after having taken a warm bath, he caught a chill while riding outside an omnibus, and took to his bed, symp toms of hydrophobia manifesting themselves two o three days later, and causing his death on April 1.
Simultaneously the Annales give the figures for the past year, and these show that 1,392 persons were reated last year, and that of these 12 died, the mor tality being, therefore, less than 1 per cent: while if he five deaths of persons who succumbed within a fortnight of treatment are deducted, as in fairnes they should be, the mortality is reduced to $1 / 2$ per cent. The following table gives the number of persons who have been treated at the institute since M. Pasteur' discovery was made : 1886, number of persons treated 2,671 ; deaths, 25 ; rate of mortality per cent, 0.94 1887, number of persons treated, 1170 ; deaths, 14 rate of mortality per cent, $0 \% 79$. 1888, number of per ons treated, 1,622 ; deaths, 9 ; rate of mortality pe ent, 0.55 . 1889, number of persons treated, 1,830 deaths, 7 ; rate of mortality per cent, 0.38 . 1890, number of persons treated, 1,540 ; deaths, 5 ; rate of mor tality per cent, 0.32 . 1891, number of persons treated, 1,559 ; deaths, 4 ; rate of mortality per cent, $0 \cdot 25$ 1892, number of persons treated, 1,790 ; deaths, 4 ; rate


HOTRL IN WHich the treaty of peace betwenn china and japan was ratified.
of mortality per cent, 0.22 . 1893, number of persons treated, 1,648 ; deaths, 6 ; rate of mortality per cent $0 \cdot 36$. 1894, number of persons treated, 1,387 ; deaths, ; rate of mortality per cent, 0.50 .
The nationality of the patients treated last year was 1,161 French, 128 English, 26 Greeks, 26 Spaniards, 19 English subjects from India, 16 Belgians, 7 Turks, 2 Dutch, 1 Russian, and 1 Egyptian.

## The Horseless vehicle.

In matters of transportation, no question is more generally agitating the public mind than that of horse less vehicles. In France, more than any other country their possibilities are being tested as to speed and adaptability, and the results are in the main satisfactory. This fact has led the enthusiast to promulgate all kinds of ideas as to the future of the horse, etc., and an endless amount of unmitigated nonsense is being published in the public press. That this class of vehicle is destined to become a prominent factor none can doubt, and it is well to be prepared. It should be remembered, however, that it is not a new idea. Car iages to run on common roads without horse powe were experimented with before the iron rail was laid and engireers have been experimenting continuously ever since. New methods of generating power have given a renewed impetus to the movement, and the prospects are more than ever favorable, and we do not doubt their use in many places where the condi tions are favorable. The horse will not be dethroned neither will the time ever come when the horseles vehicle will hold other than a secondary place. There are many adverse conditions to be overcome in the nechanical construction and in the matter of traction, and in our northern climate, where snow and ice pre vail for several months of the year, they will be use less during those periods. Their construction, how


SEMAPHORE POINT, CHE-FOO.
ever, has reached a stage when it may be well for the carriage and wagon manufacturer to give it consideration. Be made they will, and if carriage builders who are well equipped to produce them continue to antag onize their construction, stock companies, with ample capital, will be formed, and by securing the patents they will control the manufacture and prove formidable competitors. Their manufacture and sale legitimate y belong to the carriace and wagon trades, and th Hub thinks it is not too early to prepare for the control, for if it once gets out of the hands of vehicle men, it will not be recovered. We hope, the editor adds, to see some of our enterprising builders interesting them selves in this matter before the present year closes.

## Enlarged Photographs

The photographic branch of the N. S. W. Govern ment Printing Office hav already established a name for the production of large photographs. To the Chicago exhibition they senta panoramic view of Sydney measuring 24 ft . in length and which was officially catalogued as the largest photograph that had then been produced. This record has, however, been beaten by the same office as they have just produced a view of the recent annual show held by the Royal Agricultural Soc oty of New South Wales in Sydney, that measures 26 ft. 3 in. in length by 3 ft . 10 in. wide, and which is claimed to be the largest ever produced. The panoramic view was taken on 8 plates, $15 \times 12$, and enlarged on bromide paper. The finish of the picture is very good, the identity of individuals from 100 to 200 yards away from the view point being readily recognizable.

