

## A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

## $\underset{\text { [NEW SERIES.] }}{\underset{\text { Vol. XXX }}{ }}$

NEW YORK, DECEMBER 9, 1876.


## IMPROVED KNIFE-GRINDING MCCHINE.

This machine is entirely different in construction and mode of operation from any other automatic apparatus heretofore made for similar purposes. On knife sharpening machines where the grinding is done on the periphery of the wheel or stone, the beveled edge of the knife must necessarily be concave, and in shape exactly the reverse of a section of the periphery of the wheel of like width, and as the wheel becomes smaller by use, the knife edge is ground the wheel becomes smaller by use, the knife edge is ground
more and more concave until the wheel becomes too small, more and more concave until the wheel becomes too small,
and a new one is necessary. After the substitution and at the first grinding, each knife is changed back to the shape it had when the former wheel was new,so that more is taken from the edge of the blade than is needed to sharpen it. This machine is claimed to overcome all the disadvantages described, and the wheel is in the form of a hollow cylinder or shell, and, the grinding being done on its edge, it simply grows shorter as it wears away without decreasing in diame ter. Another decided advantage possessed by this machin is that the wheel used is only nine inches in diameter, while the wheels grinding by the periphery are usually from twenty to thirty inches, and hence are more expensive. The following is a duscription of the machine and its mode of following is
A is a cup-shaped emery wheel,across the projecting edges A is a cup-shaped emery wheel, across the projecting edges
of which the knife passes during the process of grinding. $B$ is a truck or way block on which the bed, $C$, carrying the knife holder, is reciprocated by means of a rack and reversing gear, similar to that of an iron planer. $D$ is the knife holder, adjustable on bearing so as to give any degree of bevel required for the edge of the knife. $E$ and $F$ are respectively a slotted handle and stand connected by a bolt and hand nut, which admit of the knife holder being held in any required position and also serve as a gage for retiring it to the same position after it has been loosened for any purpose. At $G$ are two hinged gages, one on each side, for setting the knife by its edge, bringing the edge exactly to the same position on the wheel. H is simply a shaft and
hand wheel, connecting the feed screw so that both ends of the knife holder are fed up simultaneously.
When it is desired to grind a perfectly flat bevel, the track is set so that the knife will strike both sides of the wheel. If it is desired to grind the edge concave,the track is placed so that the knife will strike but one side of the wheel. The more the track is set out of line, the more concave the knife will be ground. When once set, the machine will grind all knives to exactly the same shape until it is changed. Means are provided for setting the angle of the track so as to give a flat or concave bevel as may be desired.
For further particulars, address the Northampton Emery Wheel Company, Leeds, Mass.

Bronze Statue of Daniel Webster.
On Saturday, November 25, the colossal statue of Daniel Webster was unveiled in Central Park, in this city. It is the gift of Gordon W. Burnham to the city, was modeled in Florence by Thomas Ball, and cast in bronze at Munich by Muller. Its hight is fourteen feet, and its weight six uns. The pedestal is of Quincy granite, twenty feet in hight and a hundred and nineteen tuns in weight, and is of itself symmetrical and handsome monument. The artist has prouced a wonderful likeness of the deceased statesman, and has delineated very powerfully all that grace, dignity, and force which characterized the living Webster. Mr. Burn ham has always maintained the greatest admiration for the genius of the great Webster, to whose memory this statue is dedicated. This last contribution is the second expensive bronze statue which, through the liberality of our wealthy citizen, G. W. Burnham, ornaments our beautiful park.

## New Alloym.

Mr. P. M. Parsons, of Blackheath, England, a well known inventor of alloys, has lately patented in that coun ry a new series of compositions obtained by mingling spieeleisen, or some other form of carburet of iron mixed with

The advantages claimed are greater homogeneity, hardness, strength, and closeness of texture.
The ferromanganese, used to mix with gun metal, contains from 10 to 40 per cent of metallic manganese; with brass alloys, 5 to 20 per cent of same; and with bronze alloys, the proportion lies between the above according to the propor tions of tin and zinc employed. To prepare ferromanganese containing a given amount of metallic manganese, the inventor melts rich ferromanganese, containing up to 70 per cent, in a crucible under powdered charcoal, and with a quantity of the purest wrought iron scrap. Thus, suppos ing it is desired to employ a ferromanganese to mix with any of the alloys containing 20 per cent of manganese, a ferro manganese containing 60 per cent of metallic manganese and, say, 1 per cent of silicon, is melted with wrought iron scrap, in the proportion of 100 of ferromanganese to 200 scrap. Then a ferromanganese containing 20 per cent of metallic manganese will be obtained, in which there is only ne third of 1 per cent of silicon.
Dry sand or loam molds are recommended for casting. Metal molds render the alloy somewhat harder and closer in texture.

To Detect Gas Pipe Leaks.
It is usual to detect gas escapes by applying a lighted taper or candle to the suspected place of leakage. This is dan gerous, and many explosions have thus been occasioned. A safer mode is as follows: Mix dark soap and water in the proportion of 2 lbs . of the former to 5 or 7 pints of the latter. The sticky paste or liquid so obtained is ready to be applied by the brush to the gas pipe, when, if an escape is taking place, bubbles will readily be seen on the liquid; thus the positions of the gas escapes are indicated without any danger.
MONEY.-In order to guard against the possibility of loss through the mails, we advise our subscribers to send their money either in postal money orders, bank checks, or drafts.


EMERY WHEEL KNIFE-GRINDING MACHINE

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## THE SCEENTIFIC AMERRICAN SOPPLEERENT. For the Weok onding Decem TABLE OF CONTENTS.






III. TECHNOLOGY. Description of the Method of Manufacture of Small

 V. CHEMISTRYAND METALLURGY.-Silver Salts in Photo Plates.-Re-
Vi. ELECTRICITY, LIGHT, ETC. - The Electric Eel.-Electricity in Agri-


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## PUBLISHERS' CARD.

Some twenty thousand of the subscribers to the Scien tific American and Sclentific American Supplement will find printed on the wrappers which envelope this week's papers the information that their subscriptions are about to expire, coupled with a request that the same may be cenewed for the coming year. But two numbers of either journal, including the present issue, remain to complete the volume; and as it is our fixed rule not to send pa pers after the term subscribed for is ended, those desiring the weekly visits of our papers to continue without interruption; will therefore serve themselves by remitting as soon as possible. At the same time they will, in so doing, greatly favor the publishers, as the latter are thus enabled to form proper estimates as to the magnitude of the edition which it will be necessary to print at the commencement of the year. The rates of subscription to either journal or to both combined remain as heretofore
The success of the Scientific American Supplement has proved so genuine, and its circulation risen so greatly beyond our anticipations, that we shall continue its publi cation and use our best endeavors to increase its value. As to the programme and plans which we have in hand for rendering both Sciéntific american and Supplement indis pensable to workers in every branch of art, of industry, and of science, the reader will find them fully detailed in the dvertising pages of this issue.
Those who have taken the papers through newsdealers are recommended to continue to do so, and those in the habit of procuring their papers weekly from the stands will find them there as of old; and those who neither subscribe for nor buy the Scientific American nor its Supplement may peruse them both on file in any working men's reading room in the country, or in the library of any institution of learning in the world.
A handsome subscription list will be sent as usual on application by those desiring to form clubs.

## COLOR BLINDNESS AND ITS REMEDY.

The name of color blindness has been given to an affec tion of the ege which renders it insensible to certain colors, whether they arise from the decomposition of the solar rays, or from artificial pigments, or from the action of natural bodies upon light. In 1855 Dr. George Wilson, of Edinburgh, published a short volume on this subject; and before considering the latest scientific views thereon, it will be well to sum up his investigations, which are probably among the most extended and complete hitherto made He tells us that in England one person out of every 18 is color blind, basing his statement upon personal examination of over a thousand persons. Color blindness, he says, is moreover hereditary, and affects males more than females, and people of all habits alike. Three forms of the malady are recognized. 1. Inability to see any color but black and white or light and shadow, a highly colored picture appearing like a mezzotint engraving. 2. Inability to distinguish browns. grays, and neutral colors. 3. Inability to distinguish between red, blue, and yellow, and green, purple, orange, and brown. The first of these varieties is very rare. In the second variety, the mere shades of the more compound colors, such as browns, grays, and neutral tints, are alone mistaken. The third is the most common; and on an aver age 1 person in 55 confounds red with green, 1 in 60 brown with green, and 1 in 46 blue with green. Red and green are the two colors which the color blind are least able to appre ciate; and it is one of the most ordinary occurrences in connection with the defect that a person seeing a scarlet verbena in full blossom, cannot detect,at a little distance, any difference in color between leaves and flowers, nor can he perceive any contrast of color between ripe cherries and the foliage of the cherry tree.
Dr. Wilson says that no satisfactory explanation of the phenomena of color blindness has ever beer propounded ; but he wrote 21 years ago. The labors of Helmholtz, and more recently of Von Bezold, have since solved many of the most difficult optical problems. In Professor Von Bezold's new work on the "Theory of Color."* color blindness and its auses are fully considered.
Physicists, even before the time of Newton, assumed the existence of three fundamental colors and attributed to them a physical significance: that is to say, the white light of the sun was supposed to be objectively resolvable into three such colors, an assumption which is now disproved. Later Young and Helmholtz renewed the idea, but ascribed to the fundamental colors not a physical but a physiological signifi cance. They assume that the eye is accessible to three fundamental sensations, which we may perhaps conceive of as being made perceptible to us by mearis of three different kinds of gerves. It is supposed that all the various color sensations experienced by us owe their origin to the co operation of these three fundamental sensations, and it be pond. Red, yellow, and blue were generally looked upon formerly as the fundamental triad, but later investigation formerly as the fundamental triad, but later investigations
lead to the substitution of green for yellow, and the select
*Translated by S. R. Koehler Published by L. Prang \& Co., Boston.
ing of a blue closely bordering upon violet; and this conclu sion, that red, green, and deep blue are sensations of a simpler nature than those of any other color, is especially supported by the pathological phenomena of defective color vision and thus we are led to an explanation of that ailment.
It is curious that not only are persons born color blind, but that they may be rendered artificially so. Violent in jury to the head or overstraining of the eyes can induce a loss of the color sense; santonin derived from worm seed produces vertigo and headache,and causes the person afflicted see all objects in two hues, yellow and violet.
When a person who confounds red and green regards the spectrum, he seess the red end shortened. The place in which the red is visible to the normal eye is to him black, hence red light does not affect his eye. He is red-blind. When intoxicated by santonin the violet end of the spec. trum is wanting, on the contrary; and this condition may therefore be designated as violet blindness. The violet shadows seen under the influence of santonin are therefore simply the consequence of contrast, that is to say, a deception of the judgment.
In order therefore to explain these phenomena, Professor Von Bezold holds that it is only necessary to assume that color blind persons are devoid of one or the other of the three fundamental sensations. If we suppose that these sensations are brought to our perception by nerve fibers especially assigned to each, it is presumable that,in the case of a red-blind person, the fibers corresponding to the sensation of red are either paralyzed or that they are perhaps even wanting entirely; while in the case of a violet.blind person, the same would have to be true of the nerves set apart for the violet sensation.
We can arrive at an idea of the condition of a color-blind person approximatively by looking through colored glass, or by noting our natural conditions when viewing objects by lamplight, when our vision is closely analogous to that of a violet-blind person. Hence the reason why dealers in paintings prefer to exhibit them for sale by gas light, when, the violet rays being absent, the eye sees other colors under a rich glow of red and yellow, which adds greatly to the brilliancy of the pigments and softens and mellows tones which by daylight are crude and cold. Conversely, if a painting were executed by lamplight, it would look strange and faulty by daylight,and its incorrectness would increase with the number of cold colors intended to be employed in the picture. The same absence of blue and violet rays in lamplight explains why red and yellow dresses show nearly the same color under it, while blue stuffs can hardly be told from green, and violet becomes grayish or reddish. This is taken into consideration by ladies in buying dresses for even ing wear, and by artists in decorating apartments especially intended to be used at night.
Now it follows that we have only to weaken the rays which are in excess, to cure the defects of either the normal eye under peculiar conditions or the color-blind eye. By regarding paintings through light yellow glass by daylight, we can perceive nearly how they will look by lamplight; and if we allow lamplight to pass through the blue solution of sulphate of copper, we can weaken the red and yellow rays and produce a light equal to daylight in composition. If we proceed further, and concentrate the altered light, we obtain a still nearer approximation to daylight in brilliancy, and one which might be very valuable for those who have to deal with colors at night
To come back to people naturally color-blind, the consequence of the above is that colored glass offers a means of materially lessening the ocolar defect. If for instance a solution of sulphate of copper renders the eye looking through it red-blind, then a colored glass which eliminates the blue green rays, interposed, restores equilibrium. In this way Professor Von Bezold suggests that a few pieces of glass of suitable color, mounted like eye glasses, for colorblind people whose profession requires that they should be able to tell the difference between colored signals (and the red and green lights of railways and ships are of the very colors most easily confounded), patterns, etc., or to study or design technical drawings, such as plans and charts, might be the means of affording very essential relief at a very low cost

