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|  | NEW YORK, JANUARY 25, 1890. | $\mathbf{\$ 3 . 0 0}$ WEEKLY. |
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NEW YORK, SATURDAY, JANUARY 25, 1890.


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SCIENTIFIC AMERICAN SUPPLEMENT NO. 734.
For the Week Ending January 25, 1890.







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## safety in electric lighting.

In this city the Board of Electric Control has re moved from the poles many dangerous electric light wires. The temporary result is to reduce the illumination of a large portion of the city to the weak glimmer of gas lights, but the public is relieved from the daily occurrence of those shocking tragedies by which many lives were lost.
Another source of danger still remains, greater perhaps than that of the old overhead light wires; w allude to the electrical subways. In efforts to effec the removal of the overhead wires, the city authorities constructed beneath the surface of the streets a system of electrical conduits, called subways, designed to receive the electric wires. These subways now run through the principal streets, and so far no mode ha been devised for preventing the infiltration within them of the escaping gas from the gas mains. It is well known that ten per cent of the contents of these mains escapes into the adjacent earth. This gas find its way into the electrical subways, where it accumu lates and forms an explosive mixture large in volume, which is ignitable by the smallest electric spark. The result is a frightful explosion, which tears up the pave ments, scattering stones and iron in all directions. Four of these explosions lately took place in New Yor on one of the most crowded streets, Sixth Avenue. Sev eral others have occurred. Fortunately no lives were lost, but the danger to life is very great. The authoritie in trying to manage the electric wires have gone from the frying pan into the fire. The subways are a dan gerous nuisance, and there can be no safety until thorough system of ventilation is introduced. For illustrations of the construction of the subways se Scientific American of April 20, 1889.
In this connection it is interesting to consider what minent authorities in Europe say about the safety o lectric lighting and the modes they regard as the best. Being three thousand miles away, they are pro ably disinterested, whereas in this country the elec tric lighting business is chiefly in the hands of the
high pressure companies, who claim their plans are perfectly safe, or can be made safe, and yet they ar all the time killing people.
Mr. Werner Siemens, of Berlin, who is probably one of the most practically experienced and scientific elec tricians now living, in a recent interview with a cor respondent of the New York World, expressed him self as follows

By well constructed underground conduits the danger of electric light wires can be totally abolished if low pressure currents are used, and the dangers resulting from very high pressure can be reduced to a minimum in the same manner. There is no doubt a all that the greatest proportion of such accidents a have happened in New York will cease on the day when the last overhead wire is buried.
"Gas and water pipes," Herr Siemens continued can never act as conductors of dangerous electric cur rents from the underground wires into dwelling-houses These pipes, if crossed by such a current, would at once divert it into the ground. It is just so with light ning rods, which electricians frequently.connect with the water pipes because they make the easiest and most perfect distributers of electricity, diffusing the current over so wide an area as to make it harmless.

The insulated wires for street lamps should be placed inside of hollow lampposts. For interior light ing (houses, stores, etc.) no high pressure current should be used unless the construction is such tha every possible danger from contact with conductors and lamps is obviated.

Electric light conductors will never cause fire un less they are carelessly constructed. A well-planne and properly constructed conductor, supplied with the necessary safeguards, is entirely harmless.

No death caused by contact with electric wires ha ever happened here in Berlin. A few accidents by fir of faulty construction
"Overhead wires should never have more than 500 volts pressure. Underground conductors, with transformers, no more than 2,000 volts. The transformer and conductors should, however, be tested up to 5,000 volts.
" My system of insulated conductors, protected by lead cover, asphaltum, and sheet iron, has proved suc cessful wherever it has been used-in Berlin, Munich Rome, Milan, and other Continental cities. Some of these cables have been in use (partly for high pressure and transformers) for six years, and are apparently good for a long time to come. Their exact duration annot be fixed. Time only can solve that question.
"This system, or a similar one, will overcome all the difficulties you Americans have to contend with. In conclusion, I will say that high pressure should never be used, except where, for pecuniary or technical rea ons, it is impossible to introduce low pressure."
The World correspondent then called on Herr Emil Rathenau, who is president of the Berliner Electrici tats Werke, which supplies the Berlin public with electric lights. He had been kept thoroughly posted
going on in America, and was quite willing to dis cuss it.
"I have read," he said, "of the numerous accidents in New York, and, in my opinion, your mayor did an excellent thing when he ordered the electric wire overhead to be cut. They should all be placed underground. There is no danger of the currents being carried into the house by gas or water pipes, and thu making wischief. It is absurd. I think the trouble has been caused by the carelessness of the com panies. They were probably trying to make money too quickly

There are two kinds of accidents which may be caused by electric light wires. The danger to life is one. That we entirely obviate by using only low pres ure, no higher than 300 volts, with which we secure an excellent, clear, bright, and steady light. Never a complaint is heard. We have 80,000 lamps in opera tion now here in Berlin, and we expect to have 160,000 within a year. You see we attain excellent results with his low pressure. We use the Edison lamps, but all the arc lights in Berlin are also fed by our cables. Formerly we used 400 volts for the arc lights, but we find tha 300 volts would work as well. A current of that strength is perfectly harmless. You would scarcely eel it. There is absolutely no danger to life. We ave 1,500 men in our employ, who all have more o less to do with the wires, but no one in our employ has ever been killed or even injured.

It is otherwise, however, with the second class of ccidents-fires. Low pressure alone will not prevent that danger. But proper construction will. For five ears we allowed no one but our own men to put in the plants. With proper care and safeguards there is no danger. Now we allow other contractors to arrange the individual plants, but they must work according o our rules (here Herr Rathenau produced a formid able set of rules, regulating every detail of laying and arranging the wires, insulation, safeguards, etc.) Afte the work is done it is inspected by one of our experts and only accepted if properly áone. Besides all this precaution, we have everywhere automatic cutoffs, which at once disconnect the current should any wire become overheated. We allow no single wire to carry more than a fixed pressure. We are responsible for al accidents, but we have none. You Americans are the best mechanics in the world, and if you set to work in earnest to perfect your elcetric light system, no more accidents will happen. It would be folly to discard electric light merely because you have handled it care lessly and burned your fingers.

We charge for each new lamp (connections and all) placed in a building, 20 marks ( $\$ 5$ ); such a lamp will last forever. Then we charge 5 marks ( $\$ 1.25$ ) per lamp year for keeping it in order, and 4 pfennig ( 1 cent) an hour of actual use for each lamp of sixteen candle power. At these rates we paid a dividend of 8 per ent this year, besides adding greatly to our reserve fund. Commencing January we reduced the rate per hour to $3 \cdot 60$ pfennig ( $9-10$ of a cent) and still expect to make money. Surely your New York companies can do better than that, for we have a strong competitor in the gas works, which sell 1,000 cubic feet for 5 marks, a much lower rate than obtains in New York.
"Our rates for street lighting are somewhat higher. The city pays us 100,000 marks ( $\$ 25,000^{\prime}$ for the 108 amps in Unter den Linden and 36,000 marks $(\$ 9,000)$ for the thirty-six lamps in the Leipziger strasse. But then these are lights of intense power, and we had to erect the lampposts, wake connections, and take care of the entire plant. The lights burn every night in the year, moonlight nights not excepted."
It will be seen by the facts given in the above inter views that electric light can be furnished cheaply and without exposing the public or the workmen employed on the wires to any danger. It can only be done by using a lower pressure. It rests with the New York companies to take the proper steps, or, if they should prove obstinate, it remains for the authorities, backed by the people, to bring them to a sense of their duty. Her Rathenau also said, in the course of conversation, that his company owns and runs the electric works of Madrid, Antwerp, Eisenach, and other cities, and that their experience there was the same as in Ber-in-no accidents and no trouble

## The Muecle shoals Canal

The obstructions known as the Muscle Shoals, in the Tennessee River, which covered about 23 miles out of the 453 between Chattanooga and Paducah, at its mouth, are at length overcome by means of locks and dams built by the general government, and the river is now open so that boats loaded at New Orleans can at all times proceed to Chattanooga, and most of the time to Knoxville. The distance from Chattanooga to New Orleans is 1,601 miles, as against 2,067 from Pittsburg and 1,567 from Cincinnati, and it is claimed the coal freights from Chattanooga to New Orieans will be between 80 and 90 cents, as against $\$ 1.05$ from Pittsburg. The improvement of this short piece of the iver has been more or less under construction for sizty years.

## Copper Sulphate for Potatoes.

A. W. Pearson, of Vineland, N. J., writes as follows to Garden and Forest: For many years in this region of southern New Jersey every attempt to grow the peachblow potato has been a failure. At about the time the plant is in blossom and the tubers are say one-fourth grown, a deadly blight invades the potato field and sweeps over it like fire: I have had an acre of peachblows showing every sign of thriftiness and giving promise of a heavy crop, and in one week from the time of the appearance of this blight every plant was dead or dying. It is the prevailing opinion here that the peachblow potato is a variety which is "run out," and its culture has been generally abandoned.
Happening to see, last autumn, a few bushels small peachblow potatoes for sale, I bought them for the purpose of giving them another fair trial under the protection of the Bordeaux mixture. Last June I plowed a clover sod between the tree rows of an orchard, and there planted these potatoes in five equal plats of three rows each, manured in the row with the Mapes potato manure at the rate of half a ton per acre. The plats lay side by side, running north and south. When the plants were a foot high, and before they blossomed, I began to spray some of them with the Bordeaux mixture, and repeated this operation every two or three weeks thereafter until nearly the last of September. The times of treatment were reg ulated somewhat by the weather and the frequency of heavy rains. At any rate, I aimed to keep leaves and stalks on the sprayed plats pretty thoroughly whitewashed with the copper sulphate solution, so that its presence was always visible all over the plants. Whenever a drenching rain washed off the application it was renewed as soon as possible. I made the treatments with the portable Eureka spraying machine. I thus sprayed plats 1 and 2 , left plat 3 (the middle plat) untreated, and sprayed also plats 4 and 5.
About the time the plants blossomed, the middle plat (No. 3) was, as usual, struck by the blight, and in two weeks all of the potato tops on this plat were dead and dry. The plants on the other plats were green and growing as vigorously as could be wished. They remained green and growing until killed by frost in November
I then dug and weighed separately the total product of each plat. Plat No. 1, sprayed with Bordeaux mix ture, yielded 346 pounds of fine, large, marketable pota toes, which were sold as soon as dug for a dollar a bushel. Plat No. 3, not sprayed, yielded only 164 waunds of smarketable.
The diameter of the largest tuber on the untreated plat was three inches. The diameter of the largest on the treated plat was five inches. There is a marked difference in the cooking of potatoes from the un sprayed and from the sprayed plats. Those from the plat not treated are immature and "soggy." Those from the treated plats are mealy and have all the excellence for which the peachblow potato was formerly esteemed.
I have saved ten or fifteen bushels of these peach blows to plant next year, in the confident expectation of a crop of 350 bushels of potatoes per acre. Unde the unfavorable conditions in which these experimenta plats of potatoes were grown (between rows of tree twenty feet apart and twenty years old), I did not expect a large crop. Yet the yield of the treated plat (No. 1), 346 pounds from 225 hills, is not bad, under the circumstances, being about 125 bushels per acre.
Of the Bordeaux mixture employed, the formula is Six pounds of pulverized sulphate of copper (blue vit riol), dissolved in four gallons of hot water; fou pounds of fresh lime, dissolved in four gallons of cold water; mix the two solutions, and dilute with cold water to make twenty-two gallons of liquid.
I believe, however, that the ammoniacal solution o carbonate of copper will be found as efficient a fungi cide as the Bordeaux misture, and it has the advantag of being more readily prepared and more easily dis tributed in spray. Its forinula is : Carbonate of copper three ounces ; ammonia, one quart ; mix. The copper carbonate will dissolve almost at once in the ammonia liquor. Then dilute this mixture with cold water to make twenty-two gallons of liquid

## Six New Atlantic steamers.

There are now six fast steamers building which will press the City of Paris, of the Inman line, very hard in keeping her position as the champion racer of the ocean. The Hamburg American line, whose twin pro peller, the Columbia, made a new record of 6 days 18 hours 10 minutes to Southampton on No vember 14, will have a magnificent new twin screw ship running in May next. She is to be called the Normania, and is now building at the yard of Messrs. John Elder \& Co. the constructors of the Etruria and Umbria. The Nor mania is a little smaller than the City of Paris, being 520 feet long, with 59 feet beam, and 38 feet depth of hold. She will have 16,000 indicated horse power. She will be launched in March next. The keel of her sister ship is beinglaid by the Vulcan Shipbuilding Company, Stettin. This vessel will not be ready to run until the
spring of 1892. She will be called the Venetia. The French line also has a big twin screw ship on the stocks which will probably be running next summer. She is called the Touraine, and is to be several thousand tons larger than any of the fine single screw ships of the French line, which hold the record between New York and Havre. The White Star steamship Majestic, a sis ter shjp to the Teutonic, will be ready to do battle with the City of Paris next spring. The Cunard line wil also put two twin screw boats in the field to win back the lost laurels of the Etruria. Their names have not the lost laurels of the truria. Their names have not take the place of the Servia and the Aurania, which will do duty between Liverpool and Boston.