## The cost of British ships of War.

A Parliamentary paper recently issued throws much light upon the cost of warships and their armament, machinery, etc. The prices given are mainly those to contractors, but from other sources the expense of building ships in the public dockyards can be obtained. No real comparison can be drawn between the two, of course, for the maintenance of the public yards is imperative for many sound reasons, and therefore there are items connected with the cost of vessels built in them from which those constructed in the private yards are free. However, when we remember that the private builder has to make a profit,
we must not be surprised at the cost of employing them, and it has been fully demonstrated that it is as essential to the efficiency of our resources to give experience to the private contractors as it is to maintain public establishments. Messrs. Thomson, of Clydebank, for the hull and machinery of the battleship Jupiter, are to receive $£ 732,683$, and for the cruiser
Terrible about $£ 570,000$. Messrs. Laird will receive for the battleship Dars, £733,211; and the Barrow Company as much for the cruiser Powerful as Thomsons do for her sister ship. Messrs. Maudslay, who are the agents for the Belleville boilers in England, receive in royalties for the French firm, $£ 10,600$. but they will not construct the boilers in their shops. The Talbot class of cruiser, of which several are being constructed in Scotland, costs about £210,000 apiece, while the torpedo boat destroyers average about $£ 35,000$ apiece.

## Rewards for Inventors.

According to an article in Engineering, a very early case in which the work of an inventor was rewarded is recorded by the celebrated Italian philosopher Jerome Cardan. In his work "De Subtilitate," which first appeared in 1550, he speaks of an artificer of Brixelendum who had invented, among other ingenious devices, a machine for sifting or bolting flour, for which he had obtained a privilege from Cæsar. Brixelendum, or, as it appears in some of the later editions of the book, Brixelensem, is probably the same as Brixellum, now Bresello or Bregella, a town in Italy,
on the Po. The Cæsar referred to would appear to have been the Emperor Charles V, who held very en lightened views on government, which, unfortunately, his stormy reign prevented
Quoting from the French edition of 1556, Cardan explains that he alludes to the invention "in order that men may understand how it is possible to acquire great riches by little things, provided that they are ingenious. [This 'sentence reads very like some productions that we come across in our own days.] For now that the bakers have this instrument for their profit, and that the inventor has the privilege of Cæsar that no one can have it without his consent, he is so busy that in a brief time he has built a house." Cardan gives a sketch of the machine, provi comprises a casing inclosing an inclined siev provided with a knockin
wheel outside the casing.

The earliest authentic cases of the grant of patents in England date from 1560. They are discussed in ar ticles in Engineering, vol. xxxvii, pages 804 and 773, the former treating of the introduction of the manufacture of hard white soap, the latter of saltpeter, into this country. The first recorded instance of reward to an inventor occurs in the same year, when Jacobus
Acontius, of Trent, was granted an annuity of $£ 60$, apparently as result of his petition in the preceding year for the issue of a prohibition against the usage, without his consent, of his discovery of wheel machines for grinding or bruising, and furnaces for dyers and brewers. It appears that a few years afterward he received a patent also.
In 1565 John Humphry, in the Tower, received a patent for the "sole use of a sieve or instrument for melting of lead, supposing that it was of his own invention." He appears to have brought an action for infringement. In court the question was, as stated by Noy, " whether it was newly invented by him, whereby he might have the sole privilege, or else used before at Mendiff, in the West Country, which, if it were there before, the court was of opinion he should not have the sole use thereof." Emery Molyneux, however, in offering the Queen (Elizabeth), in 1570, his
inventions of shot, artillery, etc., appears to have
thought it a sufficient recompense to be allowed to enter her service. Another inventor, in 1575, brought forward "an engine of war whereby 24 bullets can be discharged from one piece at a time;" he wished for a pension. In the same year we have the application of Peter Morrice, a German, for a patent for the sole right of making and employing certain hydraulic en gines for the raising of water, draining marshes, etc a few years afterward this invention was applied at Old London Bridge for the purpose of forcing up rive water into the city for drinking purposes.