## OTTO OF ROSES

The most delicious of all perfumed essences is obtained by the simple distillation of rose leaves. In our climate, roses are not sufficiently highly scented to produce the properly odoriferous essence or oil; and all that the druggist can produce from rose leaves is rose water, which in fact is water slightly impregnated with the essence or oil, which is, to a small degree, soluble in it. The most favorable country for the production of the most highly scented roses is the middle portion of European Turkey, at the base of the southernslope of the Balkan Mountains, where the roses are grown in localities where they are protected against all winds except those from the south; and the flowers thu attain a luxuriance in perfume and in growth, as we:l as in size, of which those who have not visited these regions can hardly form any idea.
The town of Késanlik, situated in the province of that that name, is the center of the field of cultivation and dis tillation of the rose leaves. The leaves are gathered al over the province, which is 40 miles long, and is watered by the river Thungha and the many mountain streams which discharge into the same, furnishing the water necessary for the distillation. To give an idea of the extent which thi industry has attained, we need only say that there are in that province 128 different villages, of which the inhabi
tants are all employed in the culture of the beautiful flow
ers. These all live in peace together, Turks and Christians; and they prosper, having become wise by experience, find ing that it is better to work than to waste time in religious or political quarrels.
Almost all the country is occupied by rose plantations, and only a comparatively small portion is devoted to raising rye and barley, for the subsistence of the inhabitants and their cattle. The rose grows best on those parts of the slopes where the sun shines most, and which is the least northern in exposure. A light soil is best ; and the planting is done during spring and autumn, in parallel ditches three inches deep and five feet apart. In these ditches shoots from old rose trees are laid; they must. however, not be cut from the tree, but torn off, so that each shoot has some portion of the root or bark of the root adherent. They are then covered with earth mixed with a little manure. If the land is horizontal, and a mountain stream can be diverted so as to inundate it, this is done, to hasten the growth at the end of six months, shoots are seen coming up all along the furrows, and at the end of one year these shoots are 3 or 4 feet high, forming regular hedges. At the end of the second year, roses appear, but not in sufficient abund ance for them to be gathered. The gathering is commenced in the third year, after which they produce largely, the hedges being, at the end of 5 years, 6 feet high. The bushes produce fiowers until 15 years old, when the field is worn out, and must be plowed up. They do not prune the rose bushes at all, as we do; but they cut off, every year in the late fall or winter, the dead branches.
The great harvest commences about May 15, and lasts unt:1 June 5 or 10 : the gathering is done daily in themorning before sunrise,and the distillation is finished before 12 noon, so as to have the benefit of all the freshness of the flowers, which is at once driven off by the heat of the day. In hot seasons, the roses open more rapidly, and the crop may last but for 10 days; but in wet, cooler seasons, the progress is slower, and the crop may last for 25 days: but then the daily harvest is smaller in proportion, so that the final result is about the same. However, cool, slow weather is preferred, as it eases the daily labor
The stills used are of the roughest kind, and small ; they hold from 200 to 240 pints of water, and are carried to the rose bushes to be filled. To 20 lbs. rose leaves, 160 pints of water are added; and the whole is distilled at a gentle heat until 20 pints of water are distilled off. This quantity contains nearly all the perfume of the leaves, which are then thrown away with the remaining water; and the still is again filled with 20 lbs. leaves and 160 pints water. This operation is repeated until all the leaves have been used. The water thus distilled off is a strong rose water; and the result of 8 or 10 distillations is put in a still and submitted to a second distillation, when a stronger rose water is obtained: so strong, indeed, that it is unable to contain the essence in solution, and the latter fioats on the top of the water. Experience has shown that, for every ounce otto of roses, $3,000 \mathrm{lbs}$. of rose leaves are required.
The total yearly production of eight districts, into which the 160 villages of the province of Kézanlik are divided, is on an average $3,500 \mathrm{lbs}$. of otto of roses, of which the district in which the capital is situated produces half. Some Years ago, however, the bushes were exceptionally prolific. Thus, in 1866, 6,000 lbs. were produced ; but in 1872 only $1,700 \mathrm{lbs}$. could be obtained. We ought to add that every rose farmer has his own stills for producing otto of roses
immediately after picking the fiowers ; and thousands of industrious workers are thus occupied, earning in a single short period of 20 days the products of a year's labor in preparing the soil, planting, and taking care of the growing plants. When the distillation is over, the farmers come
from all parts of the provinces to the capital to sell their from all parts of the provinces to the capital to sell their
products, those who have large quantities selling directly in products, those who have large quantities selling directly in
the great commercial centers, such as Constantinople and Adrianople. At present, however, an enterprising firm in Kézanlik, considering the delay to which the trade with the last-named cities is subject, and the chances of adulteration, have established a depot in Paris, France, from which this delicate and expensive perfame is now distributed over Europe and all the world.
a faldable discovery in electric illdmination. M. Jablouskoff, a Russian physicist, has recently commu. nicated to the French Academy of Sciences a new and apparently important device on which a single electric current can be divided among several burners of electric lamps, disposed apart at distances more or less great. At the same time the light is augmented, and the regulators, which are the most costly and most easily disarranged portion of electric lamps, are entirely done away with.
The ordinary electric lamp consists of the carbon penclls disposed perpendicularly one above the other. Between their extremities the current forms the luminous electric arc, provided, however, that these extremities are, as the material burns away, constantly maintained in the same relative
position. To this end, delicate clockwork mechanism is used, which is both expensive and diffcult to adjust. M. Jablouskoff's substitute for the latter apparatus leaves nothing to be desired on the score of simplicity. He places two pencils of carbon in a solid cylinder (of clay, powdered stone, or any other refractory material), so that the pencils form as it were a double wick to the novel candle. The pencils are adjusted to the proper distance apart, so that, when the candle is inverted, the current passes from the end of one to that of its neighbor. As the combustion progresses, the intense heat volatilizes the refractory material of the candle, and thus new portions of the pencils are constantly exposed, while the material itself,burning in the electric light,
parallel, and hence at the distance apart to which they ar primarily adjusted. One of these candles placed in case, with reflector, etc., constitutes all that is ne cessary to connect with the battery to produce the light; and it is easy to see how a large number of them might be joine in circuit, and thus one current utilized to produce an ex in circuit, and thus