## Harvard College Astronomical Observatory.

The annual report of the director, Prof. Edward C Pickering, presents much interesting information
A gift of $\$ 50,000$ was received last summer from Miss C. W. Bruce, of New York, for the construction of a photographic telescope of novel form, which, if success ful, will materially affect the entire plan of work o his observatory
For the last six years experiments have been in pro gress on the use of a photographic doublet in the pre paration of maps of the stars. The eight inch telescope now in Peru is of this form, and was mounted here in 1885. Since then 4,500 photographs have been taken with it. With an exposure of an hour twice as many stars can be photogra phed as are visible with a telescope having an aperture of fifteen inches, and as many stars as can be photographed in the same time with a tele scope of the usual form having an aperture of thirteen inches. Moreover, with a doublet a portion of the sky covering twenty-five square degrees can be photo graphed with good definition, while only three or fou degrees can be covered equally well with telescopes of the usual form. The time required to photograph the entire sky will be reduced in the same proportion With a doublet each hemisphere could be covered in one year with eight hundred plates. In 1885 it wa proposed to photograph the entire sky with the eigh inch telescope, enlarging the plates three times. The results would resemble in scale and size the charts of Peters and Chacornac. The generous aid of Miss Bruce mentioned above will permit this result to be attained in the original photographs, without enlarge ment. A contract has been made with Messrs. Alvan Clark \& Sons for a telescope having an aperture o wenty-four inches and a focal length of eleven feet.
The first research on the spectrum of over ten thou sand of the brighter stars is now nearly completed and is partially in print. The photographs required for the second research on the spectrum of the fainte stars are also nearly complete. The eleven inch tele scope has been in constant use throughout nearly every clear night in photographing the spectrum of the brighter stars. This work is approaching completion for all stars bright enough to be photographed by means of present appliances, with the large dispersion now employed. By the use of an improved process fo staining plates with erythrosin, the yellow and green portions of the spectrum, even of the fainter stars, can be advantageously studied. Numerous experiments have been made with a device for measuring the approach and recession of stars, by means of an achromatic prism in front of the object glass Several peculiar spectra have been studied, especially that of $\zeta$ Ursae Majoris. The periodic doubling of it ines seems to be due to the rotation of two compo nents too close to be distinguished by direct observa tion. The detection of bright lines in one of the star in the Pleiades suggests a possible explanation of the egend
Duri
During last spring an expedition was sent to Peru in harge of Mr. S. I. Bailey, assisted by Mr. M. H. Bailey A station was selected on a mountain about six thou and feet high and about eight miles from Chosica All supplies for the station, including water, must be arried by mules for this distance. Two frame build ings covered with paper have been erected, one for an observatory, the other for a dwelling house. Since May 9 the Bache telescope has been kept at work dur ing the whole of every clear night ; 1,236 photographs have been obtained. A large number of interesting objects have been detected, among others several stars having bright lines in their spectra. Including the photometric work described below, the amo
material so far collected is unexpectedly large.
An expedition under the direction of Prof. Willian H. Pickering was sent in November, 1888, to the sum mit of Wilson's Peak, in the vicinity of Los Angeles n order that as much useful work as possible migh be accomplished, the thirteen inch telescope and th eight inch telescope now in Peru were sent to Willows California, where the total solar eclipse of January 1 1889, was successfully obser ved. Forty-seven photo graphs were obtained by the party during the thre minutes of totality, and the instrumental equipmen was much superior to any previously used for such a purpose. It was not until May 11 that the large tele-

Messrs. E. S. King and Robert Black, but since then it has been kept at work throughout every clear night The number of photographs obtained is 1,155 . The objects photographed are selected from a list of 62 double stars, 143 clusters, and other celestial bodies such as the moon and planets. As these same object have been repeatedly photographed at Cambridge with the same instrument, an accurate comparison of he atmospheric conditions of the two places may bel made. It will of course be impossible to derive a fina conclusion until the observations have extended ove t least a year, but the evidence already secured show that in summer results can be obtained at Wilson' Peak which cannot be obtained here. The differenc is very pronounced for such objects as the markings on Jupiter. Clusters like that in Hercules are well resolved, so that the individual stars are easily meas ured, which cannot be done with the best Cambridge photographs. As a test object the sixth star in the trapezium of the Orion nebula is clearly photographed for the first time. A new variable star has been dis covered in the midst of the cluster G. C. 3636. A beginning has been made of the measurements of the position and brightness of the double stars, and it is hoped to extend this work to the clusters, and thu urnish an extensive addition to this department of micrometric astronomy.

## PHOTOGRAPHIC NOTES.

A Platina Toning Solution for Silver Prints.-M Gastine recommends the following :


## Wichloride of platine

It is advisable,"
e silver salts from the pape bitartarate is not at hand, take five parts of tartaric acid and mix with four and a half parts of carbonate of soda."
Gelatinous Bottle Wax for Covering Corks. - In toring volatile liquids which are solvents of resinous material, the ordinary bottle wax in which bottle necks are ordinarily dipped is generally inadmissible, by reason of the solvent action of the liquids upon it In such cases the following answers admirably, giving perfect closing ; and, moreover, the top is easily pared off with a knife when the bottle is to be opened

## Soft gela Water.. Glycerin

Melt the gelatine in the water, and then stir in the glyserine. Any coloring matter can be added, and the necks should be quite free from grease when dipped A second dip can be given if the first does not give ufficient thickness. Manufacturers sending out photo graphic preparations containing volatile liquids should give this preparation a trial. The top can be stamped while soft with a slightly greased metal seal, or, when set, a warm stereotype (slightly oiled) or an Indi'a ubber stamp may be used.
Mr. J. H. Biggs' Method of Making Silver Prints on Rough Drawing Paper.

## Soft sheet gelatine................ ....

$\ldots . . . .4$ grains.
(about 0.259 gramme)
(about 5 grains.
0.324 gramme)
(..... 1 ounce.
oak the gelatine and dissolve in a water bath. Whatman's drawing paper is floated on this and allowed to dry spontaneously.

Sensitizing Solution.
 is just redissolved.

Lay the paper on a flat board, the salted side up, and apply the sensitizing solution freely with a Buckle's brush. Pin the paper up by one corner, attaching a fragment of blotting paper to the opposite corner, to prevent the accumulation of solution. When dry print, tone, and fix as in the case of a print on albu menized paper. Mr. Biggs recommends a carbonate of soda toning bath. For description of the Buckle brush, see next paragraph.
The Buckle's Brush. - This useful implement was quite common and well known in the early days of photography, when negative paper processes were much used, and is very useful when it is important to have a clean brush, or rather mop, for every operation. It is made by taking a piece of glass tube, about hal an inch in diameter and six or seven inches long, and drawing a tuft of cotton wool partly into one end o it by a thread or a hook of silver wire, an arrangemen easily extemporized.-Photographic Review.

## AN IMPROVED COMPOUND ENGINE.

An engine especially designed for use for marine purposes with twin propellers, both shafts thereof being operated by one engine, and also doing away with the ordinary guideways, lessening the cost of construction and diminishing friction, is shown in the accompanying illustration, and has been patented by Mr. James A. Clarke, of Port Moody, British Columbia, Canada. The high and low pressure cylinders are placed vertically one above the other, the exhaust pipe from the high pressure cylinder leading to the steam chest of the low pressure cylinder, while the piston in the upper cylinder is secured on a piston rod extending downward and connected with a piston operating in the lower cylinder, the exhaust pipe from the latter leading to the outside. On the piston rod common to both cylinders is secured a cross head pivotally connected by two pitmen with opposite crank arms on crank shafts mounted to turn in suitable bearings on the base, which also supports a frame carrying the low pressure cylinder. on top of which is a frame supporting the high pressure cylinder. The valves in the two steam chests are connected with each other by a valve rod connected at its lower end in the usual manner with the reversing link, operated from eccentrics secured on one of the crank shafts. The crank arms stand at angles to each other, so that the crank shafts are turned in opposite directions, and the position of the link is such that it can be readily changed by the reversing lever to simultaneously reverse the motion of the crank shafts. On the crank shafts are also formed two other crank arms pi votally connected by opposite pitmen with a slide mounted in vertical guideways, supported on a frame erected on the base, the motion of the crank shafts causing the ver tical sliding motion of the slide traveling loosely in the guideways, and thus serving as a governor, as, in case one of the propellers becomes disabled, the power of the shaft carrying the disabled propeller is directly transferred to the other shaft through the crank arms, pitmen, and slide, and the other propeller is caused to do all the work In a heavy rolling sea, also, when one of the propellers frequently rises partially out of the water, this means of transferring the power from one shaft to the other prevents the flying around of one propeller and assists the other. All the parts of this engine are within easy reach of the engineer, and there are so few working partsin motion that it is designed to reduce the friction to a minimum, the power of the engine going direct to the cranks. This form of governor can also be at tached to any twin propellers without altering the ex isting engines.

## A BRAKE AND STARTER FOR VEHICLES.

The accompanying illustration represents a mechan ism, patented by Mr. John H. Boom, for storing power during the descent of a vehicle on a down grade, the power to be utilized in propelling the vehicle upon a level or an up grade. Fig. 1 is a vertical transvers section, and Fig. 2 a plan view. A shaft geared to th veticle axle carries a sprocket wheel and a spur wheel while a secoud shaft supports a sprocket wheel and
 icating what could be seen at once in th great telescope. The mask was then suddenly re moved, and the entire nebula, suspended amid countless stars, flashed into view. The contras between the limited space representing the field of the great telescope and the sky as shown by the photographic lens was astonishing in the ex treme. This slide shows the great rings of nebu losity that were first proved to exist by Mr Roberts, of England. By carefully counting areas Mr. Barnard estimated that on the original plat ( $8 \times 10$ inches) there were distinctly visible no less than sixty-four thousand stars. This entire plat had been reduced to a lantern slide which, upon the screen, brought out peculiarities in the ar rangements of the stars that were not even suspected in the original plate. On all these plates the star images were perfectly round.

On Determining Acoustic Qualities.
Why is it that our men of science, with all thei marvelous achievements in various fields, says th Real Estate Record and Guide, have never ye discovered the secret of determining in advanc whether the acoustic properties of any building intended to hold large audiences will or will no be good? A recent writer, referring to this mat er says that "we have never discovered the principles applicable to the proportions of a grea hall by which the voice is spread and conveyed venly and in the most perfect manner to al parts. After the building is completed it is, con fessedly and notoriously, a matter of accident and a question to be solved by experiment whether it is 'good for sound.' Furthermore when the acoustic quality is not satisfactory, it is often not easy to explain why or to devis means to correct it. Here is a field for discover that has not yet been worked out nor do w ee any rational attempts to solve the problem. Can it be that it is insoluble? Or is it that
he power thus stored. The clutch upon the second shaft can then be moved to use the power, first of one
spring cylinder and then the other, through the spur spring cylinder and then the other, through the spu
wheels and gearing, there being also a fly wheel in the mechanism. The change from one spring cylinder to the other, both in compressing the springs and in using the power thus accumulated as required, is automati cally made, while the flywheel reiieves the mechanism of the shock of stopping and starting.
For further information relative to this invention address Messrs. Boom \& Loevinger, White Lake South Dakota

A Wonderful Astronomical Photograph
At a recent meeting of the Astronomical Society of the Pacific, at the hall of the Academy of Sciences corner of Dupont and California Streets, San Fran cisco, the principal paper of the evening was read by E. E. Barnard, Lick Observatory, on some photograph of the Milky Way and other celestial objects that he ad made with a large portrait lens of six inches aper ture and thirty-one inches focus strapped to the tube of the six and one-half inch equatorial of the Lick Observatory, the clock work of the instrument being controlled by hand with the slow motion rods at the eye end. A star was kept bisected by the cross wires in a high power eye piece on the telescope itself. The additional weight of the camer made it necessary constantly to cor rect the clock throughout the expos ures. With this instrument a nega tive of the Pleiades was made August 23 , last year, with an exposure of 1 h 15 m . This showed the Merope nebula conspicuously, the sharp prong of ne bulosity from Electra, and some of the nebulosity about, Maia and Al cyone. A negative of the Milky Way (right ascension 17 h .57 m. , declina tion south $18 \cdot 9^{\circ}$ ), was made July 28 with an exposure of 2 h .35 m ., anothe in the region about $M 11$ on Augus 2, with exposure 2 h .45 m ., and anothe
gear wheel arranged to engage the wheels of the first shaft, a clutch being mounted upon the second shaft between the sprocket wheel and gear wheel and arranged to turn with the shaft and engage either of the wheels. A spring mechanism is connected by gear ing with the second shaft and a clutch lever and brake for controlling the movements of the mechanism. The spring mechanism consists of a shaft on which are mounted two pinions, below which are arranged two cylinders containing springs, to the upper ends of which are secured rack bars adapted to engage th
of the Milky Way (right ascension declination south $28^{\circ}$ ), August 1, with 17 h .56 m. , declination south 28 , August 1, with an exposure of 3 h .7 m , and 26 with the great exposure. The paper was illustrated by lantern slides from these plates projected on a large screen by the aid of oxy-hydrogen light. The nebulosity of the Pleiades was very conspicuous, and the beautiful cloud forms of the Milky Way, with the my riads of stars that they were partly resolved into, were strikingly fine. The slide of the great nebula o Andromeda, when first projected on the screen, had
the properties of sound are still only imperfectly un derstood?"