## Do Horses Weep

Do horses weep? is a question discussed by our con emporary the Admiralty and Horse Guards Gazette. It tells us that there is a well authenticated case of a horse weeping during the Crimean war. On the ad vance to the heights of Alma, a battery of artillery became exposed to the fire of a concealed Russian bat tery, and in the course of a few minutes it was nearly destroyed, men and horses killed and wounded, guns dismounted, and limbers broken; a solitary horse, which had apparently escaped unhurt, was observed standing with fixed gaze upon an object close beside him ; this turned out to be his late master, quite dead. The poor animal, when a trooper was dispatched to recover him, was found with copious tears flowing from his eyes; and it was only by main force that he could be dragged a way from the spot, and his unearth ly cries to get back to his master were heartrending Apropos of the intense love that cavalry horses have for music, a correspondent of the Gazette writes that when the Sixth Dragoons recently changed their quarters a mare belonging to one of the troopers was taken so ill as to be unable to proceed on the journey the following morning. Two days later, another de tachment of the same regiment, accompanied by the band, arrived. The sick mare was in a loose box, but hearing the martial strains, kicked a hole through the side of her box, and making her way through the shop of a tradesman, took her place in the troop before she was secured and brought back to the stable. But the excitement had proved too great, and the subse the excitement had proved to
quent exhaustion proved fatal.

## RECENTLY PATENTED INVENTIONS.

## Agricultural.

Planter.-Walter W. Burchell. Sutherland, Iowa. This inventor has devised a self-dropping attachment operated from one of the ground wheels and
connected with the seed drop slide. The attachment connected with the seed drop slide. The attachment may be readily carried ine ground wheel, and may be readily applied t any planter having a reciprocating drop slide,
a drop slide of any type with a change of coupling.
Plow Stock. - Joseph W. Abbott, Lockhart, Texas. A cultivator frame of simple and inexpensive construction is set forth in this patent, the
frame admitting of being conveniently changed to faframe admitting.of being conveniently changed to fa-
cilitate the grouping of the sheaves or plows to be carcilitate the grouping of the sheaves or plows to be car-
ried by the stock. The frame has a central beam and ried by the stock. The frame has a central beam and
lateral zigzag beams forming three projections at each side of the central beam, there being adjustably secure to the pro

## Electrical.

Heating Rug.-Jesse R. Davis, Parkersburg, West Va. A casing containing a resistance coil, according to this improvement, has two electrodes
concentrically arranged therein and a metallic distributing plate extending entirely across both electrodes and properly insulated therefrom. The outer case may be of
wood, canvas covered with asbestos, metal, porcelain, ctc., and the rug may be of any desired shape most con venient for heating or warming the feet, under desks, in carriages, or on floors anywhere, the heat as it is trans-
formed from electrical energy being retained by the reformed from electrical energy
sistance of the heating medium.

Revolving Air Pump.-Vatslav A. Hlasko, New York City. For readily forming a vacuum in electric light globes and other apparatus this inventor aboat an inclined axis passing approximately through he center of the bulb, the latter containing a pumping liquid, while a pipe adapted for connection with the arti with it. Thepipe is arranged at such an angle to the in clined axis that by turning the bulb with the pipe the liquid will be caused to flow outward from the bulb return into it. At each revolution of the device an amount of air corresponding to the capacity of the bulb and pipe is drawn from the vessel to be exhausted,
trapped and discharged.
Watchcask. - William M. Rush, Jr., St. Joseph, Mo. This case has a postage stamp holder
in one of its lids, and a corresponding recess or depresin one of its lids, and a corresponding recess or depres-
sion in the adjacent lid, the stamps beeing held against sion in the adjacent lid, the stamps being held aga ma-
displacement by an overlapping thin piece of spring marial.
Fish Hook.-Frank D. Pettey, Hampshire, Ill. This device comprises a rod with a device for
holding bait in connection with self-opening hooks which are closed and concealed at their points, but which are adapted when released to spring in opposite directions the locking device being released by tension on the line.
When the fish is landed it may be readily released from When the fish is landed it may be readily released from
the hook.