## the value of fine workmansilp

Whatever is worth doing is worth doing well" is, it is rue, a platitude; but it has a peculiar value when applied o the machinist's art, for the difference in durability be tween an ordinary and a fine fit is so great that the latter is
in the end the true economy. There is of course a large class of work in which the fit of the parts is of no practica moment, and in such cases the work may be put together a it leaves the machine tools; but for all general work, such as the connecting rods, link motions, guide rods, crossheads, and valve motions of engines, either stationary or locomotive, it pays to finish the work every where to a fine fit and it may safely be said that, while every piece of turned work should be finely turned, and each piece of boring care fully bored, every brass or journal box should be fitted with the smooth file and half round scraper to its place, red marking being used to show the fit; and if this is properly done while erecting the work, there will be no danger of hot journals, or of stiff working, which too often occurs when new égines or machines are first run. It is often
advanced by machine builders that " the working parts will in a few days wear down to a bearing," and it is no doub rue : but in the process of that wearing down, infinite mischief is done. Suppose, for example, that a journal box is left to wear itself to a bearing instead of being fitted to one then the whole strain placed on the bearing will be sus tained by the reduced amount of journal area at first in contact, and as a consequence the wearing will not be smooth, the degree of roughness being proportionate to the area of metal in contact and the pressure upon the same. It is often found that the oil escaping from a newly run crosshea and slide, or from a new journal box, appears like liquid bronze, evincing that cutting is going on; and as tha cutting will cease when the working parts have come dow to a bearing, it is evident that, were the brasses fitted to a
bearing the cutting would not take place. Axle boxes are bearing, the cuting would not take place. Axie bozes are ongine slack at irst, and gradual would be no necessity for this if the parts are properly fitted, not only separately, but also when put together. If a journal box is properly fitted, the nuts may be screwed tightly home at once ; and it will work smoothly and noiselessly without requiring any special attention. In lathe work, we find that, no matter how carefully it is turned, it is not true; and though outside work may be made sufficiently true for practical purposes, inside work, such as boring, will be greatly improved if fitted by hand, especially if it is put together in pieces. Eccentric straps and pillow block or connecting rod brasses are examples of this fact ; for if we bore them to the correct
size, we shall find that they close in across the joint durin the we shall find that they close in across the joint during them, fit them to their places by hand work. But if once properly fitted, they will work a long time without causing any lost motion.
If we turn to fiat surfaces, experience has demonstrated that, no matter how carefully they may be planed or milled, they are not fnished true; and though for small work, such as s ewing machine work, they may be true enough, they are not so for large work. Three cast iron surfaces, 11x8 inches, were recently carefully planed in a very superior planing machine; and yet it took two good hours' work
with a 14 inch smooth file to file them aufficiently true to show a good bearing surface when tried together. Work may appear to be true and of a good fit when such is far from being the case, especially in the matter of flat surfaces. In fitting up connecting rods, for instance, it is no proof that, because the keys seem to have a very close fit to the keyways and the straps to the stub ends, the fitting is well done, because the vise hand or fitter knows that those are the points to which the exawiner will look to judge of the fit; and hence he is very liable to keep those edges in contact, even though the interior surfaces are hollow, and therefore not in contact at all. But it must be remembered that the wearing surface is that which is in positive working contact; and the smaller its amount, the sooner will play, looseness, or lost motion occur ; and after that has
once begun, the wear is much more rapid and destructive.
In the matter of all fiat surfaces, it is actually cheaper to make a good job than an indifferent one. Suppose, for example, we are filing out a keyway: we may use a keyway then we know, when fitting the kee that, the keyway being right, our attenticn need only be directed to the key. When the latter is planed, we may apply it to the surface plate and true it up and fit it to the keyway without having to drive it in and out to try the fit. If it binds in the middle or at the edges, we may, by applying the key to the surface plate, ascertain at once whether the key or the keyway requires to be eased, and thus ensure not only a close fit, but It fitting over the whole area
It may in fact be said, without fear of contradiction, that no fiat work can be either well or quickly done without the aid of a surface plate; nor can any work be really well done unless the parts are fitted together and the fit tried with marking. That work is often put together as it leaves the machine tool is too true, but its durability is comparatively
cost is entailed, making work true and of a very fine fit is true economy. It is, per contra, frequently urged by en gine builders that purchasers will not pay the increased cost; but the reply to this is that the cost is but little creased, because, in a majority of cases, the work may b performed actually more quickly by applying tests to ascer tain its accuracy; and furthermore, the application of the tests shows where the defects are, and the machinist direct his attention to remedying them; and in fitting up the work he knows just where to find them.
The standard of excellence to which work should be Gnished depends upon what, if any, means are to be taken to test the quality of the finished work, or whether it is to be subjected merely to a casual observation. We believe it costs much more to do good work without hand work than with it, and we are sure that good work cannot be done without actual testing, by trying the work together, and a careful application of marking, calipers, gages, etc.; and if any of our readers are not cognisant of this fact, let them test the fiatness of the most carefully manipulated piece of work, and they will be speedily convinced. Even the extra finish upon work is labor well bestowed ; for in using it, the operative is constantly reminded of its degree of superiority and is just so much the more careful in using or working it Another consideration is that the users of machinery are no slow to appreciate excellence of workmanship, and will be ready and willing enough to pay for that which time will inevitably prove to be commercially valuable. It very often occurs that a fine adjustment of fit is neglected because the parts are provided with a means of taking up any wear or lost motion. In many instances, however, the provision of suchpartsis more costly and not more desirable than omitting them and making the parts a good fit. The crossheads of stationary engines may be taken as a fair example of this. Solid crossheads have been known to work for years without any appreciable wear, while on the other hand it is not un common to find that the brass adjustable gibs and the sur faces of the guide bars are considerably worn after a few weeks' travel only. Locomotive guides and bars are much more subject to excessive duty than are those upon station ary engines; and yet it is not found desirable to provide them with any means for taking up lost motion. The link motion, etc., of a locomotive engine in England, that had run express trains for fifteen months, were taken apart, an it was found that the parts were so little worn as to be practically unimpaired; while another engine had oil on the guide bars, which was like a liquid bronze from the wear due to an improper adjustment of the gibs to the guide bars. It may also be noted that, while in many cases pro vision for taking up the wear is decidedly advantageous, in all such cases the wear is very likely to be excessive in con sequence of an improper adjustment of the parts. In con clusion, it may justly be said that, in view of the similarity and excellence of design to which many of the more promi nent builds of stationary engines have attained, the quality of the workmanship promises to receive more minute atten-
tion than has in former years been paid to it; while the em. ployment of steel and the hardening or casehardening of the working parts promises to be much more general as thei great advantages become universally known.

## NEW YORE ACADEMY OF SCLENCES

The chemical section of this society met at their rooms 4 Madison avenue, on Monday evening, November 13, 1876 Some beautiful specimens of tourmaline from Brazil were shown, which exhibited the peculiarity of having a red cen ter and green exterior, or were red at one end and green at
the other. a very large black garnet also attracted a good the other. A very large black garnet also attracted a good
deal of attention, as did a specimen of crystallized dolomite deal of attention, as did a specin.
from Westchester county, N. Y.
Professor Winchell, Chancellor of the Syracuse University, made some remarks on cephalopods, more especially the endoceros, which he has been recently studying. His re marks were illustrated by blackboard drawings.
Dr. H. Carrington Bolton showed some experiments with Böttger's ozone mixture, namely, permanganate of potas. sium and sulphuric acid. Sulphuretted hydrogen gas is immediately infiamed by contact with this mixture, without the application of heat. When a jet of ammonia gas is directed against this mixture, it causes an appearance of fiame but the gas does not itself continue to burn. Dr. Bolton also referred to the fact that sulphuretted hydrogen gas
may be ignited by means of concentrated nitric acid. Professor Falke spoke of the denncen attending the use of thi ozone mixture, and Professor Seeley described the use of chromic acid for producing heat and igniting substances.
Professor Charles A. Seeley read a paper on the friction of fiuids. Including air and other gases under the name of fluid, he explained the ball puzzle at the Centennial, the ormation of smoke rings, etc.
The next chemical meeting will be held on December 11, 1876.

The shipment of American beef to England is becoming arge and growing business. Two Liverpool steamers took over four hundred dressed cattle a few days ago.

IN accordance with a long-established rule, all subscriptions terminating with this volume will be discontinued at that time. We trust that all our subscribers will not only enew, but that they may find it convenient to induce some of their neighbors to become subscribers. We shall in the future, as in the past, give our readers fall measure and running over, in return for their money.

## THE NITES ENGINE.

When it is considered that the majority of steam users employ the cheaper classes of steam engines, it is hardly necessary to seek for further reasons why the engine with the single slide valve still finds abundant usage, despite the existence of the improved automatic cut-off machines, with all the advantages which they offer. To meet the demand for an efficient motor of the first mentioned type at low cost the machine herewith illustrated in Fig 1, modeled after the English Tangye en gine, is offered. The design is quite novel and simple, the working parts are neatly proportioned and adjusted to compen sate for wear, and access to them is ren dered easy. The bed casting is cored out, and the metal disposed as nearly as possible in the line of strain; when bolt ed down on the foundation, the entire length is in contact with the masonry, thus insuring stability. The steam chest is on the side of the cylinder, and low enough to drain it of condensation. The connecting rod is a solid forging, with out straps or stub ends. The mortises through each end are accurately broached for reception of the brasses, and a single cotter takes up the wear. The valve is driven directly by the eccentric rod The diagram, (Fig. 2) is taken from a $13 \times 20$ engine, and exemplifies the valve motion given to the engine. In this case the machine was carrying its maximum load, at rated speed, with exhaust connected to a feed water heater. The ave rage back pressure, independent of cushion, is less than one half pound, the total counter pressure referred to the whole stroke being less than five per cent of the average direct pressure
The engines are designed for use where the ordinary slide valve engine has hitherto been employed, and are built in sizes varying from 6 to 16 inches diameter of cylinders with 10 to 24 inches stroke. Fig. 3 exhibits a complete stationary engine with vertical tubular boiler, conveniently arranged on a substantial cast iron base. This engine is also modeled after the 'I'angye, but possesses some novel features of its own. The bed, cylinder, inboard pillow block, slides, and seat of steam chest are all combined in a single casting. A round the cylinder is cast a casting. Around the cylinder is cast a thin shell forming an air space, into which the condensation from the cylinder is drawn. Ample provision is made to compensate for wear, and steel is freely used in the construction. The pump (not shown in the engraving) is driven by a small crank at the outboard end of the main shaft. The boiler is of the vertical tubular type. The smoke bonnet is made in two sections, the upper one of which is pivoted, allowing it to be swung entirely clear of the boiler, for cleaning the tubes.
The boiler is provided with compression gage cocks, spring pop safety , valve, with hand lever to blow-off steam gage, check valve, blow-off, and drip tubes. The engine, boiler, governor, feed pump, and appurtenances are furnished in sizes from two to twelve horse power, complete, as shown in the engraving, all ready for the boiler to be charged with water, fired up, and run. The engine is warranted by the builders to develope the rated power at 60 lbs. boiler pressure.
For furtherinformation regarding either of the above engines, address the Niles Tool Works, Hamilton, Ohio.
New Sonth Wales International Exposition of $187 \%$. We would remind manufacturers, inventors, and all who have exhibited at the Centennial that an excellent disposition of their show articles would be to pack them and ship them to Sydney, New South Wales, for display at the International Exposition, there to be held in the months of April and May, 1877. Messrs. R. W. Cameron \& Co., of 23 South William street, New York city, are representative commissioners here,and will despatch a ship direct from New York to Sydney on the 1st of December. Freight is fixed at $\$ 10$ per tun.
The exhibitions in Sydney, which are annual, are not so much attractive spectacles as places of business where people from all the Australasian colonies meet to buy and sell. The Australian public is wealthy but utilitarian: that is, it cares little for fine arts, but a great deal for useful and improved inventions which will aid in developing the resources of the country. What is especially wanted is labor saving machinery and in a recent letter the Executive Commissioner of New South Wales at the Centennial, Hon. Augustus Morris, offers some valuable suggestions as to the kinds of machines required. He says: "The greater portion of the best pastoral lands of Australia are wholly without surface water, and generally when wells are sunk they only reach salt water. Therefore, the great requirements are apparatus for sinking through the saline stratum to the fresh water, which probably lies below; and especially appliances for excavating tanks or reservoirs,into which the rainfall may be led from the plains. The most effective pumps for use on land or in ships are desirable objects of exhibition. So, also, are the best agricultural machinery
and implements, being strong and simple in construction Timber-sawing machinery always finds a sale,and, if adapted to fell standing trees, and to cut them into lengths when on the ground, so much the better. This opportunity of bring ing American railway appliances to the notice of the Aus tralian Governments, which own nearly all the railroads,


## Fig. 1.-THE NILES ENGINE.

should not be neglected. Such a display would undoubtedly attract the principal civil engineers from all the colonies, and many prejudices would be removed. Although the Australian Commissioners have been very much impressed our colonies, and we have so reported, unfortunately none of us are civil engineers, and our opinions will certainly be taken with much allowance for error. I will, failing a mor
machines, if cheap and strong; small cheap planers and matchers; scroll saws; the latest improved woodworking machinery; any small, ingenious household goods of the latest patents; spring wagons of best construction; lightning cross-cut saws; samples of furnishing goods, etc. I could extend the list, but I shall be happy to advise any one who may wish to exhibit as to the probability of his obtaining orders. There are very few articles subject to duty in New South Wales, but any reasonable quantity of dutiable goods for exhibition will be admitted free of the custom house which will have no control over anything which enters our exhibition buildings. Everything for the exhibition should be addressed to Jules Joubert, Esq., secretary of the New South Wales Agricultural Society, Sydney, so that it may be taken free of expense to the exhibition building, and otherwise cared for."