## AN IMPROVED CORN TRIMMER.

An inexpensive device whereby corn, beans, peas etc., planted in hills or rows, may be rapidly thinned by removing the surplus stalks, without injury to those left is shown in the accompanying engraving, and has been patented by Messrs. Dudley B. Robertson and James T. Holland, of Perryville, Ky. Figs. 1 and 3 show the device in different positions in use, Fig. 2 being an other view, in perspective. Two standards, having handles on their upper ends, are adapted to slide, one


## ROBERTSON \& HOLLAND'S CORN TRIMMER

upon the other, and at the lower end of one standard are guard plates, offset to afford clearance for a thinning fork, the lower ends of the guard plates having cutting edges, to facilitate their ready insertion into the soil. Between the guard plates is pivoted a thinning fork, its tines being spaced and attached to a head block, links pivotally connecting the outer end of the head block with the lower end of the sliding standard. There is a foot rest at the side of one of the guard plates to aid in the insertion of the thinner by bearing the foot thereon, when the parts are in the position shown in Fig. 1; the handle on the other standard is then drawn up, rocking the fork as the tines are elevated, as shown in Fig. 3.
For further information relative to this invention address Mr. James T. Holland, Perryville, Ky

AN agreement without consideration is void; a note nade on Sunday is void ; contracts made on Sunday cannot be enforced.

## AN IMPROVED PRUNING IMPLEMENT

An implement adapted for pruning trees irrespective of their height, and for dressing the wounds caused by pruning or trimming, so that danger of bleeding is avoided, is illustrated herewith, and has been patented by Mr. Andreas Bosch, of Prairie du Chien, Wis. The invention covers improvements in the construction of

an implement formerly patented by the same inventor. In Fig. 1 the implement is shown with the saw in position to saw downward from the upper side of the limb, and with the waxing and shearing and planing attachments in position, Fig. 4 showing further how the saw can be set in an angular position. Fig. 2 shows the device without the saw and waxer and with a different shearing attachment, for trimming away small limbs, to facilitate the operation of which there is a hand cord, while Fig. 3 shows a combined chisel and scraper, for use when it is desired to scrape the tree, and clear away the loose bark and insect nests. The pole to which the attachments are secured is sectional, a short metallic tube with split ends receiving the ends of the pole sections, there being bands around each end of the tube, and set screws for fastening them, whereby the pole may be lengthened as desired. The attachinent for planing off the stumps of limbs severed by the saw consists of a blade-carrying disk mounted on a drum within which there is a coiled spring, a strap or cord extending downward from the drum, by means of which the disk may be rotated.
pivotally mounted, a lamp being placed beneath it for warming the wax, the can being tilted to pour wax on the brush for application as desired by means of a downwardly extending cord. The brush is so supported that a rotary reciprocating motion may be imparted to it.

## The Bleaching of Horses.

A curious statement comes from Arkansas concerning a gang of horse thieves, who had for their chief assistant a young woman-a bleached blonde-with the nickname of Sorrel Sue. She was given this name because she always appeared in public riding a sorrel horse. Her excellent horsewomanship and her dashing manner brought her many admirers. Theshootingaff air which forces her into notice was an ordinary case of plain jealousy. Two of her admirers, both members of thegang, fought for her favor. One was killed, and the survivor was severely wounded. A surgeon was sent tor. He mistook the direction and walked into the cabin occupied by "Sorrel Sue." Before he could by "Sorrel Sue." Before he could things which aroused his suspithings which aroused his suspi-
cions. These he reported to the cions. These he reported to the
sherift, who with a posse inanaged to surround the den of the horse thieves, capturing Sue and two of ner gang, 'The sherift, though pleased with the capture, was more than elated at the dircovery of the peculiar method of disguising the stolen animals adopted by the gang. He found that Sue had applied the means of bleaching her own hair to that of the horses.
When the posse entered, they found a horse enveloped in a jacket made out of rubber coats, being treated to a sulphur vapor bath.


THE FEATHER BLADE ELLIPTIC PROPELLER, FOR TEAM OR HAND POWER.

## AN IMPROVED BICYCLE BRAKE SHOE.

The soft rubber tire of a bicycle wheel, especially where the rubber is not of the best quality, after a cer tain amount of use loses its circular form, and, as the brakes heretofore in use have been adapted to take a full hold only when the tire is circular in cross-stection, the rider has by no means as full a control of his machine, by means of the brake, when the tire becomes worn. It is to obviate this difficulty that the brake herewith illustrated has been devised and patented by Mr. John J. Astor, Jr., of No. 123 West Twenty-sixth Mr. John J. Astor, Jr., of No. 123 West Twenty-sixth
Street, New York City. The brake shoe is made of Street, New York City. The brake shoe is made of
spring metal, and, as shown in the small view, is slotted longitudinally, so as to cause it to adapt itself to the periphery of the tire without regard to the cross-sec tional shape of the latter, and adapt itself with equal advantage to either a new or a worn tire. One or more slots are used as may be required, to enable the brake shoe to fit the tire as perfectly as possible. Its form is such that it can be readily shaped by a drop press or some analogous means, the outer edges of the shoe and


ASTOR's BICYCLE bRAKE.
the edges of the slits being rounded to prevent the shoe from injuring the rubber tire. The shoe is pivot ed to the fork which supports the wheel, and is connected with the brake lever by a rod in the usual way. The several divisions of a shoe thus formed act independently of each other, each division effecting its due proportion of friction, thereby reaching the whole of the tire surface for the frictional bearing upon which the shoe acts.

The Buenos Ayres-Montevideo Telephone Line. The trunk line connecting Buenos Ayres and Monte video was opened with considerable ceremony on October 26. This line, which is 186 miles long, is worked on the Van Rysselberghe system. The work of construction was in trusted by a private company to M. C. Laborde, and the Felten Guilleaume cables and bronze wires were supplied by Messrs. W. F. Dennis \& Co., of Billiter Street The line is carried on posts along either side of the River Plate from Buenos Ayres and Montevideo respectively to the points where the river is crossed. The connection here is established by means of submarine cables, which cross the river at a breadth of 28 miles. In the vicinity of Montevideo the bronze wire spans a distance of 460 yards across the river Santa Lucia, by means of poles 108 feet in height. The charges for the use of the telephone are worthy of notice. During the busiest part of the day they are as follows: For five minutes' use $\$ 5$, for five to ten minutes' use $\$ 12.50$, for ten to fifteen minutes' use $\$ 25$. The line has so far given use $\$ 25$. The line has so far given
satisfaction both as regards articulation and loudness.

RIFLE bullets are now photographed in their course by means of the electric spark. The camera is taken into a dark room, which the bullet is caused to traverse. As it passes the camera it is made to interrupt an electric circuit and produce a spark, which illuminates it for an instant and enables the impression to be taken. The wave of condensation in the air before of condensation in the air before
the bullet and the rarefaction behind it are visible in the photohind it are visible in the photo-
graph, and can be studied by exgraph, and can be studied by ex-
perts, thus enabling the form of bail or rifle which minimizes the resistance of the air to be selected.

## an mimpoved fountain pen.

A pen in which the pen staff or holder is provided with a compressible air bulb for controlling the supply and flow of the ink is shown in the accompanying illustration, and has been patented by Mr. John D. Bray, of Grand Seminary, Montreal, Canada. Fig. 1 is a full view of the pen and holder, Fig. 2 being a sectional view of its forward portion, and Fig. 3 showing a slightly modified construction. The rear end part a slightly modified construction. The rear end part
of the tubular pen-holding section is fitted to slide of the tubular pen-holding section is fitted to slide
closely within the forward end portion of the ink reservoir, and this section has entered in it from its rear a short tube, of soft rubber or other elastic material, projecting slightly beyond the back edge of the pen


2



## BRAY'S FOUNTAIN PEN.

holding section. The latter is also closely fitted with a section and feeding tube, terminating in front in a curved nose piece, with contracted opening, for supplying the pen with ink. The tube entering the rear end of the pen-holding section forms a valve seat for a stationary valve attached to a rod extending centrally backward. A flexible air bulb is arranged in the rear of the ink reservoir, and connected therewith by a filling piece having an air duct through it. This filling piece and the closing piece at the rear end of the air bulb are connected wy the backward extension of the valve rod. In the whole construction, including the valve and adjustable pen-holding section, screw-threaded connections and flexible washers are dispensed with When writing, the flow of ink from the reservoir to the pen is first adjusted by drawing slightly outward the pen-holding section, to open the valve, and afterward by the writer exerting a more or less slight pressure with his thumb and forefinger upon the bulb. After finishing writing, the pen-holding section is moved backward again within the reservoir, to close the valve, and a cap, held on the outer end of the penstaff, is placed over the forward end of the pen-holding section, when the pen may be safely carried in any position in the pocket.

## AN IMPROVED BAND SAW PULLEY.

A pulley for band saws, whereby an equal tension will be obtained upon the front and back edge of the saw when passing over the pulley, thus obviating the necessity of hammering or rolling the saw in the middle to make the tension of both edges equal, as has heretofore been done, forms the subject of an accompanying illustration, Fig. 1 showing the saw in position on such pulley, of which Fig. 2 is a front elevation. It is a patented invention of Mr. Jacob R. Hoffman, of Charleston, West Va. The pulley is provided with a rectangular peripheral groove at one side of its center, where-


## hoffman's band saw pulley.

by the teeth of the saw will be permitted to project beyond the pulley. The depth and width of the recess or groove will be varied according to the size of the pulley and the width of the saw. A saw intended for use in connection with this pulley should be made perfectly straight, and the pulley is designed to insure its rewaining in this condition until broken or worn out.

## " The Northweatern Miller."

One of the most beautiful specimens of the typographic art is the holiday number of our valued cotemporary the Northwestern Miller, published at Minneapolis, Minn. The specimen referred to contains 128 pages about the same in size as the Scientific American. A large number of elegant and original engravings are presented, among them portraits of the officers of the National Millers' Association, enterprising and vigorous looking men, officers of British trade associations, etc. Several plates in colors of prominent milling establishments are given. Some two hundred and fifty letters are printed from millers in all parts of the country, giving their several views upon the condition, prospects and wants of the trade. The general literary contents are excellent. We congratulate the Miller upon its success and prosperity, of which this superb issue is a substantial evidence.

Spontaneous Combustion of Cotton
The Boston Manufacturers' Mutual Fire Insurance Co. warn their customers by special circular of new sources of danger of fire.f rom cotton bales impregnated with cottonseed oil, as follows:
Since the introduction of cottonseed oil and its transmission in casks and barrels from one part of the country to another, a new danger has arisen to cotton in transportation, as cotton fibers saturated with this oil are very liable to spontaneous combustion. It may be that the more frequent fires in large cotton warehouses of the South and in cotton ships can be accounted for in this way. Up to this time the mutual insurance companies have been subjected to but one loss in a cotton storehouse which could be attributed to this cause. This season, however, an instance of saturated cotton bales has been discovered in one of our principal mills. Two bales have been received, one of which was saturated to the extent of 256 lb .; the other to the extent of 175 lb . They were fortunately discovered to be in this condition, and a claim for damages has been nade upon the transportation companies. A sample of the cotton has been examined at the Institute of Technology, and tested in our spontaneous combustion oven. It ignited at moderate heat in the way in which fibrous substances ignite when saturated with a drying or quickly oxidizing oil. The oil pressed out from this small sample has been subjected to qualitative tests, which prove it to be cottonseed oil. We therefore warn all our members who represent cotton mills that it would be prudent to have their cotton carefully examined for oil, bale by bale, before putting it into the warehouse.

## Natural Gas Items

According to the Pittsburg Dispatch there is still an overwhelming supply of natural gas at some of the wells, however much others have failed.
The Dispatch says : Park Brothers were lately obliged to shut down three of their Murrysville gas wells, owing to the pressure being greater than the pipes can carry. This company has a 20 in . diameter main running from the Murrysville gas fields; yet so strong and so plentiful is the gas that they assert they can supply not only their own great works, but also the sixteen other large mills which take gas from them throughout the winter with the decreased number of wells.
The pressure at the Homestead reducing station is 500 pounds to the inch. This gives them more gas than they can possibly use. The outlook for the winter for natural gas is as bright as the consumers want, they say. The same inconveniences that were experienced last year by limited supplies, stoppage of work enced last year by limited supplies, stoppage of work,
and in many cases causing hardship and giving limited and in many cases causing hardship and giving limited
supplies of bread, are not likely to transpire this winsupplies of bread, are not likely to t
ter, according to present indications
Messrs. Chalmers \& Taylor, of Tarentum, Pa., have struck a huge spouter about three miles east from that place. The size of the new well was a surprise, and experts who have examined, agree that the sand is the same as the Murrysville sand, showing plausibly that a belt connects this territory with the Murrysville field.

## Speed and Power or Birds.

In an article in the Forum Prof. R. H. Thurston says The vulture is said to fly, at times, at the rate of above 100 miles an hour ; the wild goose and the swallow, in their migrations, make 90 miles an hour; and the carrier pigeon has certainly flown long distances at rates of speed ranging from 60 up to 80 miles an hour, and for many hours together. The common crow ordinarily lounges across country at the rate of 25 miles an hour, the speed of a rail way train. Professor Langley finds that the power exerted by the eagle in full flight is but a fraction of one horse power. Mr. Chanute computes the power exerted by a pigeon flying 2,200 feet per winute, 25 miles an hour nearly, at $\frac{1}{20}$ of a horse power per pound, or $91 / 3$ horse power for a flying machine of equally good form, weighing one ton, at 25 miles an hour, or about 50 horse power per ton British A soronatical Sr. Wenhaus, a the pelican, an expenditure of $\frac{1}{11}$ horse power by 21 lb . of bird, and this is one horse power to 231 lb ., or about a horse
power for the weight of a man, allowing ample margin for surplus power. The birds are found to have a surplus lifting power of about one-half. Professor Langley has purchased recently for the Smithsonian Institution the prize steam engine of the Aeronautical Society of 1868, which, with car and screws, weighs only 16 lb ., and but 13 without these essentials. To the engineer these facts certainly look encouraging.