Decomposing Substances by AmmoGermany. This invention is for a process of separating metals from ores and other insoluble materials, and for
he utilization of certain waste materials strontian residues from the desaccharization of molasses, permiting the recovery of the reagents. At the critical pressure nd temperature the compound is treated with ammo nium chloride in a dry state, the superfluous reagents, with the volatile products, being separated by distillation
or sublimation from the non-volatile residue, and from this the soluble part is separated by a solvent.
Type and Matrix. - Coelestin Skaneans of forming matrices for linotype machines, by first casting short letters and assembling them into
ords, with space bars between to form the proper lengt words, with space bars between to form the proper length
of line, and then casting a backing on the line to unite with the short letters and fill the spaces between the words. The line matrix comprises single short type with a cast backing to make the matrix the
the spaces between the words being filled.
Woven Chenille Fabric.-Leedham Binns, Philadelphia, Pa. This invention relates to a farmerly patented invention of the same inventor, the which are separate sets of warps some of the wefts pass ing over the central warp and others under it, the wefts forming bends where they bind the central warp and
he ends of the wefts projecting from the outermo orming tufts or loops. Hasp.-William Firfield, Perth Amboy, N. J. This hasp is so formed in sections that when applied to an object and engaged with a staple or othe keeper, the section secured to the support by screws o fastening devices wll be completely covered by one of
the other sections, which will extend over its face and the other sections, which will extend over its face and the fastening devices while the hasp is in locking en-Stove.-James A. Carroll and William hisstove is suspended a heating drum having its lowe wall inclined downward and rearward from the side adjacent to the stove door, there being an air flue communicating with the interior of the drum. The cold air is taken from the floor and carried to the drum, where it is heated without coming in contact with the fuel ger of gas escaping into the room.
Ditcifing Machine.-Alexander Mann, Berkshire, Mich. To effectively dig up the ground ing place, this machine is made with a pair of windin drums and carrier rope, scrapersbeing detachably secured in the runs of rope, while a pivoted boom carries a hoist ing.rope with means for engaging the scrapers. There
is a wheel on the pivot of the boom to which is secured a rope having its ends fast to a second pair of winding drams, and
pairs of drums.
Ore and Coal Loader.-Patrick H. Hageney, Ashtabula, Ohio. This machine comprises a
boom adapted to carry a bucket, and bars pivotally connected with the boom have a sliding motion to push the
backet into the material to be raised to fill the bucket bucket into the material to be raised to fill the bucket.
The machine is preferably mounted on a truck on which
turns, acabin or house containing the operative parts, to
be maripulated from within the cabin, and is more especially designed to facilitate loading coal, ore, and other material into cars.
Diving Apparatus. - Hubert Schon, Allegheny, Pa. This apparatus is more especially designed to properly locate sunken vessels preparatory to raising them. It consists principally of a casing with rames having angular flanges bolted together, panels set and fastened in the frames, a top bolted to the upper end while a bottom bolted to its lower end carries a weight. It is made of a size to permit two or more persons to occupy the casing several hours without change of air. It has glass panels and is lighted from the inside, to permit the occupants to closely examine sunken objects as