## American Progreas Viewed from

## Abroad.

M. Louis Simonin, one of the ablest of French writers on political economy, contributes to the Revue des Deux Mondes, a very valuable and, to Americans especially, interesting summing up of what the Old World thinks of our Centennial. The chief fault which he finds is due to a misapprehension which
which we are surprised to discover in an observer in other respects so acute. He objects to the award system on the ground that "the great builder and the great manufacturer who went to large expense in order to take part in the Exhibition are not distingaished from the smallest exhibitor, since they all alike receive bronze medals." Now, as the medals included in awards amount to nothing more than to attract attention to the report of merit, and as the reports offer a means of differentiating honors with a minuteness only limited by the adjectives and modes of expression comprised in the English language, it certainly follows that no one who reads the reports is liable to misunderstand why, and for what, awards were conferred. We cannot agree with M. Simonin in thinking the Corliss engine the most remarkable thing in Machinery Hall and one of the greatest curiosities, perhaps the principal, in the Exhibition;" norcan we applaud the comparison of the spinning and weaving machines with similar collections in other Expositions" in number and noise." In his review of our industrial progress and possibilities we should expect to note the master hand of the writer, and the following significant paragraph certainly more than compensates for the minor errors into which he has strayed:

America can feed Europe with corn,

Fig.2.-INDICATOR DIAGRAM OF A $18 \times 20$ NILES ENGNIE.
suitable person, gladly take charge of any railway exhibits, and do my best to forward the interests of the exhibitors, if,


Fig. 3.-NILES SEMI-PORTABLE ENGINE.
very many articles in the Centennial buildings, which would, when known, be introduced into Australia advantageously to the makers. I will mention a few only: Brickmaking.
 on consultation, I can advise them to be sent. There ar
wheat, preserved meats, and live stock, as it has supplied it with cotton; it has clothed Europe, and it can nourish Europe. It can get along without Europe as far as regards iron, steel, copper, machinery, and most of the manufac tured products. It will not cease, however, to give Europe the gold and silver which is needed for all transactions, for the mines of the United States yield more than the mines of the whole world. $\Delta s$ for coal, America will soon produce as much as England, that is, as much as all the rest of the world, and its carboniferous deposits are twenty times greater than those of England
" America will learn more and more how to get along without Europe, but Europe will not be able to get along with out her. It is truly a new England which is rising across the seas, and which already threatens the old England in al her markets. The commercial interests of France are also threatened; even American wines are competing with ours The connoisseur alone demands the wines of France.
"But what is still graver is the fact that the Americans are getting hold of the processes, the sleight of hand of our workmen. Already in the manufacturing of jewelry, watches, bronzes, farniture, and artificial flowers, they produc. an article which bears the real stamp of solidity and good taste. In these departments the American is more to be feared than the Englishman, because of his situation, which feared than the Englishman, because of his mixture of races, and an incessant contribution of climate, a mixture of races, and an incessant contribution of
European and Asiatic immigration render peculiarly favorable. Switzerland is already in a state of agitation ove the success of American watches. In carriage making, cabinet work, glass work, and pottery, the United States is al most the peer of France and the other great nations. In other things they have got ahead of us; and all this in spite of the high price of labor. It may be said that we are their instructors and masters, as Italy was for us at the Rénaissance, and that they are destined to surpass us some day, as we did the Italians. Venice, Milan, and Florence taught us formerly how to melt:glass, to weave silk and velvet, and soon we got ahead of them. Will the same thing happen to us in respect to the United States?"

To determine whether beeswax is adulterated with paraf fin, heat the suspected material to $329^{\circ}$ Fah., with sulphuric acid. On cooling, the paraffin, if any be present, will rise to the surface.

## A CURIOUS CLOCz.

We take from La Nature the annexed engraving of a new clock lately devised by M. Guilmet. The odd feature about the timepiece is that the clock oscillates while the pendulum is stationary, thus reversing the usual order of things. The mechanism is contained in a circular case which is pivoted to the branches of the bracket, A B. The rear of the clock, with the escapement and small pendulum, $P$, is shown in Fig. 3. The ring, B, Fig. 2, is connected to the crosspiece, C C, Fig. 1, by means of three springs. Below the cross-

Fig. 1.


Fig. 2.

piece is attached a balance rod, which also acts as a pendulum. The ring is slipped over a hook, $a$, in the hand of the statae, and the clock is thus sustained, a slight swing being sufficient to start its oscillations. The effect obviously is the came as if the piece, $a$, Fig. 3, vibrated in the usual manner. The outline on the right of Fig. 1 indicates the swing of the main penduation, and consequently regulates th movement of the clockwork. The weight of the small pendulum and the elasticity of the supporting springs unite to render the vibrations continuous.

IMPROVED APPARATUS FOR CURING TOBACCO. It is well known that a large portion of the tobacco grown never enters into that state of fermentation necessary to fully develope its burning quality, flavor, and dark color, so that it retains its wild rank elements and its green and yellow leaves, and is therefore unfit for cigar purposes.

The inventor claims that, by the process and apparatus
shown in the accompanying engravings, such tobacco can be forced to sweat and color, and its quality can be improved, thus reclaiming a large quantity of goods hitherto considered worthless. The case of tobacco to be operated upon is unpacked, and the tobacco, one or more hands at a time, is laid loosely in layers upon the rack bottom of the truck, D. As each layer rises a little above the horizontal bars of the side racks, one of the loose racks, E, is placed upon it, and so on until the whole case has been transferred to the truck, D. Each layer is then moistened with water. As the tobacco becomes soft it settles down, and the racks, E, rest upon the horizontal slats of the side racks of the truck, which prevents the tobacco from packing so closely as to prevent all its parts from being moistened evenly. The loaded truck is now run into the steam chest, $\mathbf{A}$, the door, C , is closed steam-tight, and steam is admitted until it has attained a pressure of from 3 or 5 lbs., which pressure is main tained for 5 or 10 minutes. During this time any excess of moisture that may be contained in the leaves will be vapo rized and distributed evenly through the entire mass, and the tobacco will have settled so that the hands press upon each other, and will be in suitable condition to sweat and color. The steam valve is now nearly closed, only enough steam being admitted to maintain a temperature of from
$150^{\circ}$ to $200^{\circ}$ Fah., long enough to thoroughly sweat the to $150^{\circ}$ to $200^{\circ}$ Fah., long enough to thoroughly sweat the to bacco and bring it to the depth of color desired. It is then ready for stripping.
This invention was patented through the Scientific Amer ican Patent Agency, September 26, 1876, by Mr. Charles S. Philips, of Brooklyn, N. Y.

## A Two-Stery street Car.

The Sirth Avenue Railroad Company of this city have in troduced a novel car on their road, which attracts considerable attention and will be found specially desirable for sum mer use. It is only the pioneer of others if the new design prove desirable. Its interior is of hard wood, handsomely finished, polished, and varnished. The braces, bolt hoads, hnish pors, and anen the match scraper are nickel heade door hanles, and The seats are of fine polished wood, perforated, the nail
heads mounted and burnished. The body of the car is shortheads mounted and burnished. The body of the car is short-
ened to give space for the stairway on each platform. The two benches on the center of the roof are placed so that passengers will sit back to back. A canopy is spread on braces that are screwed to two strong uprights, and is high enough to allow a person six feet in stature to stand upright.
This car has one commendable improvement in the shape of a guard before the front wheels. It is a broad iron strap attached to the under edge of the car, extending to within an inch of the track, thus sheathing the wheel, and acting as a sweeper of the rail.

## The Cornell Owl.

During the past week, a bittern, a duck, and four owls have been received at the laboratory. One of the owls is kept alive. He has disposed of parts of several fish, a chip munk, and a live snake two feet long. The encounter with the snake was quite amusing. The owl, on spying him in a glasscase, oviced a so the snake was placed on the floor of the laboratory. Th owl with one fell swoop came down upon his snakeship, and, striking its claws into his back, raised his head to its mouth
and instantly smashed it. Then commenced the process of deglutition. The owl proceeded to swallow thesnake's head first and proceeded badly enough, until, after a minute's struggle, all was swallowed but two inches of the tail. At this poin the owl stopped to take breath, and stood with its eyes slowly blinking, while the two inches of tail, still visible, was wiggling vigorously. At last, summoning up courage, the still wiggling, down his throat.-Cornell Era

Wall Papers and Typhoid Fever
An Englishman, several members of whose family had been sick with typhoid fever, had a room repapered, and found that there were no less than twenty-five wall papers already on the wall. The presence of this mass of decomposing paste and paper sufficiently accounted for the dis agreeable smell that was always noticeable, although drains and water closets were well trapped.

A NEW STEAY PUNTP.
We illustrate herewith a novel steam pump, operated by the condensation of steam, something after the pulsometer principle. To start the pump when first set up, it is only ecessary to pour a small quantity of water into the cylin er, then open the globe valve, $X^{\prime}$, and raise the steam valve U , by means of the milled nut, T , which allows the steam o flow into the cylinder, E, forcing the air therefrom through he port, K. The head, G, being at the bottom of the cylin er, the valve stem, $I$, projecting below, holds the valve, $M$ pen, and allows the steam to come in contact with the wa er. Then, by closing the stoam valve, U, a partial vacuum

is formed. The steam is then again admitted, and the same operation continued until the air is exhausted from the pump and pipes. This being accomplished, the pressure of the atmosphere forces the water up the suction pipe, $Z$, nearly filling the vacuum chamber, $B$, then up the passage, $C$, forcing the head, $G$, upward until the hub on the disk, $L$, comes in contact with the counterbalance, $R$, and, lifting the steam valve, U , admits steam into the cylinder, E. As the valve $M$ (the only means of escape for the steam), is closed, the head, $G$, is forced downward, forcing the water with it until the valve stem, $I$, is brought to bear on the bottom of the cylinder, when the head, $G$, leaves the valve, $M$, which is thereby opened and allows the steam to pass through the piston, past valve, $H$, and exhaust into the water below the piston, which condenses it instantly, thus forming nearly a perfect vacuum in the cylinder, $E$, the valve, $U$, being at that instant closed by the pressure of the atmosphere. When the vacuum is formed in cylinder, E, beneath the piston, the air instantly expands and forces the water out of the