## AN IMPROVED RAIL JOINT.

A rail joint designed to insure the rigid support of the abutting ends of the rails joined, and which can be rolled from iron or steel, to form a joint which is strong, durable, and inexpensive, is illustrated here-


## LYND'S RAIL JOINT.

with, and has been patented by Mr. Ives Lynd, of 372 Congress Street, Troy, N. Y. Fig. 1 is a perspective view, showing the joint applied, and Fig. 2 is cross section. The joint is made in two sections, each of which is shaped to receive one-half of the base of a rail, and to fit against the rail web and the under side of the rail tread. These sections each have downwardly extending vertical flanges, below the base of the rail between the ties, the flange of one section having a groove, and that of the other a flange adapted to enter the groove, to hold the parts against vertical displacement. These vertical flanges are preferably formed after the sections have been rolled and cut to proper length, thus giving a broad tie-bearing at each end of either section, with recesses to receive the spikes. A joint thus formed constitutes a bridge and vise, preventing the depression of the end of one rail below that of the other, whereby pounding is avoided and a very strong joint is made.

## AN IMPROVED DOOR LOCK.

A lock for stable doors, etc., in which the parts are so arranged that the door will latch upon closing, and the latch will be locked and held against displacement, is illustrated herewith, and has been patened by Mr. John Connor, P. O. box 56, Whitestone, Queens Co., N. Y. Fig. 1 shows the parts as they appear when the door is open, the catch arm pivotally mounted on the door to the left being guided by a strap, and having a catch hook on its outer end, while its inner end is carried downward and connected to a short arm that is rigidly mounted on a key shaft, which extends outward through an escutcheon secured to the outer face of the door. Upon the other door is a keeper adapted to engage the catch hook, and above the keeper is a gravity hook, rigidly connected to a key shaft, an arm with lateral projection holding the gravity hook in the position shown in Fig. 1, and so that the catch hook in entering the keeper will carry the gravity hook for ward to lock the door, as shown in Fig. 2. A stop limits the inward movement of the catch hook, so that


CONNOR'S DOOR LOCK.
it will rest practically within the edge of the door when the latter is open, and a button on the other door is adapted to prevent the operation of the gravity hook o lock the doors when it is desired to close without locking them. A key is used for each door, one to raise the gravity locking hook and the other to raise the catch arm to the positions shown in Fig. 1.

## the new yori post office.

In the days of its Dutch occupancy, when the city of New York was termed New Amsterdam, there was no post office. F'oreign letters were delivered personally by the agents of ships and by the officers, sailors, and passengers. Unclaimed letters were left in the hands of some private citizen until called for. As the volume of the business increased, a system of voluntary distribution from the taverns was developed, and the socalled "coffee house delivery" was maintained for over one hundred years.
When the English obtained possession of the quiet old city they left matters as they were for some years, but in 1686 an official order was issued that ship letters must be delivered at the custom house, and in 1692 a post office was established, the city then having a population of not far from 6,000 inhabitants.
In 1710 a "chief letter office" was established, and arrangements were made for the delivery of the Boston mail twice a month. On May 4, 1732, the post office was removed to Broadway, opposite Beaver Street, ac cording to an advertisement in the New York Gazette of May 3, signed by "Richard Nichol, Esq., P. M." In 1753 Dr. Franklin was appointed Postmaster-General. Up to this time the coffee house delivery was still in existence, and was eventually considered an injury to the revenues of the regular service. Alexander Colden was postmaster of New York until the breaking out of the revolution. For the period of the war the records
are missing, but in 1785 William Bedlow held the office, and was succeeded in 1786 by Sebastian Bauman. In the first year of his incumbency the income of the office was \$2,789.84.
A little over one hundred years ago, during Mr. Bauman's incumbency, the post office department, sub stantially as at present constituted, was established with seventy-five post offices and 1,875 miles of post roads. Josias Ten Eyck succeeded Mr. Bauman, hold ing the New York office for the year 1803, and was followed by General Theodorus Bailey, who retained the position for nearly twenty-five years, dying September 4, 1828. He moved the office to No. 29 William Street, corner of Garden Street, now Exchange Place. The next move, in 1825 , was to Exchange Place, and two years later it was moved to the Merchants' Exchange on Wall Street, between William and Pearl Streets.
In 1835 the building was burned in the great fire, and the post office was moved to the rotunda in the City Hall Park. The next change was in 1845, to the Middle Dutch Church, in Nassau Street, extending from Cedar Dutch Church, in Nassau Street, extending from Cedar
Street to Liberty Street. Thence it was moved in Street to Liberty Street. Thence it was moved in
August, 1875 , to the present building, erected for the purpose by the federal government.
The building even now affords insufficient accommodation for the operations of the office. It contains too many columns, which are found to interfere with the fore many years some relief will be necessary. A part Of the building is occupied by federal court rooms and offices, which eventually may have to be established elsewhere.
The New York office is now under the management of Mr. Cornelius Van Cott, New York postmaster, and represents the highest grade of efficiency in its many departments. Our thanks are due to him and to Mr. J. Gayler, assistant postmaster, for courtesies received. Mr. Gayler is one of the oldest employes, having been in the service for thirty-five years, representing the best principles of true civil service.
The United States Post Office Department may be considered as executing its work in two general divisions, one the railway post office and the other the stationary post offices. The work of the entire department is executed in large and small post offices through out the country and in railroad cars, its operations ramifying all over the land. To acquire any concep tion of its processes it must be remembered that one division assists the other to the utmosit of its power, each playing into the other's hands.
We illustrate in the present issue the work of the New York City Post Office. The working divisions of the office are as follows: The executive division; first division, financial accounts; second division, mailing and distribution, third division, city delivery; fourth division, registry; and fifth division, money order. In
the city, besides the central office, there are eighteen the city, besides the central office, there are eighteen
branch stations tributary to it, besides twenty sub stations at which mail matter is received but not de livered. The branch stations both deliver and collect letters.
Mail matter reaches the New York office through several channels, in some cases with canceled, in other cases with uncanceled stamps. The mail with uncan celed stamps comes to the office in three ways. A par reaches it in bulk from large mailing irms, publication
offices, etc. This is delivered on Maii Street, at the north side of the building. Large scales are provided on the platform for weighing it, and it is discharged through chutes, shown in Fig. 8, to the basement A second source is the letter and package drops in the main corridors of the building, shown in Fig. 6 by collectors attached to the offlce.

The first operation the letters have to undergo is ermed "facing up;" this means arranging them with their addressed sides all in the same direction and right side up. As fast as the letters fall into the post office drops the clerks in charge thereof perform this work, one of whom thus engaged is shown in Fig. 2. He is a veteran of the war, and has but one arm, yet is found very efficient. As the collectors bring intheir collections they also face them up and divide them into two genera divisions. One includes letters for city delivery, the other includes out-going domestic and foreign letters. For this work long tables are provided, along one side of which the collectors arrange themselves for facing up and separating their letters, while along the other side are stamping clerks. Both carriers and clerks engaged in these operations are shown in Fig. 3. As fast as the letters are faced up by the carriers they are as the letters are faced up by the carriers they are
placed on shelves over the center of the table, within easy reach of the stamping clenk. The letters from the post office drops, already faced up, are handed also to these stamping clerks.
The stamp with which the letters are marked is a double one, containing a canceling device as well a one for post-marking the date and hour. By means of upon the letter, one "killing." as it is called, the stamp, the other giving the time of its deposit. The letters, when being stamped, are placed upon a thick sheet of India rubber. For "killing" the stamps on circulars, newspapers, and packagesa special kind of stamp, made of printer's roller composition, without date is used. The time in the letter stamps is changed every half hour by a special clerk who goes the rounds periodically making the change, and, by registering impressions in a book properly divided, keeping a record of changes made. This precaution is taken in order that no possible doubt may exist as to the time at which a letter reaches the post office-and is found particularly use ful in cases where negligent messengers have failed to mail promptly letters intrusted to them for that pur pose.
The
The separation of letters received at the New York post office drops is effected, to a certain extent, by the public, who mail them in outgoing domestic, New York Cits, and foreign countries delivery drops. This cor responds to the first separation made by the collectors.
Letters from other post offices, from branch station in the city, and from all parts of the world are received with stamps already killed. The date of receipt at New York is stamped upon this class of mail upon the backs. It is termed backstamping.
Upon the main floor in the central office, shown in Fig. 4, are situated a number of tables, from which rise up cases of pigeon holes, each pigeon hole labeled. These are called the separation and distribution tables. Most of these are used for dividing the mail addressed to different parts of the United States and Canada. The first operation is termed separation. There are 75 separation tables, all duplicates of each other, each provided with 90 pigeon holes. The titles of the pigeon holes may be classified in three divisions. The first di vision includes boxes devoted to a special post office there are comparatively few. There are ten in the
State of New York, three in Pennsylvania, three in Ohio, and so on The letters placed in these pigeon holes are tied up in bundles and receive no further dis tribution within the office. The second division includes letters for (a) New York State in general; (b) New Jersey; (c) Pennsylvania; (d) Maine, Massachu setts, Vermont ; (e) Connecticut, Rhode Island, New Hawpshire, and Canada; (f) Ohio, Indiana, Illinois, Tennessee, Virginia, Texas. All of those mentioned under the second division have to be redistributed in the office. The third division includes remaining States of the Union, and is distributed by the railway
post office, after separation on these tables. Five dispost office, after separation on these tables. Five dis
tribution tables receive the second of the divisions des ignated above from the separation tables. One table is devoted to New York, another to New Jersey, another to Pennsylvania, another to the Eastern States and Can ada, and one to the South and Western States, as just specified. Here the lettersare still further distributed Some are placed in boxes, labeled with the names of post offices, to which they go directly. Other boxes are marked with the name of the place followed by the letters " $D$ and $D$." In these are placed letters intended for direct mailing to that post office, as well as to be distributed therefrom as a local center. A third and very numerous class are marked with the names of railroads, and are distributed from the cars to post offlce station on the
clerks.
erks.
On the New York State table 392 of these distribu New are made, and on the Pennsylvania and the New England and Canadian tables respectively 224, for New Jersey there are 126, and for the Southwest 72 distributions. Were the clerks simply required to refer the numerous post offlces each to the box including it, the feat would be a considerable one, but in addition to this, changes are continually being the cork ha to keep accurate watch of ali such changes.

Probably the wost complicated department is the New York City distribution. These letters have been separated from the general mail partly by the public mailing them in designated boxes in the post office partly by the collectors on reaching the office, and the remainder at the 75 separation tables. At the New York City tables pigeon holes are provided open at front and rear. They are arranged and marked to corre spond to the carriers' routes supplied from this office and partly to the branch stations. For these the stree address is the guide. The distributing clerk must at once refer this address to the proper office in whose district the street is included, or to the carrier's route on which it lies, and throw the letter into its proper box. In some cases the odd and even numbers on a street will fall to different divisions. At the same time the clerk has to watch for all names of holders of lock boxes. 'These, even if directed to street addresses, go to the box belonging to their receiver. The clerk therefore has to know the name of every box holder in the city, of whom at present there are 3,000 .
The mail for foreign countries is distributed on the same general lines by being thrown into proper pigeon holes. In this department there are 14 distribution tables, each having 29 boxes.
The weight of letters passing through the post offlee is watched. Those that seem too heavy are weighed, in order that unpaid postage may be collected upon them. All such go to the mail inspection and rating department, falling under the first division.
The letters leave the office in pouches after separa tion and distribution for all districts except the car rier district of the office. They are removed from the pigeon holes, are tied in bundles, and each bundle is labeled with the name of the pigeon hole from which its contents is removed. They have next to be "pouched." For this purpose a large semicircular table is provided with a range of large sized pigeor table is provided with a range of large sized pigeon
holes whose floors are inclined downward in the rear These are marked with the names of railroads, cities, These are marked with the names of railroads, cities,
etc. The packages of letters are thrown dexterously etc. The packages of letters are thrown dexterously
into the proper compartments, whose labeling does not correspond necessarily with that upon the pack ages. At the back of these inclined pigeon holes sacks may be attached by hooks to receive the bundles as fast as thrown in, or the pigeon holes may be closed at the back and their contents removed from time to time. Both systems are :mployed. The letters go out in these pouches, some to post offices, and some to be opened on the trains and sorted and separated and distributed along the route by the railway post office employes. For city branch offices the pouching is done in simple frames supporting the bags by the mouth as shown in Fig. 7.
To the mailing of newspapers a special department, occupying most of the basement of the building, is devoted. Here the papers and circulars are received in bulk in sacks, which come down inclined chutes from Mail Street, as shown in Fig. 8. The work done her in the separation and distribution compares closely in the separation and distribution compares closely eparation tables, each with sixty-four divisions o boses. Five distribution tables are supplied from limited number of the boxes of the separation tables There is also one table specially provided for news dealers' packages. The work at a newspaper separa tion table is illustrated in Fig. 5. As an example of the work done in this department it may be stated that on the New York table there are 576 distributions effected, on the New England table 144 distributions, and for the other three tables from 125 to 150 . The third and fourth class matter handled in this departnird and fourth class matter handled in this depart out from $1 \mathrm{~A} . \mathrm{M}$. to $10 \mathrm{~A} . \mathrm{M}$. is stamped with a figare 1, from 10 A . M. to 7 P. M. with a figure 2, and from 3 P M. to 1 A . M. with the figure 3. It is placed on elevators, shown in Fig. 1, and delivered to the mai wagons on Mail Street, north of the building. As the elevator rises and descends it opens and closes auto matically a safety door covering the orifice.
In the basement storage for sacks and pouches is provided, as shown in Fig 9, where they are stored way, labels cut off, and whence they are taken as re quired. The repairs of sacks and pouches is all exe cuted in Washington
Forbidden articles far into two classes--those pro hibited by the Postal Union and those by the United States laws. A large quantity of matter is held back as unmailable every year, and the sender notified
A number of letters with undecipherable or mean ingless addresses are received. We give some sample addresses: "Your friend, Claus S. Anderson. P. S. addresses: Your friend, Noth to bed. North America." "Shipped Knocked Down. Can be set up by any cabinet maker New York, Mexico." "A Happy New Year. Thomas Souniel, Cuba." "Mr. Brooklyn President St., New York, United States." The first three represent a very numerous class written from circulars or the ending of letters by those ignorant of the language. If un deciphorable they are sent to $W$ ashington, and occer sionally some are interpreted there.
Some statistics of an approximate year's busines will be of interest. Such would include about 216,