Grain Scalper. - Adam W. Haa leetwood, Pa. This improvement relates to screens fo bolting flour, etc., providing a screen to be supported in horizontal position and have a gyratory motion with quick return. With an uninterrupted motion the screens ment of the screen rearward or in the direction of its head being much greater than the movement in direction of its tail, causing the material to move in the direction of the tail, whereby the advantages of the gyratory mo-
tion are obtained and a feed is provided for the screene material.
Bicycle.-George B. Thomas, Duran o, Col. The driving mechanism of this wheel is de signed to give increased power and speed as compare with the ordinary treadle power. The rear or drive wheel of the machine is much larger than the front or rims, the rear wheel having also an inner fly wheel. The main frame has front and rear yoke portions and the pedal axle journaled in the lower end of the front yoke portion has cranks connected by pitmen with cranks of the main axle, the crank motion being thus more di-
rectly and uniformly distributed at each side of the rectly and une
drive wheel.
Starting Race Horses.-James T Adrew, Montgomery, Ala. To facilitate the starting a number of horses simultaneously thisinventor provides
stalls, to be operated singly or in sections, with gates all o be raised together on a given signal for the horse and ider to pass out, each animal to be at the same instant is such that the stalls may be conveniently set up and is such that the stalls may be conveniently set up and
operated on a race track and readily taken out of the
way.
Portable Kitchen Cabinet.-Lester Haskill, Fort Meade, Fla. For conveniently keeping, and sifting when required for use, flour, meal, etc., this inventor has devised a neat and compact cabinet which
can be made at a low cost, means being provided for can be made at a oive cost, means being provided for the sieves may be kept clean and in good order. The cabinet also has drawers for spices, sugar, etc., and is
preferably mounted on casters, so that it will be as
convenient to move about as a table or other article of convenient
furniture.
Chair.-Williaw G. Magee, Hudson, V. Y. An invalid chair which combines the functions of a reclining chair, a rocking chair and a wheeled chair
is provided by this invention. The position of the chair
in relation to the wheels is shifted by a simple adjusting the chair from one form to another, the chair being automatically converted from a reclining to a roller chair by simply moving the body and rocking the chair forward.
SASH Lock. -Irving Elting, Saugerties, SASH Lock. - Irving Elting, Saugerties,
N. Y. This is an improvement on a formerly patented N. Y. This is an improvement on a formerly patented
invention of the same inventor, providing an improved device for positively preventing a rotary movement of the locking plate which engages horizontal grooves on Wire Fastener.-Oliver Swift, Aberdeen, South Dakota. This is a device for securing the headed stem passed through a perforation in a clamping block having at one side a projecting toe adapted to enter the post, the toe being separated from the perforation through which the stem passes by a space which receives the fence wire. A wire fence can, with this fastfarther apart, it being impossible to force the clamps out, the wire breaking rather than pulling out the clamps.
Bonbon Dipping Machine.-Leo Hirschfeld, New York City. A table pivotally mounted
upon a frame, according to this improvement, has chanupon a frame, according to this improvement, has chan-
nels upon one of its faces to receive the material to be dipped, there being means for holding one end of the table elevated. Located over the channeled portion of the board is a feed wheel having a series of radiating blades, and the motion of the wheel is controlled by a ratchet and pawl mechanism. 'This wheel is mounted in adjustable boxes to be raised or lowered to suit different sizes of material, the machine affording a quick and effient means of dipping candie in making any form of
Fork for Dipping Bonbons, etc.This is a further invention of the same inventor of a fork adapted to receive any desired number of bonbons or ultaneously dropped into the moulds or wherever they are to be deposited. The head of the fork has tines mounted to turn and having receivers to hold the bonbons, there being also in the head a rack and a trigger operated mechanism whereby the tine
without turning the body of the fork.
Coffee Surrogate.-J
Coffee Surrogate.-Jeremiah B. Drake, Bolivar, Mo. To effecteconomy in the use of.coffee
and'yet provide a beverage of good quality and flavor, this inventor has devised a compound to be used in connection with a proportion of pure coffee. It consists of sugar, caffeine, cream of tartar, caffeol and corn starch, LAMP. - James Forsythe,
Lamp. - James Forsythe, Pittsburg, Pa. This lamp has valve devices by which, no matter which way the wind blows, the air passages to the windward will be held closed while the others remain open,
there being also in the top an inverted cone-like deflector to prevent the currents of air having a counteracting effect on each other. The air valve devices are also designed to prevent the lamp from being smothered by becoming clogged with soot or by the condensations freez-
Horse Checking or Unchecking. elix H. Kittrell, Loco, Tenn. This invention is for an thachment for driving harness to permit of releasing the check rein, to allow the horse to lower his head, and the
retightening and fastening of the rein without getting
out of the vehicle. The check strap is extended beneath
a gripping cam on the saddle and is made to act on a a gripping cam on the saddle and is made to act on rearwaraly projecting arm to release the cam by being
lifted or moved upwardly. To check up the horse again it is only necessary to pull back on the strap
Knee Protector.-Thomas B Walker, Honolulu, Hawaii. For the use of cavalrymen and others to protect the rider against rain, snow, etc., this inventor has devised a new article of manufacture to be made of leather, rubber or waterproof cloth. It comconnection with each other and with the trousers legs boots or leggins. The knee protector is of somewhat tri angular shape, with side flaps at the lower corners and