chamber, $B$, into the cylinder. At such time the foot valve $\mathrm{R}^{\mathbf{0}}$, is held closed by reason of the pressure in the chamber B, being superior to the atmospheric pressure without. But the instant the piston begins to descend again, so that the valve, J, closes, the water at once rushes past the foot valve and into the chamber, B, with great force, thus compressing the air as before. In this respect the action is similar to what takes place in a hydraulic ram. When water enters the cylinder, E, a jet is forced through tube, N, above the piston. The steam valve, $U$, is held open while steam is to be admitted by the pressure of steam under it, but is closed by atmospheric pressure as soon as it is allowed to descend by the forming of the vacuum under it, the action being gentle, so as to prevent hammering the seat by the valve The arrangement of the cylinder, E, and head, $G$, with its valves or equivalent, effects separation of the steam and wa ter until the time of exhaust, and secures at all times a ho steam cylinder, in which the water to be pumped has no no access either to space or surface.
This machine may be used as a condensing steam engine it being only necessary to connect a piston rod with the head allowing it to take in only sufficient water for condensa tion purposes. The invention was patented through the Scientific American Patent Agency, September 19, 1876, by Mr. E. G. Shortt, of Carthage, N. Y.
the army worm : its hatural history complete by profzssor a. v. biley.
The substance of some experiments of mine made during the year, on the biology of the army worm, was laid befor the American Association for the Advancement of Science at its late meeting, and is here repeated in popular form.
The army worm is one of the most destructive insects to North American agriculture. At irregular intervals it sweeps throagh the meadows and grain fields about the time that wheat is beginning to ripen, often rendering them un fit for the mower or harvest machine. It proves injurious from Maine to Tezas, and from the Atlantic to the 100th meridian; and though the same species, or geographical races of it, occur in other parts of the world, it is not known to beanywhere else so injurious. It is the larva of leucaria unipuncta, Haw, a moth with buff-colored wings, and char acterized chiefly by having a conspicuous white speck on the disk of the primaries. Up to the year 1861 its parentage was unknown; and it is a singular fact that, notwithstanding the great abundance in which the insect occurs all over the country indicated during certain years, the nature of the eggs, and the time, place, and mode of disposition, remained unknown up to the present year. Two trains of circumstances serve to explain this fact. The one is that, during great army worm years, when the species most attracts at

 tention, the worms are so followed by parasitic and preda ceous insects, and so persecuted and destroyed by other animals, man included, that comparatively few of them sur vive long enough to produce the moth. The other is that in seasons when the insect does not abound, no one thinks of looking for the eggs.
The time and place of oviposition in this species is quite important from the economic standpoint. Structure is a re hab the ovipositor, made last winter, convinced me that thur of the ovipositor, made last winter, convinced me that there
was a third and more important reason why the eggs rewas a third and more important reason why the eggs re-
mained undiscovered, namely, that theyare secreted. With this clue, I have in the present year been able to solve the mystery, and to prove the correctness of the conclusions arrived at from structural study. The eggs are, indeed, thrust in between the sheath and stalk of well grown grass es, whether out or standing, or occasionally in between the natural fold of the green leaf, or the unnatural curl at the sides of a withered leaf. On low blue grass, where my firs observations were made, they are almost invariably the fold at the base and junction of the terminal leaf with the stalk. The moth invariably endeavors to secrete them They are generally laid in rows of from five to twenty and upward, and they are accompanied with a white, glistening, viscid fluid which glues them to each other and to the plant and, when laid in the fold of a spear, draws the two sides securely over them, leaving but a glistening streak along the more or less perfectly closed edges. Each egg, when first laid, is spherical, 0.02 inch in diameter, smooth, opaque white, with a very delicate and yielding shell, which before hatching becomes faintly iridescent, and shows the more sordid embryon within. The newly hatched larva is a looper, the two front pairs of prolegs being so atrophied that it necessarily loops the body in orawling, as the fall grown larvo of another large family of moths-the geometridonormally do. A large number of noetuids, in which the full grown larvo have the normal complement of prolegs fully developed, exhibit this peculiarity in the early larval stages. The newly hatched army worm bears no resemblance to the full grown individual and is so small, and so much of a color with the pale base of a grass blade, that it would scarcely be noticed even where occurring in handreds to the square foot. It developes very rapidly, going through
ive molts, and attaining fall growth in from two to three eeks.
There is one other mooted question in the natural history of the army worm which I have been able this summer to settle, namely, whether the species is single or double brooded. In a review of the matter in my eighth report, I came to the conclusion that, in the more Northern States
$\qquad$ lasion that, in the more Northern States  the larger portion of the country in which it proves injurious, it is but single-brooded, and I am still of the opinion that such is the case. But I have proved that, like so many other species which are single brooded further north, it is frequently, if not always, double-brooded in the latitude of St. Louis. By carefully feeding the moths reared from my first larvæ with sweetened water, and supplying them with grass in spacious vivaria, I succeeded in obtaining eggs from them. These eggs in due time hatched, and the second brood of worms gave me the moths again early in Augast. The worms were generaly paler than those of the first brond; and being the second generation, reared in confinement, they were less healthy. I obtained, in consequence, but five moths, all of them unfortunately females. One of these escaped, threedied without showing any develpment of the ovaries while the fifth died with the ovariesso well developed that the eggs, in a state of nature, that the eggs, in a state of nature,
would probably have been laid within a week. It is very clear, from the above recorded facts, that the eggs of his insect do not as a rule, if at all, Full grown army worm pass the winter at the foot of grass stalks, as was hereto ore surmised. Nevertheless, the burning over of meadow and grain stubble in winter will act as a preventive of arm worm injuries, for the reasons that the moth lays very early n spring, that she prefers the full grown sheath and stalk ven when dry, to the young green spears, and that she can not well lay her eggs, for want of support, where the grass is yet sparse and thin, as it is when first starting in a burnt neadow.
In my own experiments, the females, in secreting their ggs, showed a preference for old hay over fresh and grow ing grass. Finally, without entering into further details, I give the following as a revised summary of the natural hisory of the army worm:
The insect is with us every year. In ordinary seasons, when it is not excessively numerous, it is seldom noticed: 1 , because the moths are low, swift flyers, and nocturnal in habit: 2, because the worms, when young, have protective coloring, and, when mature, hide during the day at the base of meadows. In years of great abundance the worms are generally unnoticed during early life, and attract attention only when, from crowding too much on each other, or from having exhausted the food supply in the fields in which they arin thed all in pastures in great bodies. The earliest attain full growth and commence to travel in armies, and to devastate our ields, and to attract attention, about the time that winter wheat is in the milk-this period being two months later in



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$b$
 Maine than in Southern Missouri,
descend into the ground, and thus suddenly disappear, to ssue again two or three weeks later as moths. In the latitude of St. Louis the bulk of these moths lay eggs, from which are produced a second generation of worms, which became moths again late in July or early in August. Further orth there is but one generation annually. The moths hi bernate and oviposit soon after vegetation starts in spring The eggs are inserted between the sheath and stalk, or se reted in the folds of a blade; and mature and perennia rasses are preferred for this purpose. The worms abound n wet springs preceded by one or more very dry years. They re preyed upon by numerous enemies, which so effectually heck their increase, whenever they unusually abound, tha he second brood, where it occurs, is seldom noticed; and wo great army worm years have never followed each other and are not likely to do so. They may be prevented from invading a field by judicious ditching; and the burning over of a fleld, in winter or earl
It is thus that questions which have caused discusio for years, and given rise to various theories, are settled, and ircumstances that seemed wónderful and difficult to ac count for are explained by a few careful observations and xperiments.
St. Louis Mo

## Contegyoultuct.

A Handy Form of Chuck.
To the Editor of the Scientific American:
I want to thank you as well as Mr. Joshua Rose for the many useful hints to amateurs contained in his notes on tools and their uses, and particularly to the articles on lathes and lathe tools ann I indebted much for useful information.
I send you a model of a chuck something in the style of he one described by Mr. Rose in your issue of August 5, 1876, in which, as your readers will see, by the use of a variety of parallel slips, many different sized pieces can be held for turning, by only two wedges; and any boy wha can use a lathe can make it


I would advise all amateurs to have a tap to match the screw on the mandrel ; and also a small piece of hard, closegrained wood, tapped to fit, the hole being bored with the grain, and then screwed on to the mandrel, and thereturned with slight taper from left to right. A small shoulder or flange should be turned on the left hand end, so that, when screwed on, it fits up close. Then turn a piece of good soft dry pine board, as large as will swing, $1 \frac{1}{2}$ to 2 inches thick, and turn a hole in the center to exactly fit the piece of hard wood in which you have cut the thread; put these together with good glue; when the glue is dry, turn the face and edge, and you have a chuck or face plate, which (being of soft wood) can be easily turned out so as to hold any block that is less in diameter. When this face plate is used up, it can easily be renewed on the same piece of hard wood in which the screw is cut. Dogwood is perhaps the best of the common woods in which to cut a thread; it is cheap, and to be found in almost any yard where firewood is sold. I have some of these wooden chucks, the threads being cut across the grain, which have been in use in my chuck for years; and they are as good as new. I prefer a wooden face plate, made as above described, to screwing a board on to an iron face plate, because the screws give in the wood, and they do not remain true.
Philadelphia, Pa

## The Ratio of the Diameter of a Circle to its

 Circumference.
## To the Editor of the Scientific American:

It is not easy to realize the comparative minuteness of the difference between the figures $3 \cdot 1416$ and $3 \cdot 14159$, unless we reduce them to some familiar standard, say to some fraction of an inch. The former of these numbers is too large and the latter too small, the true figure being at some unknown point between them, but about three times as near the latter as the former. The difference between these numbers is 00001 ; and with regard to a 12 inch circle, it would represent 0.00012 of an inch. Every mechanic using a minutely divided steel scale is familiar with the appearance of $\frac{1}{0}$ of an inch; and he may, byan effort, be able to imagine the minuteness of $\mathrm{I}_{100}^{10}$ part of one of these one hundredths, $1 \frac{1}{f}$ of which latter subdivisions constitutes the 000012 part of an inch. But this small fraction is the sum of the two rrors contained by the numbers $3 \cdot 1416$ and $3 \cdot 14159$, said errors being respectively only about $\frac{9}{10}$ and $\frac{3}{10}$ of a subdiision for those numbers. Now two lines over uhree feet long, differing in length only by 0.012 parts of a $\frac{1}{100}$ of an nch, have practically the same length; and slight as is this difference, the circumference of a 12 inch circle, if straightened out, would be longer than one and shorter than the other, that is, it would differ from either one by less than the amount by which they differ from each other. If a microscope having a power of 200 diameters were brought to bear upon these minute portions of an inch, the former ( 0.3 inch etc.) would appear less than a $\frac{1}{80}$ on the scale, while the latter ( $\frac{3}{10}$, etc.) would have an apparent breadth scarcely exceeding that of one of the division marks; and yet these microscopic amounts constitute respectively the extent of the errors developed by using the above ratios to obtain the circumference of a 12 inch circle.
For other sized circles, these errors increase or diminish in exact proportion to the diameters: for instance, in a circle the size of a locomotive turntable they would be respectively about $\frac{1}{8}$ and $\frac{1}{8}$ of a $\frac{1}{10}$ of an inch. The mechanic realizing these facts is enabled to use the numbers $\mathbf{3} 1416$ and $3 \cdot 14159$ intelligently, as multipliers for the diameters,
and with full confidence in their almost absolute truthfulness as applied to circles of moderate size. Rochester, N. Y. $\quad$ E. B. Whitmore.