000,000 letters, postal cards, and newspapers delivered by carriers, $350,000,000$ collected in the city from all sources, $34,000,000$ letters forwarded to foreign countries, and over $25,000,000$ received from the sume. Over half a million of letters are wisdirected annually, and of these about 86 per cent are forwarded to their correct destination. The dead letter office at Washiugton, D. C., receives about one million pieces of mail matter In a working day, on the average in round numbers, 620,000 letters, weighing 16.000 pounds, are disposed of, in addition to 10,000 sacks of serond, third, and fourth class matter. The whole represents 500.000 pounds The carriers dispose daily of about 8,000 pounds of letters and postal cards. In the year 1889, 200,000,000 pounds of mail were handled in the office. The registered letter department forwarded during 1889 nearly three millions of dollars as gold coin in bulk.

## NEW LETTER STAMPING MACHINE

The Hey and Dolphin letter stamping machine is now in full operation in the New York post office. It was put there on trial, seven months ago, by author ity of the Postmaster-General. The post office officials here are greatly pleased with it, and Postmaster Van Cott has made a very favorable report of its merits to the Washington authorities.

The machine combines the merits of great speed, effective cancellation, uniform and legible postmarking, and an accurate maristry of the number of registry of the number of letters and postal cards operated upon. It is claimed that it will cancel, postmark, count and stack the letters and postal cards at the rate of 30,000 per hour. On November 2, it canceled, postmarked, counted, and stacked 187, 980 letters in the course of twelve hours, and it has disposed of 3,000 postal cards in 4 winutes and 50 seconds. It has canceled, postmarked, counted, and stacked 24,000 postal cards within an hour. In two hours and two minutes it canceled, postwarked, counted and stacked 46,480 letters and postal cards, of which 21,000 were letters. Of course this record would have reached higher figures but for the idle intervals which occurred to the machine owing to the failure of the supply of letters. It is this great capacity for speed that gives to the machine its principal value.

The work of canceling and postmarking letters as done by the old fashioned hand stamp is the chief hinderance to a quick and satisfactory postal service in cities. It sometimes happens that letters and postal cards are deposited in the post office in such great $\mid \mathrm{D} D$, holding back any other. Under the action of $t w$ quantities just before the closing of the mail that the clerks are unable to cancel and postmark them in time and consequently a portion of them must necessarily be detained over until a later mail than the one for which they were posted. Fast mail trains and faithful letter carriers are of no avail for letters detained over because insufficient time has been allowed the post office officials to cancel and postmark them.
The government has been long in need of machinery having great speed for doing this work, and the importance to the public of its introduction at this time cannot be overestimated. By placing the necessary number of machines in each post office the officials will be given absolute control over the quantity of work to be done in a given time, and no letter need be detained for a later mail than the one for which it was posted.
The machine is compact, and condenses its numerou functions and great capacity within very limited dimensions. It comprises a receptacle or hopper, a combined feed and separator, a counter, a printing device and a stacker.
The operations are wholly automatic. Letters of indiscriminate sizes are placed in the receptacle, and are imnediately oarried forward to the feed and separator which feed the letters forward with great rapidity while preventing the passage of more than one letter at a time.
The letters are placed upon their edges in a species of horizontal hopper, whose under surface is formed by


NEW LETTER STAMPING MACHINE IN USE AT THE NEW YORR POST OFFICE.
positive feed rolls, one of which is shown at $B$, the letters are fed forward. An ink font, $A$, and inking rollers, $C C$, are seen in the front of the machine Back of these is a feed roller. Working in unison with it, and practically forming a continuation down ward of this roller, is a rotating die. The roller, B, acts as a pressure roller, forcing the letter against this otating die, which cancels the stamp by horizonta ines which extend across its face, and next imprints the date upon the face of the stamp. Trip mechanism is provided actuated by each letter as it coues forward, by which the die is released from a detent and is clutched to the roller alluded to. It thus rotate with it, and produces the desired imprint upon the envelope. As the letter passes out, the clutch is re lased, leaving the die loose, and at the same time a stop mechanism is operated, locking the die in a posi tion so that it cannot print. The next envelope that comes along releases the stop, throws on the clutch, so that the die rotates sufficiently to produce its imprin upon the envelope, and is immediately unclutched and ocked. The envelopes then pass on to a stacking table, where they drop down before fingers carried by a rotating shaft that continually feed them forward against a board placed at any position desired. A egister, $H$, indicates the number of letters which have been canceled, and is one of the most conve aient accessories of the machinc. The date and hour in the die are changed by hand.

The machine is driven by a one-quarter horse powe lectric motor, but can be run by foot power like printing press. One very valuable feature of the machine is the clearness with which the date is printed upon the envelope. The hand stamp imprint inevita bly lacks clearness, but in the machine we are describing the impression is produced with the distinctness of printing. The clerk in attendance watches for envelopes which have the stamp upon the wrong corner, or that have a number of stamps on them, and by feeding then upon other than the top edge secures the canceling of the stamps. The feed rollers are held to their places by elastic bearings, and elastic coiled spring belts are used for driving them. Thus the roller can be pulled apart to a considerable extent, and there is no danger of the attendant getting his fingers caugh or being injured in any way.

A Formidable old Dragon.
In a paper read last November, before the Na tional Academy of Sciences, Prof. O. C. Marsh de scribes the skull of the gigantic Ceratopsidm, the emains of which are found in the Rocky Mountains.
The geological horizon of these strange reptiles is a distinct one in the upper Cretaceous, and has now been traced nearly eigh hundred miles along th eastern flank of the Rock Mountains. It is marked almost everywhere by re mains of these reptiles and hence the strata con taining them may be called the Ceratops beds.
The skull of Triceratops the best known genus o the family, has many re markable features. First of all, its size, in the larg est individuals, exceed that of any land animal living or extinct, hitherto discovered, and is only sur passed by that of some o the Cetaceans. The skull the type of the species, i that of; a comparatively young animal, but is abou six feet in length. The type of Triceratops horri dus was fully adult, and probably an old individu al. The skull, when cow plete, must have been over eight feet in length. Two other skulls, both nearly perfect, now under exam ination by the writer, fully equal in bulk the two a ready described, and othe similar specimens from the same horizon maintain equal average dimensions equal average dimensions Another striking feature is its armature. This consisted of a sharp cutting beak in front, a strong horn on the nose, a pair of very large pointed horns on the top of the head, and a row of sharp projections around the margin of the post
ior crest All these had a horny covering of gre th. All covering of grea formed together an armor for the head as complete as ormed together an armor for the head as complete as and in a great measure determined its form and tructure
The skull itself is wedge-shaped in form, especially when seen from above. The facial portion is very uarrow, and much prolonged in front. In the fronta region, the skull is massive, and greatly strengthened to support the large and lofty horn cores which formed the central feature of the armature. The huge, ex panded parietal crest, which overshadowed the back of the skull and neck, was evidently of secondary growth, a practical necessity for the attachment of the powerful ligawents and muscles that supported the head.

The Northwestern Railroader learns that a large railroad company has the plans for a three-story freight house in Chicago, nearly 300 feet long, and will un cars on a track and by hydraulic lifts raise it to the second story and then run a second series of cars on second track and raise that to second story. Ter:uina ground is certainly getting valuable, and railroad man agers will watch with interest to see three trains being loaded or unloaded at one time into a freight house from the same side. If the plan proves feasible a great saving of ground rent will be rendered to all railroads torminating in large citios.

LABORS OF THE TNTERNA-
TIONAL BUREAU OF TIONAL BUREAU OF
WEIGHTS AND MEASURES.
The first meeting of the General Meter Conference was held at the pavilion of Breteuil (St. Clond Park), from the 24th to the 28th of September, 1889. The mission of this conference was to sanction the labors of the International Bureau of Weights and Measures, and to receive the metrical prototypes designed for the subscribing States of the meter convention. It consisted of the International Committee of Weights and Measures, of the French section of the Meter Commission, and of the diplomatic or scientific delegates of the States represented in the reunions of 1872. The president of the Academy of Sciences was the president of it de jure. The Minister of Foreign Affairs, desirous of showing the great interest that the government took in this conference, open-
ed the first session himself.

We shall say but little of the conference itself, of which we might give a pretty accurate idea by merely reproducing the speeches that were delivered. It was at the second session that the prototypes received their official sanction, and were distributed by lot among all the States. The international meter and kilogramme, so exact copies of those of the Archives that it is impossible to detect the direction of their errors, were placed in a strong box, situated in a their errors, were placed in a strong box, situated in a
deep cellar closed by three locks, whose keys were respectively in the hands of the director of the bureau, of the president of the committee, and of the guardiangeneral of the Archives. The extraction of these standards by an officer of the International Bureau was, therefore, subordinated to the authorization of the International Committee and the French government. It could take place only in the presence of the depositaries of the various keys. These precautions, which at first sight seem to be a little excessive, were neces sary in order to give all the States the absoluteguaran tee that the fundamental standards of the metrical system should run no danger of being injured by ill-dis posed or careless persons.
As we have said, the mission of the conference was to sanction the labors relative to the new prototypes of the metric system. We propose to pass these various labors rapidly in review.

It will be remembered that the Meter Commission, renouncing the primitive and theoretic definition of standards, decided simply to copy the meter and kilo gramme of the Archives in their present state. The problem was, therefore, reduced to the making of these copies, then to the getting up of immutable standards for the States, and to the determining of their exact value.


Fig. 4.-UNIVERSAL COMPARING MACHINE.
(the latter in the proportion of 10 per cent). This metal is extremely hard; its resistance verges on that of steel, and its temperature of fusion is that of dazzling white (according to Mr. Violle, $1,775^{\circ}$ for plati num and $1,950^{\circ}$ for iridium).
The metal necessary for the construction of the metrical standards was ordered from Messrs. Johnson, Matthey \& Co., of London, who, after long researches, succeeded in purifying it. T'he difficulties of separating the last traces of rhodium and iron from the iridium were, says Mr Mat they, almost insurmountable. It took no less than eleven consecutive analyses, the result of which was not declared satisfactory till Oct ober 18, 1885.
The hardness of the metal, which is an important qua lity for the construction of standards, rendered the manufacture of them par ticularly difficult; it was necessary, from the lessons of experience, to modify the The selection of the metal was a subject of profound tools employed for planing metals. Finally, after discussion. The material for the meters and kilo grammes had to be very hard and unchangeable with time, not attackable by atmospheric agents and by ordinary chemical agents, and very refractory, in orde


Fig. 1-STANDARD METER. Fig. 2.-FLEXION OF THE
RULES. Fig. 3.-DEVICE FOR GRADUATING THE RULES.
o resist even the temperatures that might accidentally occur in the fire of a laboratory
The important labors of $H$. Sainte-Claire Deville led to the adoption of an alloy of platinum and iridium
ools employed for planing metals. Finally, after April, 1886.
The rules have the form shown in Fig. 1. This form, which is odd, at first sight, has been so calculated by Mr. Tresca that the distance of the divisions limiting the meter and engraved upon the surface, A, are inde pendent of the support of the rule. Fig. 2, in which the flexions are purposely exaggerated, shows that the upper surface of a rule elongates or contracts according as it is supported at the center or at the ends. The median line, called the surface of neutral fibers, re mains sensibly invariable. The X-shaped standard has been so calculated, moreover, as to effect as much saving as possible in the very costly material.
Most of the old standards of precision are very delicate and can be handled only with the greatest care, if it be desired to prevent permanent distortions; the new ones, on the contrary, are exceedingly, strong, and are capable of undergoing shocks without danger. Accurate experiments have shown that a weight of forty kilogrammes can be suspended from the middle of an X -shaped weter without permanently modifying it.
The rules, delivered in a crudestate by Messrs. Johnson, Matthey \& Co., were finished and cut to the length of 102 centimeters by Messrs. Brunner Bros., of Paris. Then they were polished and engraved at the Conservatoire des Arts et Metiers. A beginning was made by polishing a space near each extremity, and then the rule was placed in a horizontal comparing apparatus, where it received the two lines defining the meter, and each accompanied with two other lines at half a milli meter from the central line. Thus there was obtained at the same time with the metric standard, the micro metric standard, under the form of two millimeters


A NOVELTY IN TRAMWAY PRACTICE.-[See page 58.]