String Fastener.-Charles C. Pine, New York City. For fastening shoes, corsets and other articles to be laced, this inventor provides a device fo springs, jaws, etc., the fastener being more especially de signed for use with flat strings. A body piece adapted to be fastened to the shoe or corset has a narrow slit fo the passage of the string, the slot being arranged in alignment with the back pull of the string, and the latte passes over the body piece and twists on entering the slot. Only the string end has to be passed through th
to fasten the string in place.
Paper Doll. - Edward T. Gibson, Minneapolis, Minn. This invention relates to dolls in which changes of costume can be made by the adjust-
ment of paper garments, the doll being destitute of arms ment of paper garments, the doll being destitute of arm
and shoulders, and preferably destitute of head and neck By meaus of a locking key the assembled parts of the doll are so firmly held together that the doll may b tossed about without disarranging the parts, and an extension of the key serves to support the doll in nearl upright position
Game Apparatus. - Joseph Jessup, Woodbury, N. J. A game to be played in simulation of ble board being used, marked off as a football field while a movable block has the position of the opposin teams indicated thereon, a series of dies indicating the different players, character of play and distances on the field. It is designed that those who have played this
game will better appreciate all the points of a good game game will be

Design for Wrench Head.-Walter T. Johnston, Macon, Ga. This head has a rounding and transversely serrated top surface, one projecting end
presenting a bifurcation and the opposite projecting end presenting a bifurcation and the o.
being concaved at the under side.
Note.-Copies of any of the above patents will furnished by Munn \& Co., for 25 cents each. Please
send name of the patentee, title of invention, and date of this paper

## SLIENTIFIC AMERICAN

building edition

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Potter, New York City.
0. A residence at Montclair, N. J., being an additional May issue.

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(6598) T. D. B. asks : 1. Will you please tell me the name of inclosed leaves and greatly oblige
several parties $\$$ A. Charles W. Dabney, Jr., of the De partment of Agriculture, informs us that the leaf whic you inclose is that of the common poison ivy, Rhus radi
cans. 2. Please give formula and an example of increase candle power due to increase of amperes in an inceas descent lamp. A. An increase in the amperes will in crease the light of an incandescent lamp becauseboth heat and light are determined by the power used by the lamp. Electrical power is measured in watts, which are calcu ated by multiplying the amperes by the volts. $\mathbf{W}=\mathbf{C E}$ (1) A 16 candle power lamp should use about 60 watts
when the pressure is 115 volts. From formula (1) $w$ obtain (2) $\mathrm{C}=\frac{\mathrm{W}}{\mathrm{E}}$ hence $\mathrm{C}=\frac{60}{115}=0.52$ ampere. If in Pormula (1) C is made larger, the product CE become larger; that is, more power in watts is used and more
ight is given. This answers the question as asked but ghe result cannot be gained in this way. With a given lamp and generator capable of lighting it, no variation in the amperes can be made. Ohm's law is $C=\frac{E}{R}$ $\frac{\text { volts }}{\text { ohms }}$. Dynamos for incandescent lighting usually have a constant voltage, and the resistance of he lamp may be said to be constant. The voltage of r . sistance of the lamp only changes by decreasing as the
fiament grows hotter, or increasing as the lamp wear out; so that there is ordinarily a uniform amperage pass ing in a lamp. To increase the light given by an inca creased. This should not be done, because it will wear the lamp out too fast. A comparatively small increase of
pressure will reduce the life of the lamp by a half. The only other way to increase the light is to make a lamp with a lower resistance, that is, with a shorter or larg lament. This is the method actually employed
(6599) P. W. says: Please teN me through your paper: 1. What is celluloid composed of? A. Celluloid is a hard elastic compound made by subbjecting gon cotton, camphor and other ingredients to hy raulic pressure. See our SUPPLEMENT, No. 227. lowers, so as to preserve their shape and color. A. method of preserving the natural colors of flowers, recommended by $\mathbf{R}$. Hegler in the Deutsche Botanische Monatshefte, consists in dusting salicylic acid on the plants as they lie in the press, and removing it again with a brush when the howers are dry. Red colors in particular are well preserved by this agent. Another lution of 1 part of salicylic acid in 14 of alcohol by means of blotting paper or cotton wool soaked in it and placed above and below the flowers. Powdered boracic acid
yields. wearly as good resulty Dr . Schonland, in the