## The Earth's Motion.

To the Eaitor of the Scientific American:
In an article on the "Irregularity of the Earth's Motion," on page 321, current volume, it is mentioned that "smaller changes, some in one direction, others in the other, have taken place, generally lastingabout four weeks at a time." Whatever may be the cause of the changes of long duration, there must, of necessity, be a change at every revolution of the moon, since it has long been a well established fact that the earth does not move in a regular orbit around the sun, but in epicycloidal curves, the center of gravity between the earth and moon making the real orlit in which both together revolve. And as this center is outside of the earth, the whole body of the earth must cross the orbit twice in every revolution of the moon, and thus must apparently be con stantly varying in the velocity of its motion.
To represent the true path of the earth would require a section of over one hundred feet in length, of an arc of one hundred feet radius, in which arc the earth would be but one tenth of an inch in diameter. But the path of the moon, which is affected in a much greater degree, can begiven on a much smaller scale. Thus, if we take a plain wheel of six inches diameter and insert a pin in the center and another at one tenth of an inch from the first, and roll this wheel around the edge of another wheel of seventy-six inches diameter, we will find that, while the center pin de scribes a circle of eighty inches, the other will describe a curved line like that of the moon. It will thus be seen that it is only the common center of gravity that has a regular motion, while the motion of both the earth and moon mus be constantly varging.
J. A. B.

Canton, Mass
PRACTICAL MECHANIBM.
bY JOSHOA ROBL.
Srcond SERIEQ-Number XVI. PATTERN MAKíNG.
Our next example is what is called a T, a drawing for which is shown in Fig. 113. It is shown with fianges on the main body, and a hexagon on the branch. Sometimes a flange is employed instead of the hexagon, but this depends

apon the connections to which it is to be attached. Patterns of this class are often made so that either round flanges or heragonal connections may be put on at will; and it is in that style that we propose to make our example. It is apparent that the pattern will be the most easily molded with its body and branch both lying horizontally in the mold, so that, if we suppose the surface of this paper to represent the surface of the mold, the engraving shows just how the pattern will lie in it. It will be advisable, therefore, to make the pattern in halves.
We first prepare the body and flanges, in the same manner as described for the body of our gland, the only difference being that we have, in this case, to fit a flange on each end. The same method is pursued in making the branch, with the exception that we only require a core print on one end, the other end abutting against the body. The first question that arises is how long shall we make the branch; and this depends upon how farthe branch follows the curvature of the
body. In our example, the branch and body are of the same body. In our example, the branch and body are of the same diameter, and therefore the branch will follow exactly half way around the body. We turn up the branch piece, then, to its requisite diameter, and make its length equal to the diameter to which it should stand out from the body, added to halfthe diameter of the body. 'The pieces we have made, then, are those shown in Fig. 114, in which A represents the piece for the body, and B the piece for the branch. Our next proceeding is to cut out the abutting end of the branch to lows: We first set the bevel square to an angle of $45^{\circ}$ by the process shown in Fig. 109, and then, taking the branch the process shown in Fig. 109, and then, taking the branch
halves apart, and placing the bevel square with its back haives apart, and placing the bevel square with its back across the end face of the branch (the blade lying on the joint
face of the half branch), we mark the two lines, $\Delta B$, in Fig. 115, which must meet exactly in the center of the branch and at the extreme end, as shown in Fig. 116. We then pareoff the angular piece, $C D$, down to the lines, $\Lambda B$. If, before we do the paring, however, we give our half branch a quarter turn around, it will appear as shown in Fig. 116 ; the curved formed by the intersection of the plane surface (just made) with the round surface of the piece is the true curve of the body of the T.

Turning to the other half of the branch, we perform upon it the same operation; and we may then cut away with the

gouge the intervening timber from between the curve lines. Our two halveswill be of the proper curve at the end to fit actly to the body of the T, as shown in Fig. 117, in which


A represents a sectional view of the body of the $T$, and $B$ $C$ are the two halves of the branch; while the view, $D$, shows the body of the T lying horizontally with the branch attached.
We have now to fasten the branch to the body of the $T$ and here we must pause to consider whether the pattern is required to serve simply for the production of a few castngs, whether it is to be cast aside after the first casting, never to be used again (which is often the case), or whether it is intended for standard or continuous use. For a temporary purpose, a few screws will be sufficient; but for a permanent pattern, a much stronger joint may be made as fol manent pattern, a much stronger joint may be made as fol-
lows: Brush with hot glue the ends of the branch piece, and let them stand until the glue has baen absorbed into the pores of the wood. This is called sizing, and is always nepores of the wood. This is called sizing, and is always necessary in gluing end wood, as it is called, meaning the end grain of wood. The reason that sizing is, in that case, necessary is that the pores of the wood all meet the surface in the end grain, and the sizing is necessary to fill them. We then take a truly planed piece of board, and lay one half of the body down upon it, placing a piece of thin paperbetween the body and the board so that any glue that may run out may not touch the board: otherwise it may glue the work so fast to the board that, in parting them, some of the fibers of the wood may get torn out. Then we fasten temporarily the half body to the board, and lay one half of the branch with its flat surface on the same board, and glue it to its place, drawing it well up to the body piece with dogs or clamps, at the same time observing that it is close down to the board, and fixing it temporarily there, as shown in Fig. 118, and allowing it to remain until the glue is dry. In put-

ting on the second half of the branch, the board need not be used, since the first half, already in position, will serve as a guide. A piece of paper must, however, be placed between the two halves of the branch to prevent them from adhering together. When all is dry, put a strong screw in the position denoted at A, in Fig. 117, cut out a recess on the flat face of each half, and let in a piece of hard wood, as shown by the dotted lines in the same figure.

## Fig. 119.

Let us now suppose that, in our example, the diameter of the branch had been smaller than that of the body of the T. In that case we must first ascertain its proper length by the process illustrated in Fig. 120, which represents a piece of board, upon which we strike the line, A B; and from the point, C, we mark the semicircle, $D$, which must be of the came radius as the body of the pattern. Then, parallel with the line, A B, we draw the line, D E, the distance between these two lines being equal to half the diameter of the branch of the pattern. Then from the junction of the line, D E, with the semicircle, D, we strike the line, D F, at a right angle to $\mathbf{A} \mathrm{D}$; and then from $F$ to $G$, added to the dis tance which the branch requires to stand out from the edge of the body, is the length we require to make the branch. To draw the curve on this branch so as to cut it out to fit
the body, we proceed as follows: Fig. 121 represents the ap plication of a peculiar trammel designed for this and similar purposes. It enables the operator to strike a true circle upon a round or uneven surface. It is composed of the

turned bar or rod of metal, $A$, of about half an inch diame ter, and upon it slidesthe piece of brass tube, B, upon which contrived a support for the sliding arm, C , as well as a set screw for fastening the arm, C , in any desired position. At the end of the arm, C , is placed an arrangement for fast. oning the scriber, D , so that we may set the scriber at any requisite distance from the rod, $\Delta$, by adjusting and fasten-
ing the arm, $C$, and revolve it about while lifting or lowering it upon the rod, A. When properly made, this is a most useful tool ; and if not in use, it may be taken apart in an instant, and it occupies but very little room in a tool box. If the stand, E , pierced with holes for screwing down, is provided, it will be a very useful addition, but it may be dispensed with; whereas the tool proper, or some improvised substitute for it, is absolutely necessary, for the curvemust be struck somehow. If the pipe or branch is large, sayeven six inches in diameter, to attempt to fit it by guessing and rying is the work of a novice and not of a workman. To apply this tool to our branch, we proceed as follows: Taking a planed board, we gage a line upon it; and at a point on this line, we describe a circle upon it of the size of the foot of the instrument. We then make two $V$ blocks, such as shown in Fig. 122, to carry the branch. We then place

these $V$ blocks with the apex of the $V$ exactly over the gaged line, and place the branch in the Vs. We then set the point of the scriber at a distance from the rod of the trammel equal to the diameter of the branch, which may be readily done if the size of the rod be known. We next mark upon the top of the branch, as it lays in the Vs (with the joint of the two halves standing vertically), the distance it rtquires to be cut out to form the curve, which distance will correspend to the distance of F G, in Fig. 120. We then draw the branch forward until this mark falls exactly under the scriber, keeping the joint faces vertical ; and this adjustment being made, we fix temporarily the branch to the piece of board whereon it and the Vs rest. Then we move the sim, C, in Fig. 121, a half circle; and letting the point of the scriber contact with the branch, we draw the necessary lide. It will be found, however, that it is requisite to mark the lines while lifting the arm to prevent the scriber from digging into the wood. Thus one side of the branch will be marked, and we must then turn it upside down on the Vs, set the joint vertically again, adjust the mark to the scriber point, and proceed as before to mark the other side of the branch. We may then cutout the corners to the lines, which may be most rapidly performed by a band saw, sawing exactly to the line: the branch being held on a board, as it was when being marked. In fact, a piece of wood should be when being marked. In fact, a piece of wood should be
fitted underneath, where the saw cut will come, so as to prevent the fibers of the wood from being torn out at the prevent the fibers of the wood from being torn out at the
edge, showing a ragged cut: as it is very apt to do, especial edge, showing a ragged cut: as it is very apt
ly if the band saw is not in first class order.

## ly if the band saw is not in first class order.

Should the branch be required to stand obliquely to the body of the pattern, as shown in Fig. 123, it may be struck out in the same manner; but instead of being set square with the rod of the trammel, as in the former case, it must be set at the bevel at which it is to be fixed upon the body of the pattern. When marking one side, the branch must make an angle with the upright equal to the angle at A, in Fig. 123; while, when marking the other side, it must form an angle equal to that at $B$, in the same figure. It will pay, where two or three pattern makers are employed, to have this marking apparatus always standing ready for use upop board, with the degrees of angles marked thereon; so that workman could mark off his job in five minutes, and cut it out with a band se,w. Catting out with a gouge and trying o its place may take four or five hours. It must be borne in mind that too much care cannot be given to striking out the pieces accurately and to sawing them true to the lines. The saw must besharp and of a width suitable to the curve, and not tremble, or "dither," as band sawyers say. By at tending to these matters, a fit may be obtained with a mini mum of labor to the workman; and this isdesirable in itsel and is an item of profit in the cost of the pattern