A brief description of this mode of engraving will doubtless interest some of our readers.
Upon a board, B (Fig. 3), is placed the model rule, I, and the rule to be ongraved, $H$. The apparatus hav ing been adjusted, the first line of the rule, $I$, is brought under the microscope, M. Then, by a proper movement of the diamond graver, a line is marked upon the rule, $H$. The board is then shifted parallel with the axis of the rules, until the second line of the rule occupies in the microscope exactly the position in which the first was found; then a new line is engraved upon $H$, and so on. The entire engraving is done with out the operator seeing his work ; it is not until he has finished it that he can examine it. The least defect necessitates the entire work being begun over again for, in view of the precision that it is necessary to ex pect, it is impossible to mend an interrupted division. This difficult, work, performed by Mr. Gustave Tresca, has succeeded in an unexpected manner; one of the first meters engraved, compared with the standards at the International Bureau, served as a type for the rest of the operations. Now, among the thirty meters thus engraved, there is none whose equation reache $3 \mu$ (three thousandths of a millimeter), and the mean of all is exactly equal to the International meter whence we conclude that there was no systematic error in the instruments.
We shall not expatiate upon the manufacture and adjusting of the kilogrammes, which presented diffi culties of another nature, and not so great. The iridiun-platinum cylinders that served for this were strongly compressed in a powerful apparatus in order that all the small internal cavities might be crushed The movement of the density shows the continuity and, within certain limits, the purity of the metal.
While awaiting the delivery of the standards, the Bureau occupied itself with the elaboration and im provements of the methods of comparison. The first apparatus, which were quite imperfect, were partially replaced with those which have already been des cribed; and others completed the collection.
A long series of comparisons had put the Bureau in possession of provisional standards of the meter and kilogramme, whose equations with respect to the standards of the archives were exactly known. But it was still necessary to deterwine a certain number of copies for the labors of the Bureau, to measure their expan sion, and to get up standards of the subdivisions of the meter and kilogramme. On this subject a few words of explanation may not prove amiss. To speak only of the measurements of length (the same reasonings and nearly the same processes are applicable to the masses) we may say that although there exists in the world one meter exact by definition, it cannot be pretended that we have a perfectly accurate single decimeter, centimeter, or willimeter. Remaining within the limits of practice, we can assert that, in a well divided meter, there are but very few millimeters whose erro is less than the limit of the errors of observation.
If we desire to find the error of a millimeter, we begin by comparing the divided meter with the meter exact by definition. Afterward, on comparing the decimeters with each other, we ascertain the excess of each of them over their mean, and, consequently, the error of each separate decimeter. Afterward, by an analogous process, we pass from decimeters to centi
meters, and from centimeters to millimeters. This meters, and from centimeters to millimeters. This
operation, which we are describing in a few words, takes nearly a year of assiduous work. It may be don by means of an instrument called a universal compar ing machine-called universal because it permits of measuring all the lengths between certain limits, while nost comparing apparatus are designed solely for measuring definite lengths, generally one meter or several meters.
The universal comparing machine (Fig. 4) consists essentially of two microscopes, $M$, movable upon a very massive cast iron bridge, $A$, supported by stone pillars, $P$. The rules are placed upon two supports, B, capable of being moved in all directions.
The tests can be made by different processes. The simplest consists in fixing the two microscopes upon the bridge at an invariable distance, say of 1-10 m ., for example, and in making all the decimeters of the rule pass successively in their field. The two micro scopes thus form an optical compass by means of which each decimeter is measured separately
We shall speak further along of the various other labors undertaken by the Bureau. For the present, we wish to terminate what concerns the study of the prototype standards designed for the subscribing States. Here again we shall speak only of the meters, grammes, forty in number thered. For the kilo methods of comparison was exactly the same.
The standards were designated by numbers, arranged upon horizontal and vertical lines. Each standard was then compared with all those of the same horizontal line and of the same vertical column. Each comparison of two meters was made four times, by alternately placing one end of each of the rules to the right and left of the observer.
The series of comparisons of the meters numbered

784 , to which must be added nearly 400 series for the measurements of the expansions. As each series com prised 6 measurements of one rule and 5 of the other we reach the very respectable number of about 13,000 measurements. This required an uninterrupted labo of two years.
The measurements were made independently by several observers and by means of various apparatus. Their variations therefore give a good criterion for the accuracy of the same. They also indicate the limit that it is now possible to obtain. A profound study eads to the admission that the errors of the equations scarcely exceed $0.2 \mu$ (two ten-thousandths of a milli meter) for the rules, and are certainly less than 0.01 mg . or the kilogrammes. The accuracy of the weighings greater than one hundred thousandth, or to a magni tude corresponding to 10 centimeters upon the ter estrial quadrant, is the greatest of all that can obtained in physical measurements.-La Nature.

## A NOVELTY IN TRAMWAY PRACTICE.

We illustrate a novelty in tramway practice, taken rom the railroad operated in the beautiful town of Ontario, San Bernardino Connty, Cal. The railway passes through the middle of Euclid Avenue, a broad and beautiful street, bordered with orange and lemon trees. The avenue is some $61 / 2$ miles in length, with heavy grades as it approaches the hills.
The car is drawn up hill and over the levels by a pai f mules, but in going down grades the mules ride and he car moves by gravity, as shown in our engraving A platform with folding sides is provided, which i supported near one end upon a pair of wheels. The opposite end of the platform is supported on the car When the mules are the tractive power the sides of the platform are folded down and the whole rolls back under the bottom of the car, where it remains and is drawn along the track with the car. The wheels on which the platform is carried are of small diameter and near them is a brake bearing directly on the rai when applied by the conductor.
On down grades the platform or truck is drawn ou from beneath the car, the sides are raised, and the guard rails, etc., are adjusted. The mules are driven upon the platform, the gates are closed, and all is read or the descent. The mules quietly stand, well fenced in, while the car rapidly runs down the grade.
We are indebted to Mr. E. P. Slater, of Ontario, Cal., for photographs from which our illustration hes been prepared.

## Horniman's Museum.

We have just had the privilege of being conducted by Mr. Horniman over his unique collection of curiosities. Mr. Horniman's museum is probably the most complete, if not the largest, of any private museum in the country, and is the result of thirty years collecting $t$ considerable expense and diligence by the owner.
But by far the most extensive and complete section of the museum is devoted to specimens of beetles and butterflies (Coleoptera and Lepidoptera), of which ther are over 12,000 specimens, in 500 drawers, and South America is in this section exhaustively illustrated
South America is particularly celebrated, not only for the abundance but also for the surpassing beauty of its insect fauna, among which may be mentioned the huge silk-producing moths of Brazil, belonging to the yenus Attacus (allied to the Indian Atlas moth) and Polythysania; the hummingbird moths, Calliomina, Enyo, etc., also the true hawk moths, Chœrocamp, Pachylia, Philampelas, and other genera common in Panama and Colombia. Castina endesmia from Chili, and others belonging to the same genus from Brazil, Colombia, and the upper Amazon, are almost unique among moths by having clubbed antennæ or horns, which is generally considered to be the distinguishing appendage of a butterfly, but this is an exception to the rule.
In the Thrysana (night-flying moths) is found one whose spread of wing is nearly eleven inches. This is found in Brazil. The beetles from Brazil alone are legion, from the lovely longicorn or long-horned beetles, Psalidognathus, whose beauty can .n'y be compared to monstrous jewels, to the little cirious Coswisoma, with tufted legs and horns. Brazil also produces the wonderful beetle, Dynastor, Hercules (an old world name for a new world insect), the back or thorax of which in the males is lengthened out into a horn or spear about four inches long, underneath which is another attached to the head and movable, the two forming a weapon resembling the claw of a lobster. Then there are the Diamond beetles, so called from their exceeding brilliancy ; in fact, Brazil, Nicaragua, Panama, Chili, and the other countries in South America all combine to produce such numbers of species as are found in no other part of the globe. The butterflies are as numerous. H. W. Bates, in his "Naturalist on the Amazons"-a charmingly written account of a charming country-speaking of Para, gives
the number of species of butterflies that may be found within an hour's walk of that place as 700. The total number found in the British Islands does not exceed
fur Heliconias throng the paths in the woods, while the gorgeous metallic blue Morphas soar aloft, scores of feet high, in the bright sunshine, the reflections of whose iridescent wings may be seen afar off-some say a mile-and the hummingbirds add to this scene of enchantment.
The museum is open to the public, on Wednesday and Saturday afternoons, by cards of admission to be had from Mr. E. D. Watkins, the genial curator, 100 London Road, Forest Hill ; and Mr. Horniman permits also natural science classes, or parties interested in the works of nature and art, to go over the museum under the charge of the curator. It is, however, necessary to arrange beforehand, in order that a convenient time may be appointed for the visit. South American visi tors, and those from India, would be peculiarly inter ested in the collection, as the fauna of those continents is so well represented.-Chemical Trade Journal.

## decisions relating to patent cases,

## Supreme Court of the United States.

WATSON $v s$. THE CINCINNATI, INDIANAPOLIS, ST.
LOUIS \& CHICAGO RAILWAY COMPANY.
Letters Patent No. 203, 226, granted to Chauncey R. Watson, April 30, 1878, for improvement in grain car doors, Held to be void for want of patentable novelty if construed to consist of the combination, in a freight car having an outside rigid door, of an inner flexible sliding grain door.
Where the complainant's door was carried on rods and staples and the defendant's door moved in grooves Held that even if there was no material difference be ween the doors of complainant and defendant, re spectively, there was no infringement, for complainant had in effect disclaimed defendant's door.
A patentee will not be permitted to say that certain specified elements of his combination claim are not es sential to the combination
An alleged combination which consists in a mere ag gregation of parts, each to perform its separate and independent function substantially in the same manner s before combination with the other and without con ributing to a new and combined result, is not pat entable.

## Trade Marks.

## superior Court of Cincinnati-State of Ohio

 нокв et al. vs. BISHOP et al.A small metallic frame containing a portrait fastened to a pin, so as to be used as a personal ornament, does not constitute a valid trade mark when so attached to and sold with a cigar as to be readily detached and used separately in the manner indicated.
An article having a distinct commercial value of its own cannot be made a trade mark for another article by being attached to and sold with it.
Where it is charged that the defendant has imitated the packages of the plaintiff for the purpose of imposing the goods of the former upon the public as those of the latter, not only must the fact of imitation be shown, but it must also appear that the imitation was made with intent to impose upon the public as aforesaid, and such intention may be presumed from the fact of imitation, but the presumption is not conclusive, and may be overcome by facts showing that the imitation was for other and innocent purposes.

Japanese Lacquer.
Mr. Romyn Hitchcock described recently to the Washington Chemical Society the manner in which Japanese lacquer and the beautiful Wakasa ware are prepared. Lacquer is obtained from a tree, Rhus Vernicifera, which grows throughout the main island of Japan, but is best around Kioto. The juice, from which lacquer is obtained, exudes from horizontal cuts in the bark, and is collected from May to October. It exudes slowly, and is collected with a pointed instrument like a spoon, and transferred to a wooden receptacle. A dozen trees are cut in several places in rapid succession, and the juice collected from time to time. During the season each tree is visited about twenty times. As the sap first exudes it is a grayish white, thick or viscous fluid, which quickly turns to yellow, and afterward to black, when it is in contact with the air. It is strained through a cotton cloth to free it from wood and dirt, being first thoroughly stirred to make it of uniform consistency. A portion of the raw lacquer, usually about 16 lb. , is then poured into a large circular vessel and vigorously stirred with a long-handled implement for five or six hours, while the heat of a small charcoal furnace is ingeniously thrown on the surface to evaporate the water. During the stirring certain ingredients may be added. Thus, iron is added to produce the fine black lacquer. In Tokio, a soluble salt of iron is used for this purpose ; in Osaka, a fine iron dust. The lacquer is then poured into a vessel to settle, and is afterward drawn off from the sediment.

There is a great increase in the consumption of African teakwood, on account of its property of pre with it.

## The Production of Pumice Stone

We often hear it remarked, and particularly after an eruption of a volcano, that pumice stone ought then to be plentiful and cheap, as quantities must have been ejected during the volcanic disturbance. As a matter of fact, however, none of the white stone in general use is obtained from active volcanoes. It is true that Vesuvius has ejected pumice stone, for at the tine when Pompeii was destroyed large quantities fell over the doomed city, but that pumice appears to have been only of diminutive size, and is gray in color, and of the same inferior character as that found to the north of Naples. It is also probable that volcanoessituate in the southern seas emit pumice, for accounts are published now and again of vessels sailing through quantitles stretching for miles upon the surface of the water. This, presumedly, is similar to that taken from the sea near the Italian shores. It is small in size, and in the form of pebbles, having been rounded by the action of form of peb
As already stated, we are not indebted to ejections As already stated, we are not indebted to ejections
from volcanoes for our supply of stone. It is to actual deposits of the article discovered in one or two quar-

Some years ago it was almost the general custom to send the stone loose in the vessels to the Leghorn merchants, who sorted and packed it for shipment. This custom, however, has been altered, and by getting the stone sorted at the place of production, far better results have been obtained than formerly. There is no doubt but there is now less good stone to be found than used to be the case. For one ton of good light stone a miner has to have many tons of inferior quality to dispose of, and now that prices have been so interfered with by the operations of the syndicate that has been formed to acquire the working of the principal portion of the mines from the municipality, it has become a question of paying a very high price for stone we could formerly obtain for far less than it now costs.