Gardeners' Chronicle, recommends, as an improvement
in the method of using sulphurous acid for preserving in the method of using sulphurous acid for preserving be placed loosely between sheets of vegetable parchment before immer
(6600) J. D. writes : I am figuring on a refrigerating plant, to be operated by the use of com cubic feet of air, atmospheric pressure, at a temperature i $20^{\circ}$, would be required to cool say one gallon of wate o a temperature of $34^{\circ}$. the water being in a coil of pipe placed in a receiver into which the compressed air is ex panded to $1 / 2$ pound above ammospheric pressure. Please dvise how many units of heat are contained in one ga eat in one cubic foot atmospheric air at $90^{\circ}$ and at $20^{\circ}$ A. The difference of $70^{\circ}-34^{\circ}=36^{\circ} \times 81 / 3$ pounds of wate per gallon equals 300 heat units. The specific heat of ar for equal weights with water is but 0.237 , and as 13 cubic feet of air at $60^{\circ}$ equals one pound, then $90^{\circ}-20^{\circ}$
$=\frac{70^{\circ}}{13 c^{\prime}}=5 \cdot 39 \times 0 \cdot 237=127 \%$ heat units per cubic foot from
$50^{\circ}$ to $20^{\circ}$. As the mean dufference of the water above
he air temperatures at its lowest point is $322^{\circ}$, then $-\overline{13 c^{\prime}}=$
$-46 \times 0 \cdot 237=0.583$ heat unit for each cubic foot of air ex eat units are required $\frac{300}{0.583}=514$ cubic feet of free air at $20^{\circ}$ to cool one aallon of water from $70^{\circ}$ to $34^{\circ}$. See Scientific Ameri Air." Supplement, No. 999, on "Cooling by Compresse
(6601) P. B. V. says : Please give me hrough Notes and Queries a formula for a black hair Sulphate of iron
Glycerine...... Glycerin
Water 10 grn.
1 oz.

The hair must be thoroughly washed with this, dried
and brushed once daily for three days; then the following should be applied on a small tooth comb. but it ould result Or 2 ,
 Water................................11/2 oz.
After the first application of formula 1. the bair shou After the first application of formula 1. the hair should
allowed to dry and then be brushed. Subsequently both formulæ may be used once daily at an interval of parations of lead and mercury are injurious if used for any length of time: they may, however, be legitimately used where some small portion of hair has, from personal idiosyncrasy, lost its color, wheh cannot be retored.
(6602) F. and M. say : Have you receipt or working over and restoring rancid butter to Presh,
weet flavor? A. To Convert Rancid Butter.-1. 100 pounds o butter is mixed with abont 90 gallons of hot water, contaiuing $1 / 2$ pound of bicarbonate of soda and 15 pounds of fine granular animal charcoal free from dust, nd the mixture is charned together for half an hour o. The butter is then separated; after standing, warmed and worked up with one-half its weight of fresh butter 2. To Sweeten Rancid Butter.-Rancid butter may be restored, or at all events greatly improved, by melting it with some freshly bnrnt and coarsely powdered animal charcoal (which has been thoroughly freed from dust by sifting) in a water bath, and then straining it through clean flannel. A better and less tronblesome method is next with cold spring water. Butyric acid, on the presence of which rancidity depends, is freely soluble in fresh milk.

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