## ANTIQUE GOLD AND SILVER WORE.

It was the custom among rich men in the middle ages to invest a considerable portion of their wealth in gold and silver wares: not only for the sake of possessing valuable and rare specimens of art workmanship, as a means of display, but as an investment. Men of large revenue must have been sorely puzzled to know what to do with money when stock companies, bonds of corporate bodies, and na tional debts were unknown; and even bankers, as known as such to-day, had no existence, the castom of banking not being introduced till about the seventeenth century. This consideration, probably, furnishes an explanation of the great wealth in gold and silver plate which was pos sessed by some of the European monarchs in the thir teenth and following centuries. As the goldsmiths became dealers in this form of property, and frequently received it for safe keeping or as security for loans, they gradually became bankers; and many of the oldest banks in London were originated in this way.
The practice called into existence some of the very greatest artists that the world has ever known. Ben venuto Cellini may justly be called the chief even of the most renowned workers in the precious metals; and the demand for his services spread to all the courts of Ev rope. His works are very numerous, and the smallest authentic specimen of his handiwork is sure to fetch an enormous price when offered for sale, and to be highly prized by its purchaser, and closely studied by the con noisseur, as well as by the aspirant for fame in th beautiful art of metal working. Cellini founded the renaisaance school of design and ornamentation of the precious metals; and his contemporaries and follower extended the infiuence of the newly revived classical forms, till the goldsmith's art, as we now know it, was formed. The progress since made was studied by tens of thousands of people at the recent Centennial Exhibi tion; and the magnificent exhibits of Messers. Elkington \& Co., Tiffany \& Co., and other firms have well shown the present condition of the craft.
The accompanying engraving delineates a very re markable salt cellar, being part of a collection of an tique plate formed by the late Loid Londesborough This curious example (the engraving of which weselec from the pages of the Siloersmith's Trade Journal) of th quaint designs of the old metal workers is considered to have been the work of one of the famous Augsburg goldsmiths at the latter part of the sixteenth century It is a combination of metals, jewels, and rare shells, in a singularly grotesque general design. The salt was placed in the large shell of the rare pecten of the South Seas, which is edged with a silver-gilt rim, chased in fioriated ornament and further enriched by garnets to it is affixed the half-length figure of a lady, whose bosom is formed of the larger orangecolored pecten, upo which is fixed a garnet, to represent a brooch; a crysta forms the caul of the head dress, another is placed below the waist. The large shell is supported by the tail of the whale on one side, and on the other by the serpent which twists around it; in this reptile's head a turquoise is set, the the eyes are formed of garnets, and the tongue of red onyx. The whole is of silver-gilt, and within the mouth is a small figure of Jonah, whose adventure is thus strangely mired with the general design. The sea is quaintly indicated by the circular base, chased with figures of sea monsters disporting in the waves. It would not be easy to select a more characteristic specimen of antique table plate.
sIEMENS' gENSITIVE ARTIFICIAL EYE.
We have already alluded to Dr. William Siemens' curious device of an artificial eye sensitive to light, an invention

based upon the action of light upon the electric conductivity of seleniom. The construction of the eye is shown in the annexed engraving
A hollow sphere, suitably supported, is provided with two openings, in one of which is placed a converging lens, $A$ B,
and in the other a selenium plate, $\mathbb{S}^{\prime} \mathbb{S}^{\prime}$, the latter in communication with an electric current and a galvanometer. The lens being covered with two movable screens, $E E^{\prime}$, the whole is comparable to an eye, in which the screens repre sent the lids, and the selenium plate the retina. Whenever the screens are removed, the galvanometer is seen to deviate and the degree of deviation depends on the color of the ligh which converges upon the selenium. It is very slight if the light is blue, more if the light is red, and still more if white light be transmitted. The eye may be placed in communica tion with an electro-magnet, which may automatically ope rate the screens, in manner similar to lids. "Here," says


## AN ANTIQUE SALTCELLAR

Dr. Siemens, "is an artificial eye, sensible to light and to differences in color, which gives signs of fatigue when it is submitted to the prolonged action of light, which regainsits strength after resting with closed lids," and which, by an electro-magnet attachment, may be made to close itself, as does the human eye involuntarily, on the occurrence of vivid flash.

## Trade Marks in Great Britain.

Hon. R. H. Duell, Commissioner of Patents, has received communication from the Commissioner of Patentsof Great Britain, informing him that by act of Parliament foreigner have been accorded the privilege of registering trade marks in that country on the same terms as British subjects. The United States Patent Office has recently declined to register trade marks for British sabjects for the reason that no provision had been made by treaty or act of Parliament extend ing the reciprocal privilege to our citizens; but in view of the action of England now communicated, our Patent Office will hereafter register trade marks for them on the same terms and under the same regulations as those prescribed by it, in accordance with act of Congress for citizens of this counin acc
try.
Th
The letter from the London Patent Offce calls especial at tention to the fact that prior registration in the country of which a foreign trade mark owner is a subject is not neces sary before registration in Great Britain; but in case a trade mark has been used before the date of enactment of the new law (which date is not, however, stated in this communication) it will be necessary in the application for registry that a description of the goods in respect of which it has been used, and the length of time during which it has been so used, be given.

## New Remedy for Boiler Scale.

Zinc has been shown to be an excellent anti-corrosive in those cases where decomposed grease or fatty acid is the de stroying agent of boiler metal ; butits usefulness is mainly confined to boilers in which sea water is not used. Filtering the feed is an excellent precaution and should be universally adopted. To prevent the corrosive action in marine boilers, of substances which no filtering can arrest, Mr. Rowan, in a paper recently read before the British Association, proposes forming on the interior surfaces of the boiler, an artificial coating of calcium sulphate and magnesium hydrate; in proportions varying with the pressure carried by the boiler. It is claimed that, when once hardened by heat, the artificial scale thus made with fresh water cannot be dissolved by fresh water, and is not likely to be affected by the small quantity of sea water which may leak in: that its thickness is quite under control, and that it is free from the trouble attending the keeping up of a salt scale.

## Sawing Granite.

Among the interesting things that were shown to the ar chitects in Philadelphia, during their convention, was the patented process of Messrs. Struthers \& Sons, for sawing ranite. Hitherto it has been found impracticable to cu granite with a saw, since the ordinary sand process would cut only an inch and a half or two inches per day. The in ventor of the Messrs. Struthers' process hit upon the ides of using chilled iron, finely divided, instead of sand. A je of steam is directed upon a fine stream of melted iron, and blows it into spray, just as in the common atomizer a jet o pulverizes, so to speak, the stream of liquid upon whic is turned. The iron, divided into fine globules of, say a fortieth or a fiftieth of an ineh in diameter, falls into cold water, and is chilled into excessive hardness. It is used under a saw of soft iron, and with a stream of water, as sand is used in sawing marble. Most persons would have supposed that the scratching of angular grains of sand would be more efficient than the rolling friction of globules of iron; but it would seem that the sand is speedily crushed into dust, while the tough iron, simply wearing down into smaller and smalle globules, crushes its way through the felspathic and other crystals of the granite (which with us is usually sienite, by the way, and not granite). The rolling of the globules is curiously shown by fine channelings or fiutings, which score the under edge of the saw from end to end. By this device granite can be sawn at the rate of three or four inches per hour, and at small ex pense: the waste of the iron being about three pounds for every square foot of kerf, or two square feet of sawn surface. For small blocks, where a saw can be used that is short enough and therefore stiff enough to bear a heavy pressure without buckling, it is found possible to cut at the rate of twelve or fourteen inches per hour. The surface obtained by sawing is vastly better prepared for polishing than a hammered surface not only because it is smoother, but because by ham mering the surface of the stone is "stunned," as it is termed:thatis, the crystals are so bruised and shattered below the surface that it is necessary, before the polish ing can begin, to grind away an eighth of an inch or more, which is unnecessary with a sawn surface.American Architect and Building News.

## A NEW BLOWPIPE.

We illustrate herewith a novel blowpipe, which consists of a fire chamber, connected with an airforc ing apparatus, and provided with nozzles of various forms for directing one or more jets of heat and flame The object is to provide a portable blowpipe, the flame of which will have sufficient power to heat objects of considerable size. The fire chamber consists of a cylin or, B, of iron, having conical ends. To one of these ends the blast pipe, C , is attached; and to the other a nozzle, $D$ is attached by screws, so that it may be removed and replaced by nozzles of different forms. $E$ is an aperture in he top of the fire chamber, for the introduction of coal, etc. The chamber is lined with a coating of fire clay.
Fig. 2 represents a flat or elliptical nozzle, and Fig. 3 a double nozzle, capable of directing the fiame on both sides of an object. In use, the chamber, $A$, is filled with burning charcoal, coke, or other suitable combustible substance, and the blast pipe, $C$, is connected by a flexible pipe with a blower or bellows. A blast being created, a jet of flame and heated gases issues from the nozzle, D, which is directed against the object to be operated on. The heat generated in this manneris said to be so intense that heavy irons, like the frame or braces of a locomotive or other large objects, may be heated in their places and bent. With a nozzle having several jets arranged in an arc, the tire of a locomotive wheel

Fig. 1.


Fig. 27

ma y be heated and expanded, so that it may be easily re moved.
The apparatus is the invention of Messrs. O. G. Dodge and William Gushurst, of Omaha, Neb., and was patented through the Scientific American Patent Agency, September through
$26,1876$.

## aCHMEA PANICÚLATA.

The achmea paniculata, represented in the fine engraving herewith (which we extract from La Nature), belongs to the bromeliacea, a small family of endogenous plants, which includes the pineapple, and is quite nearly related to the canna, ginger, and banana families. The plants are usually stemless, scarcely woody, and nearly all tropical. They are mostly epiphytes in the forests of Central and South America, growing in trunks of trees (though they are by no means parasites) and in clefts in rocks. The leaves are dry or fleshy and channeled, sheathing at the base, and usually covered with scurf. The flowers are hermaphrodite and regular, and are crowded on the stalk, which grows to a hight of two or three feet. Each fiower consists of three outer divisions or calices, and three inner, much longer, with petal-like divisions all attached to the inferior three-celled ovary. Each flower is likewise placed in the axil of a bract the upper bracts, which are without flowers, developing are with out flowers, developing at the top
of the stem as a group of small of the stem as a group of smal leaves, ending in a point or spur The six-cleft perianth is the dis tinguishing feature of the family to which the achmea belongs, and thus curiously enough allies to the wholly dissimilar appearing Tillandsia or long gray moss, so common in our Southern States.

Knowledge Made Useful. In a recent address to the students of the School of Pharmacy, London, by Mr. Barnard S. Proc tor, he illustrated as follows the idea that not only must the mind have received an ample mind have received an ample store of useful facts, but all those faculties must also have received a larg development before one can be regarded as in any complete sense well educated and intelligent. "To make a carpenter you want wood and tools, and skill to use them So to make a learned man you should have knowledge of facts and laws, and power to use thom. Probably many of you are not aware how imperfectly you exer cise these faculties upon facts or circumstances which are presented to you. I will take an illustration. to you. I will take an inustration.
Suppose I write down in a vertical Suppose I write down in a vertical
column two series of units $0,1,2$ column two series of
3 , etc., up to 9 , thus:

| 0 | 9 |
| :--- | :--- |
| 1 | 8 |
| 2 | 7 |
| 3 | 6 |
| 4 | 5 |
| 5 | 4 |
| 6 | 3 |
| 7 | 2 |
| 8 | 1 |
| 9 | 0 |

" Some would be noticed by all of you if you regarded the figures long enough, but you would not long enough, but you would not
all observe them equally soon; it all observe them equally soon; it
would depend upon the innate fawould depend upon the innate faculty and the degree of education-
al development of the individual. The first thing you would notice is that the double column repre sents the nine column in the multiplication table; next you might notice that, if we place a plus mark $(+)$ between these two columns, and an equal mark after them, we should obtain a third column all nines, thus : $0+9=9$, and the same with all the others down to $9+0$ $=9$. Next, if you draw diagonal =9. Next, if you draw diagonal lines from the 0 to the 8 , and from the 9 to the 1 , and so on, with the most charming of princesses), though very costly you will see that the products are all eights one way and all
tens the other. In making these observations we should tens the other. In making these observations we should not say you had discovered a law, though we might say you had detected a rule applying to the arrangement, and you would naturally say: ‘Where there's a rule there's a reason." And in the search for the reason you exercise the higher faculties of the mind. You do not continue yourob servations upon these figares alone; you commence considering, speculating, and testing speculation with experiment You may extend the column upwards and downwards, and find nine times nine tenths is $8 \cdot 1$, and nine times eight tenths is 7\%. So the remainder, the sum of the two figures continues to be nine. You may then carry your extension down wards, and find nine times eleven are ninety-nine, the sum of which two figures is not nine but eighteen. Then nine times twelve equal 108, in which case the sum of the three numbers gives us nine, as also is the case with the following numbers: 117 and 126, etc. You will observe the hitch a eleven times nine in the sum taken horizontally, and that there is no hitch in the sums taken by the right hand diago nal, and three hitches in the left hand diagonal. This wil lead you to observe that in stepping from decimals into units the rate of progression is altered, and that it is not altered
in passing from units to tens, because we take in the teens between ten and twenty."