## THE FRENCH WAR SHIP "REDOUTABLE."

The "Redoutable," one of the ships in the French squadron of evolution at Toulon, was constructed in 1876. She is built of iron and steel, 318 feet 2 inches long, and with 64 feet 8 inches breadth of beam, having a displacement of 9,200 tons, and drawing 25 feet 6 inches water. Her engines are 6,071 indicated horse

## Pyorrhcea Alveolaris.

This is an insidious disease which begins by a deposit of tartar upon the necks of the teeth and gradually creeps in, reaches the roots, clinging to the exterior thereof. The teeth become loose, painful, and extrac tion is often deemed necessary. But some dentists are successful in effecting cures. Some treat the disease by introducing scraping instruments, thereby removing as much of the tartar from the roots as they can then injecting sulphuric acid or peroxide of hydrogen followed by alkali and an antiseptic. At a recent meeting of the New Jersey State Dental Society, Dr James Truman, in the course of some remarks upon the subject, said :
"Does it originate from tartar? Not if I understand "When you take a patient in hand who states that in the morning when he brushes bis teeth the blood will ooze from the gum, you know what the condition is. Here and there a tooth will present a bright red line at the border line of the gum. The moment that it is touched blood will ooze from it, by the disturbance of the capillaries at that point. That is the begin-
ning. And if you take it in hand at that stage, you


THE FRENCH IRONCLAD "REDOUTABLE."
ters of the globe, the best of which is at present to be found in the island of Lipari, situate in the Tyrrhenian Sea. The island is of no general interest, and is scarcely visited at all by any but Italians engaged in trading in its productions, such as currants, capers, wine, and pumice. It is mountainous in character, and consists of tuffs and lavas and of highly siliceous volcanic products. The district where the stone is found is called Campo Bianco or Monte Petalo (1,500 feet above the level of the sea). It is an interesting ride there upward from the town. The views obtained of land and sea during the ascent are very fine, and the effect produced by the first sight of the pumice deposit curious, for after riding a considerable distance, partly along precipitous paths, sufficiently dangerous to be interesting, and partly through vineyards and over grassy plains, one almost suddenly comes upon a seemingly snow-clad narrow valley inclosed by hills, also quite white, and the whole glaringly bright on a sunny day, such as can be experienced in this south ern latitude. Into these hills workmen are ceaselessly digging deep burrows, working within by candle light. In theirexcavations they come across many lumps of pumice stone, which are placed in baskets, subsequently being conveyed along the valley to the seashore, where small boats are loaded and sailed to the seaport near by, where the stone is sorted, packed, and shipped to distant parts either via Messina o Leghorn.
power, working twin screw propellers, and giving a speed of 14.66 knots an hour. The coal storage is 510 tons, sufficient for steaming 2,800 miles at 10 knots an hour. The hull is protected by a belt of armor plate 14 inches thick, and the central battery has 9 inch plate armor, with 15 inch backing. The guns in the central battery are eight breech-loading 24 ton guns, with caliber of 27 centimeters diameter, rifled ; and the barbette guns are six 3 ton guns of 14 centimeters bore. She carries also twelve machine guns and four torpedo tubes.-Ilustrated London News.

Telephones and speaking tubes are of greater an tiquity than most persons are aware. The speaking tube is a contrivance mentioned in ancient writers, and comes down to us or survives just as candles and oil lamps have not been altogether superseded by gas and electricity. In 1667 Robert Hooke, of London, described how he transmitted sound by means of a wire to considerable distances. Wheatstone described his "telephone" in 1821, and in 1854 Ch . Bourseul said: "Suppose a man speaks near a movable disk, sufficiently pliable to lose none of the vibrations of the voice, that this disk alternately makes and breaks the currents from an electric battery, you may have at any distance another disk which will simultaneously execute the same vibrations. It is certain that in a more or less distant future, speech will be transmitted by elec tricity."
can stop pyorrhœa alveolaris. It has nothing to do with tartar. It may come from constitutional disturbances; it may come from some form of nephritis or a long siege of sickness. What then follows necessarily after this? Immediately succeeding we have a development of micro-organic life. When you place a rabber dam, or a clamp, or ligatures upon teeth, you produce irritation, and the patient will complain. You take off the instrument, and you allow the patient to go away without any treatment whatever. In forty-eight hours there will be a development of micro-organisms, and pain will result, and irritation at the neck of the tooth, and if it is not stopped at that time, it may go on until this pathological condition which we call pyorrhoea alveolaris appears.
"I hold that no dentist should put a rubber dam in the mouth, or a clamp on the teeth, or do anything of that kind liable to raise inflammation at the necks of the teeth, without applying an antiseptic. For this purpose I know nothing better than sulphate of quinia, mixed into a paste-not because it is the best germicide, but because it is more lasting than other agents."

A permanent and durable joint can, it is said, be made between rough cast iron surfaces by the use of mineral asbestos mixed with sufficient white lead to make a very stiff putty. This will resist any amount of heat, and is unaffected by steam or water.

RECENTLY PATENTED INVENTIONS. Railway Appliances.
Car Coupling.-John Bender, Marion, Kansas. Combined with the drawhead is a coupling hook pivotally connected thereto, a weight arranged in cook plvotally connected thereto, a weight arranged in
connection with the hook, a jaw being pivotally connected to the drawhead and a plate mounted withn a recess in the jaw, and links by which the jaw and
are connected, with various other novel features.

## Mechanical.

Nut Lock.-Isaac S. Humbert, Staunon, Va. The bolt has an integral thread and the nut has a transverse groo ite its threaded portion, the therewith is used a transversely wedge-shaped and
ongitudinally curved and tapered key having longitudinally curved and tapered key having a
lardeued or steel body, a soft tip, to adapt it to cut the hardeued or steel body. a soft tip, to adap
bolt thread and clasp in the nut groove.
Journal Box. - Ezra L. Post, New York City. This invention covers a bearing provided with a continnous series of anti-friction rolls, a roll-
holding attachment, and radial anti-friction rolls, makholding attachment, and radial anti-friction rolls, mak-
ing a bearing designed to operate with a minimum amount of friction, and one in which the parts are so rimes when the journal shaft is revolving and the bear times when the journal shaft is
ing is subjected to side thrust.
Saw Swaging Machine. - Henry P O'Connor and Antoine Leduc, Manistee, Mich. This machine has two side disks and $a$ handle between them,
the latter fulcrumed on a shaft secured on a plate, the construction being such that the tooth during ewaging s engaged on all four sides, on the top and back by dies, and on its sides by flanges which limit the tooth point to the desired width.
Pug Mill Elevator. - James H. Steele, Butte City, Mon. This is an elevator for con-
veying mud to the mud mill of brick machines, the conveyer slightly compressing the mud as it passes up
from the hopper, and clearing the mud of stones and from the hopper, and

Clamping Device for Saw Tables. -Joseph Balsley, Seymour, Ind. This is a clamp designed to be instantly adjusted to any width of lumber, to hold it while being cut by the saw, the
slotted saw table having a stationary edge flange, in slotted saw table having a stationary edge flange, in
connection with grooved guideways, a stop with recessed base, a chain, with sprocket wheel, shaft, and hand

Feed Device for Ore Furnaces. Albert C. Johnson, Wilmington, Del. The shell of the furnace has openings in its top and a hopper whose
openings are out of alignment with those in the top of the shell, there being apertured gates between the shell and the hopper, and means for alternately reciprocating the gates, whereby the ore may be fed regularly to the
furnace and the supply cut off as soon as the furnace is furnace and
stopped.
Drilling Machine. - Williaw H. James, Pittston, Pa. This machine has a rectangular
frame with an opening in one of its end bars, a sliding crosshead in which is swiveled a socket, an internally threaded guide ring and a threaded feed bar, with means for operating it, and other novel features, the rock, etc., while not being heavy or burdensome.

## Miscellaneous.

Pocket Book. - Isaac Scheuer, New York City. This pocket book has a bag with pivoted
jaws and a separate and independent bag suspended from its upper longitudinal edges within the first bag, nd having closed ends with folds extending above the points or pivo
Carpet Fabric. - Joseph Jagger Riften Glen, N. Y. This is a new article of manufac cure, consisting of a fabric having the usual warp or middle warp thread for binding the filling thread carrying the pile down into place.
Halter, Yoke, and Bridle. - Peter J. Krater, St. Mary's, Mo. This is a combination
device of halter and attachments, enabling one device to be used as a substantial ha!ter or as a guard to prevent an animal jumping or breaking a fence or injuring himself thereat, while allowing him to feed and water himself freely from or at the ground, being also adapted for use as an open riding bridle or a blind driving

Clothes Line Prop. - Robert McAlpine, Trenton, N. J. The pole or prop consists of
wo pieces of wood of suitable length, one section two pieces of wood of suitable length, one section
being notched at intervals on one side and the other ection being held by clip bands to slip on the notche tixed a threaded stud and a nut
Clothes Line Support.-John B. and Robert Johns, Findlay, Ohio. This support consists of a shank with a head beyond which there 18 a spiral
section, the support to bedriven into a post, and obviating all knotting of the line, while providing for the ready taking up of any slack.
Clothes Line. - Charles Barlow, Cookshire, Quebec, Canada. This line has a metalic core, with a spirally wound wire covering turning freely on the core, in order to lessen the possi bility of the
clothes being cut or torn when blown to and fro in the clothes being cut or torn when blown to and fro in the Clothes Pin. - Edward M. Watson, Jersey City, N. J. This pin is preferably made of one piece of metal wire, in the form of a head piece with three arms projecting therefrom, so made that it may be used to fasten garments or fabrics to a line without danger of tearing the fabrics being blown about by the wind.

Washing Machine.-John S. Headen and John T. Boswell, Pleasant Hill, Mo. This inven ion consists of a ixed corrugated or huted board and se first one making an improved washboard which imple and durable.
Scow.-Willian Osborn, Duluth, Minn suction pipe just below compartments in the botto the scow, valves connecting the compartments and pipe, which pipe is open at both ends, and communi cating at one end with the water below the scow, to provide a simple and cheap way of unloading sand

Steam Liquid Heater. - John F. Bradford, Leetonia, Pa. This invention covers an im. provement especially intended for use in heating tannng liquors, whereby the degree to which the
lquor is heated may be automatically regulated, the liquor is heated may be automatically regulated, the
highest heat being obtained by subjecting all the coils of the liquor pipe to the live steam, while by permitting or less extent, the degree of heat is lowered as the

Wave Motor.-Robert B. Davy, San Diego, Cal. This invention provides a float or buoy the water within aimit of nuty the surface of with suttable mechanism to retain the float in position and utilize the vibratory movements to convey a con-
tinuous running movement to a drive shaft located on hore.
Paper Feeder. - George W. Crane nd Harry Bradshaw, Topeka, Kansas. Rock shafts are journaled beneath an adjustable paper-carrying
table, with a rock shaft above the table from which elastic fingers are suspended, and connections between the shafts, with other novel features, making a device or any machine to which paper is to be fed one sheet at a time from a pile.
Breech Loading Gun. - James Jensen, Park Place, Ark. The barrel of this gun has a catch holding the bolt in retracted position, a slide and catch being arranged in connection therewith, a thumb piece benng carried by the slide, and a lever connected o the slide and to the bolt, providing for the secure for improving the arrels when moved to firing positio

Boot or Shoe Ventilator. - Peter Welander, San Francisco, Cal. This is a short tubular
shell of sheet metal having a flange turned over outwardly upon one end, and the opposite end closed by readily secured in place at any desired point upon a boot or shoe, and set in open or closed position, to afford thorough ventilation of the interior.
Toe Weight. - Elwood L. Gregg Hoxie, Kansas. This weight has a dovetail or under cut gro on its rear side a projection arranged to engage a clip, whereby the weight may be securely held to a a clip, whereby the weight may be securely held to a therefrom.
Extensible Trestle. - Gustav Llano, Texas, adnin, Mexico, and August Zincke, of Llano, Texas, adninistrator of Robert J . Bogusch,
deceased. This trestle has a brace frame with parallel connected end bars having hook-shaped ends with set screws, and other novel features, making a strong and
simple construction for a simple construction for a scaffolding for masons,
carpenters, etc., which may be readily put together and ken apart.
Bird Trap.-Benjamin Walton, Compon, Cal. This is a sprigg trap so constructed that most of its parts may be entirely in the top part of a
post or stake, hut so arranged that when a crow or hawk or other birdsalight on the posta spring-held catch will be released, and arms with serrated teeth will be closed

Hay Stacker. - Daniel H. Talbot, Sioox City, Iowa. This is a machine designed to be ordinarily operated by means of a team attached thereto for stacking hay, ensilage, etc., the machine beng
portable and capable of automatic elevation as the stack is formed, while it is designed to form a stack with but little manipulation or attendance on the part

Corset Clasp. - Frank B. Converse, New York City. This clasp has a catch plate with a slot that 18 narrow at one end and around the slot a depressed flange, the locking stud having a head rounded underneath and adapted to enter and engage
the catch plate, making a clasp which may be readily fastened or unfastened even by a child.
Booom Brush Bridle. - John B. Butenschon, Portland, Oregon. This bridle consists of
an upper and lower wire loop connected together and each having an eye for the passage of the free end of the wire, making a cheap and efficient clamp for holding the brush of a broom in form without stitching.
Window Cleaner. - George Pilson, Yonkers, N. Y. This device has a brush head with a bore in alignment with a bore in a hollow handle, a receptacle with a series of apertures being secured to
the head, whereby a continuous supply of water may the head, whereby a continuous supply of wate
Knife Cleaner.-Joseph Thompson, Decoto, Cal. This is a household implement, designed
to be simple and inexpensive, for the cleaning of table to be simple and inexpensive, for the cleaning of table
knives, the main object beng to provide for the yielding support of the polishing material and the deliver it in such quantities as may be required.
Check Cutter.-Leonidas C. Pressley Brooklyn, N. Y., and William Lumbard, Wheatland, angled cutting edge, in combination with a right angled cutting edge, in combination with a right
diagonally opposite corners, for cutting checks or other
billets of various sizes from check books or sheets. Aerating Milk. - Aldis O. Morgan and Jerome B. Gates, Hermon, N. Y. This invention covers an apparatus adapted to be readily inted to a milk can, whereby a continuoue supply of cool air may
be passed through the milk for cooling it and driving off noxious volatile matters.
Cabinet File. - John Muhlhauser, Kochester, N. Y. This casing bas rigid horizontal panels loosely mounted upon one another in the casing, with the casing and being vertically making a convenient receptacle for sheet music, papers,

Folding Bed Screen. - John J Griffith, San Bernardino, Cal. Combined with a frame having rubber-lined uprights and a folding top, on which a mosquito bar is secured with side pockets to hold the mosquito bar in position against the uproghts and on the floor, with other novel features, the screen being one which can be readily folded up, and
from the bed.
Sash Balance.-John S. Headen and Coleman G. Farmer, Plessant Hill, Mo. This is
designed to be a simple, ornamental and reliable device whereby the upper and lower sashes may be arranged to counterbalance each other, and be relatively adjusted in the window frame as desired.
Jug Handle and Stopper.-Simeon L. Bray, Evansville, Ind. This is a combination device, onsisting of a stopper having a transverse hole through
through which passes a handle exiending to the sides the jug, while a bail is connected to the jug and arranged eccentrically in the handle, whereby the
mouth of the jug may be closed by turning the bail mouth o
handle.

## SCIENTIFIC AMERICAN

BUILDINGEDITION.
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. Page engraving of a chimney piece by Hugues Lallemand, Museum de Cluny, Paris.
Perspective elevation and floor plans of a house a New Rochelle, N.
hundred dollars.
A residence costing twenty-four hundred dollars, erected on Chester Hill, Mt. Verno
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spective.
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## 

HINTS TO CORRESPONDENTS.

(1742) A. M. H. asks : Please inform me what will take wood smoke
Wash with whiting and soap.
(1743) W. G. O. writes: What ingredients are looked for in sanitary water analysis? What are the best and latest books on the subject A A.
Chlorine, ammonia, free and albuminoid organic matter, Chlorine, ammona, free and albuminoid organic matter,
oxygen required to oxidize same, are the principal data sought for. We recommend MacDonald, "Wate
Wer sis," \$0. and Austen's "Hand Book for Water Drink sis," $\$ 2$; and
ers," 50 cents.
(1744) F. A. B.-The object that you end ba gall, wh.
(1745) W. S. B. writes : 1. I want to at tach leather to tin without having to roughen the tin
What can I use for a cement or glue? A. As a simpl preparation use a freshly made solution of gum traga canth. It should be about as thick as butter. Ordi nary glue mixed with tannic acid and at once applied, monia for ten days, may answer your purpose. 2 monia for ten days, my answer your purpose. 2.
have a lot of soluble glass with which I have mixed shellac. What can I add to make it still more adhesiv to use as a cement for orduary purposesy A. You can
not make it satisfactorily adhesive as a cement for gen eral use.
(1746) G. A. O. asks how to construct and connect a spark coll so that with the proper gas fixtures he can light three gas jets, not at the same time, that 18, so that one can be nighted without ligbting the
other two? A. For coul use five pounds No. 18 magnet wire wound around a bundle of iron wires one inch thick and six inches long. From one end of the coil carry three wires, from the other end carry one to th
battery, thence three wiros, thus making two to eact burner. Use a switch or key in each line.
(1747) E. T. asks: What is the form have never seen anything in your paper, and that suband advantage of a bilge keel as differing from an
ordinary keel, applied to a ship? A. Bige keels, as their name implies, may be only a deep strake along each side of a veesel at the bilge, or at the most prominent point in the curve from the main keel to the water line, for the purpose of preventing excessive
rolling in vessels havuIg high centers of gravity. They increase skin friction and have a retarding effect by their curved form of line, otherwise the only advantage is to lessen the draught of the vessel, by dispensing
with the center keel. They do not compensate for the oss of leewas in disensin with the main keel In fact, we can see no value in wilge keel except to pre
vent vent excessive rolling in overbalanced steamere
(1748) F. K. asks : 1. What causes warm gusts of wind to come when the air is quite cold, and especially in the fall and spring just before a storm?
A. In the fall, owing to dry air and rapid radiations A. In the fall, owing to dry air and rapid radiations,
ereat differences of temperature may occur within mall area. Thus winperature marm air to a co locality very quickly. When such sudden changes occur, the conditions are favorable to disturbances and
storms. $\%$. How long will the common iron road bridge hast? A. If taken care of it will last many yeare They have not been in use leng enough to determine the factor of endurance. If neglected and left un painted and unrepaired, they may very quickly go to ieces.
(1749) M. H. D. asks the process of making diamond ink for etching on glass. A. Mix sulphate of baryta with hydrofluoric acid.
(1750) J. J. asks : What cement will set quickest and firmest cast on collodion? A. Use strong solution of collodion for above purpose.
(1751) J. L. asks: What number of wire is used to wind the magnets of an electric bell such as
(1752) Frank asks : Would you inform me through the columns of your valuable paper how the white ink is made, such as is used on colored paper?
A. A solution of oxalic acid may be used on blue paper. Or a body ink may be made by rubbing up
(1753) H. J. L. asks how to solidify paraffine oil. A. Solution of glue and emulsion of slippery elm bark have both been suggested as materials
to mix with oil for producing a species of gelatinizto mix with oil
ing or solidif ying.
(1754) A. V. F. asks : 1. How much hydrogen gas will an ordinary 1 volt average size battery set free in twenty-four hours? A. None on closed cir-
cuit, as the voltage is too low to decompose water cuit, as the voltage is too low to decompose water. 2 .
Is there any way of electro-plating other articles besides metallic ones? A. Several ways are practiced. The simplest is to thoroughly coat the object with plumbe dusted over the object, after applying the plumbago
(1755) A. H. R. asks : 1. How can I mag netize a needie sufficiently strong to use in a galvano-
meter? A. Rub it a few times, always in one direction, with the same pole of a magnet. 2. What is the best shape to use-round or flat? A. Itis immaterial. 3. Will made and highly sensitive galvanometer we refer you to our Supplement, No. 628.
(1756) J. H. F. asks to be referred to paper showing how to make filter for domestic use. A.
We refer you to our Supplement, No. 451 , for descrip tions and illustrations of simple and effective homemade filters.
(1757) H. W. K. asks: Is there any chemical that will etch on the polished surface of patent of vitriol would have a slowly corroding effect, but w clieve no practical results can be obtained
(1758) W. A. B. writes : I am building a would tell me the best cement to use in putting in the glass and also the best paint to coat the bottom with oo make it impervious to water? A. Use a mixture of Burgundy pitch 150 parts, old gutta percha in fine shreds 25 parts, finely powdered pumice stone 75 parts,
for cement, and paint bottom with same. It mast be applied hot, and a hot iron wire may be used to melt it applo crevices, etc.
(1759) F. G. F.-To remove warts apply solution of chromid it will blacken them, and day with a stick of lunar caustic, first moistening the
(1760) E. B. and G. F. W.-For a fusih, metal resembling


All are parts by weight. The last two are particularly
recommended as imitating silver.
(1761) E. P. is referred to the Scientific American Supplement, Nos. 69, 237, and 265, for notes
on celluloid. Pyroxyline, or nitro-cellulose, is ground in water to a pulp. To 2 parts by weight of dry pyroxyline 1 part of finely divided camphor is added. After thorough mixing and kneading together, the mass
is placed in moulds, and is heated under pressure to a is placed in moulds, and is heated under pressure a a
temperature of $150^{\circ}$ to $300^{\circ}$ F. for a sufficient time. It is left to cool under pressure in the mould.
(1762) W. I. L. says: You have been publishing very interesting articles on various subjects,
but there is one very interesting subject abont which I
have never seen anything in your paper, and that sub-
ject is Submarine Boats. Will you kindly tell your
eaders something about this? A. See Screvtric Amders something about this? A. See Scientific
Amean Supplement, Nos. 218 and $3 \geqslant 0$, for illuatrated description of submarine torpedo boats, and many others under the head. "Torpedo Boats," in our catalogue. Our literature on this subject is very full in the
(1763) D. H. D. asks what is used on moulds in casting lead to make casting smooth and bright. A. Moulds for casting lead are made of iron or brass, or else of sand. Pure lead does not run
smooth and bright when cast. By adding a little tin, in and antiniony, or tin, antimony and bismuth, a bright castings.
(1764) J. M. asks : Will you kindly in orm me as to the best way of raising water from a eet above the river? A. In a rapid river there is sup posed to be fall enough for the use of water wheels and pumps for the purposes of furnishing water for irrigat ing land. A dam of convenient height, a race for obtaining sufficient fall, a turbine, overshot, or hreast necessary for elevating water to moderate heights. In the absence of details as to the situation and facilities for erecting a pumping plant, we cannot be expected to give specific information.
(1765) H. Y. asks how poplar, walnut, nd other woods are stained, so as to imitate cedar, in If you will soak a piece of the box in water, the veneer will come off, disclosing the way it is made.
(1766) H. W. asks: 1. What size of wire should be used for a bell. $w$ be operated by one Leclanche cell? A. No. 24. 2. How long should the cores be? A. One and one-half inches. 3. How thick? A. Three-eighths of an inch. 4. Will cast iron do for the cores? A. They should be made of wrought iron.
. If soft iron is heated and hammered to fit, will it injure the magnetic property? A. The iron should be annealed after working. 6. What should the armature be-steel or soft iron? A. Soft iron. 7. Should the current start from the positive pole, through the electro-magnet, then to the negative, and back to the battery? A. It makes nodifference which way the current runs through the magnet. 8. What size should the
conducting wire be that runs from the battery? No. 18. 9. Will cast iron make as good electro-magnet as malleable iron? A. Soft gray cast iron makes a fair electro-magnet. It is probably better than malleable
iron, but is not so good as wrought iron. 10. In what iron, but is not so good as wrought iron. 10. In what
number of your paper are there directions for making nduction coil? A. You will find information on the construction of induction coils in Supplement, No. 160 .
11. How long should the wire be for the bell mentioned in the beginning of the letters winding on the bell magnets should be equal to the diameter of the core
(1767) W. A. M. asks : 1. Is there writing fluid of any color other than black or red that
iill stand? A. Yes; you will find many inks described in stand? A. Yes; you will find many inks described
in Suplement, No. 157. 2. Will you kindly give recipes used for preparing inks suitable for use in shading pens? A. Make a solution of gum arabic of
sufficient thickness, and color with aniline previously dissolved in a little alcohol.
(1768) Zero asks : 1. What is gum salt A. Gum salt may be a name for crude rock salt. What is white vinegar? A. Vinegar that is destitute o color, generally supposed to be made from white or colorless wine. 4. There is a spring of magnetic water in Chardon, 0 . What is the cause of its being magnetized? A. There is no such thing as magnetized water. 5. Where can I procure a catalogue of locomo-
tives? A. You will find many locomotives described in the Scientific American and Supplement. 6. If we had a boiler with 40 lb . steam in it, and should pump in a 100 lb . air pressure, keeping the heat the same, would t condense the steam? A. If the water were kept at he same temperature, the steam would for the most part condense. You must supply page reference for
your other query. (1769) W. P
(1769) W. P. writes : 1. Could you tell to leather, retains its brilliancy for a length of time without a second application? A. See query No. 1704 . 2. I have a large quantity of paint scrapings from pots and kegs, etc. How can I reduce them and use them over again for a priming coat? A. Grind them in a (1770) K
(1770) K. McI. says: I have seen it asserted that the Mississippi River runs up hill through
its lower course with the course. I have no doubt you are conversant with the statement and the reasons given therefor. At
the present I find it very dificult to understand how this can be, since nothing can recede to a position further from the center of the earth than that which it at first occupied without some impulse which totally overcomes the influence of gravity. Now, as is well known, centrifugal force does not decrease the weight of a body to any considerable extent at the equator. how the happears to me very dincult to comprehend force does decrease the weight of a body at the equator: 195 pounds at the equator is about equal to 194 pounds nearly an oblate spheroid. The distance from the surface to the center at the equator is about 3,962 miles, while from the surface at the poles to the center is $131 / 2$ miles below the surface of a perfect sphere of the $131 / 2$ miles below the surface of a perfect sphere of the tation shows that the mean surface of the earth at New erleans is nearly 600 feet further from the center of the of the Missiesippi from Cairo to New Orleans, a distance $2 \cdot 8$ inche 1,000 miles by the way of the river, is about 2.8 inches per mile at mean water, or 233 feet that 1
runs down hill from Cairo to New Orleans with runs down havl from Cairo to New Greans with gravity datum, but it recedes in so doing 3 f7 feet from
the center of the earth, which in one sense may be considered up-hill.

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