## Indian Manufactures.

According to the English papers, a great change is coming over India in the matter of manufactures. The old indigenous industries are in many places dying out, first through the competition of English looms, and latterly through the introduction of machinery into India itself. The delicate handed natives, however, conform to the altered circum stances, and show a great readiness and aptitude for me chanical work. In jute, cotton, and sugar factories they find employment by thousands; but the traditional excel lence of their work has not yet in all places succumbed to the invasion of steam, for in Orissa and in Patna the hand: loom still holds its own; and the muslin (the finest in the world, of which fabulous tales are related in connection

hard substance they are easily broken; further, it is fre quently necessary to color the ball afresh, as any deep pen etration of the color produced in the ivory would affect it quality, and give rise to more frequent fractures. The cen ter of gravity of the ebonite ball lies exactly in the middle s the material is perfectly homogeneous. The hardness of hese balls is such that they may be thrown with all one's orce against a granite plate without being injured, and they have also great elasticity, springing to a hight of 60 or 90 feet. The price of the balls (notwithstanding their supe rior qualities) is about one third less than that of the ivory balls."
It might be worth while to test balls of glass, hardened by the Bastie process, as substitutes for ivory.

## Oryolite and its Uses.

Cryolite was discovered toward the end of the last century in a bay in Arksut Fiord, West Greenland, where it constitutes a large bed or vein in the gneiss, of about 300 feet in length and 80 feet in thickness. The name is derived from two Greek words meaning "ice" and "stone," and is applied because of the fusibili ty of the mineral in the flame of a candle. It was supposed to bo sulphate of barytes until exam ined by Abildgaard, who found it to contain fluoric acid. Subse quently Klaproth detected soda in its composition. It was not, how ever, until 1850, when Jules Thom son discovered that the minera could be easily decomposed eithe by the dry or wet way with lim and the calcareous salts, that $i$ came into industrial use. In ap pearance cryolite is snow whit partially transparent, of vitreous luster and brittle texture. It hardness is 2.5 , specific gravity 3; and it cleaves in three direc tions, two of which are rectangu lar.

From cryolite, aluminum, alum, caustic soda, and glass of a pecu liar quality are obtained. Abou 6,000 tuns of the mineral are yearly brought to this country for soda manufacture. The glass is produced in Philadelphia unde the name of "hot cast porcelain," and, when made of pure cryolite is milky white in hue and slight ly transparent. Impure cryolite yields an opaque glass closely re sembling marble. The mixture for milky glass consists of oxide of zinc 1 part, cryolite 4 parts and sand 10 parts. This is melted in pipe clay pots, which are no attacked by the flun-silicic acid disengaged. The glass is ver hard, remarkably solid, and is not attacked by strong , acids isen when pulverized. These proper when pulverized. These proper-
ties are doubtless due to the preties are doubtless due to the preWith a small quantity of the miWith a small quantity of the mi-
neral, the glass is brilliant and re fracts light strongly; with a greater quantity it becomes opalescent and finally, on more cryolite be ing added, the glass turns opaque and closely resembles porcelain.

## A New Weapon of war.

According to the San Francis co Chronicle, another terrible in strument of war has been inven ted, by a resident of that city. The new gun, patented by Leonard and De Vry, and chris $\left\lvert\, \begin{aligned} & \text { The new gun, patented by Leonard and De Vry, and chris- } \\ & \text { tened " Peace Conservator," was exhibited at the Pacific }\end{aligned}\right.$ Iron Works. The prompt action of the instrument, deliver Iron Works. The prompt action of the instrument, deliver-
ing seventy shots in four seconds, and ten hundred and fifing seventy shots in four seconds, and ten hundred and fif-
ty shots in one minute, through a thick oak barricade, proves that it is one of the most terrible death-dealing in ventions ever known. The machinery is simple and easily worked, requiring but few attendants, who are perfectly protected from their adversaries' bullets; and it can be transported with much greater ease than an ordinary six-pounder The bullets from this terrible machine will, it is claimed, diverge 300 feet in 1,000 yards-the distance claimed at which it will effectually deliver shots-and the gun can be easily worked by one person in any direction, or made to shoot al most solid.

Hall's Journal of Health advises over.stout people not to seek to reduce flesh by drinking vinegar or smoking, but to maintain as perfect a digestion as possible and avoid fatmaking foods, such as starch in the shape of potatoes, flour bread,and rice. Spirits,malt liquors,and sweets are to be abjured. The gluten of wheat is the best food. It will sus tain life in full vigor, but it will not add an ounce of fat to the body.

HOUSE BUILDING.
Bricks, girders, various types of masonry, metallic laths, and chimney cowls, subjects all connected with house build ing, are illustrated in the accompanying engravings, which we select from Knight's "Mechanical Dictionary."* HOLLOW BRICKS
are made for purposes of warming, ventilating, and removFig. 1.


ing moisture from walls. In some cases the hollows form flues or shafts, either for ventilation or for the discharge of dust from upper stories; in others the orifices formair chambers, the imprisoned air being a very poor conductor of heat. At $a$, Fig. 1, is represented a 9 -inch wall of hollow brick Fig. 3.

finished with solid brick at the angle; $b$ shows a 14 -inch wall, a half ventilating brick being used alternately in the courses; $c$ shows the relation to each other of the ventilating spaces, so as to render the openings continuous. Figs. 2 and 3 represent the construction adopted in Prince Albert's model houses. It is stated that there is an advantage of 29 per cent in favor of the hollow bricks over the ordinary bricks, in addition to a considerable diminution in the cost of carriage and transport, and a saving of 25 per cent in mortar and labor. In Fig. 4, $a$ is a hollow brick for ceilings, hav-

Fig. 4.

ing lips which rest on the lower flanges of the girders. The bricks indicated by letters, $b$ to $k$, are external and internal, quoin, jamb, and splay bricks. Fig. 5 shows
metallic laths
for wooden or iron partitions which are very much in use for fireproof and partially fireproof buildings. $a$ has a cor rugated plate and transverse rods; behind the latter the plaster makes its lock. $b$ has plates with dovetail holes in which the plaster fastens. At $c$ are corrugated plates which catch upon hooks on the studding. The plates at $d$ have bent prongs; those at $e$ are inverted frustums; those at J have flanged corrugated edges. At $g$ there are sheets with projecting studs of frustral form; at $h$, iron slats, which are held by slotted iron plates driven into the studding. At $i$ is shown a form in which the edges of bent slips enter slots in the studding; at $j$, bent strips occupy depressions in the same ; $k$ has means for pinching the edges of the lath. The lower figure represents a portion of a structure in which the wooden joists and studding are so isolated from each other and protected externally that the wood cannot be readily fired by exposure to flame. $m m$ are the wooden joists, $n$ protecting bodies of concrete, and $t$ the corrugated lath. o is the wall plastering, which is spread upon similar metallic lathing on the studding, $r$

GIRDERS
are the principal beams of floors, spanning the distance from wall to wall, and affording a place of attachment for the
|binders, to which the floor and ceiling joists are applied. In $\mid$ by guys. The supporting columns were, by means of tackles, double framed floors the binding joists, $n$, Fig. 6, instead of attached to the crosspiece, hoisted into vertical position, and resting on the walls, rest on the girders, $m$. The bridging

## Fig. 5.


joists, 8 , rest on the binding joists, and the ceiling joists are secured beneath the girders. $a$ to $l$ are forms of wrought iron, and $m$ to $z$ forms of cast iron, girders. $b b$ is a compound I girder. $\quad a \boldsymbol{a}$ is rolled in one piece, and $c c$ is a com-

Fig. 6

pound beam built of several layers of plates riveted together and to angle irons. In Fig. 7, A represents a portion of Fig. 7.


Paxton's Girders(Crystal Palace, London, 1851
the framing of the London Crystal Palace, showing themeans adopted for getting it into position. This was effected by upright poles, $a$ a, connected by a crosspiece, $b$, and steadied
there bolted, after which the girders were raised and secured the cast iron girders. They were 23 feet 34 inches long and

Fig. 8.


Fig. 9


3 feet deep. Their great comparative strength enabled the columns to resist great lateral thrust, and imparted extreme stiffness to the structure. D is a form of wooden truss employed in the same building. Figs. 8 and 9 are arched gir ders for bridges.
An interesting series of illustrations of ancient and mo dern

## MABONRY

is given in Fig. 10. The Greeks and Romans used several methods for walling, as the opus incertum, A, Fig. 10; B, opus reticulatum, formed of square stones laid diagonally C, isodomon, in which the courses were of equal hight, D pseudisodomon, in which they were unequal; E, Greek e.m plectum; F, Roman emplectum, of coursed work on the out side, the interior being of rubble. In these the stones were small and laid in mortar. Where large stones were used, no mortar was employed. The Roman emplectum found in England has sometimes courses of tiles built in, as shown a G. H represents wide-jointed masonry, and I a combination f wide and close joints.
In a few of the earlier English buildings, considered by some to be Saxon, the quoins, the door and window jambs, and occasionally some other parts were formed of stones al

Fig. 11.

ternately laid flat and set up endwise; the latter were usual ly much longer than the others. This is termed long and short work, J. In the Norman period, herring-bone work, short work, J. was frequently employed in rubble walls. The stones
K used during the Middle Ages were seldom larger than could be lifted by two or three men. The various kinds of ma sonry employed in modern practice may be divided into three
not squared. Coursed work, $M$, in which the stones are squared more or less and set in courses. Ashlar, N, where each stone is squared and dressed to given dimensions. 0 is rubble with cut stone plinth, quoins, piers, and coping. $P$ is ashlar facing filled in with rubble. In $Q$ the stones are of equal thickness laid alternately header and stretcher. The length of each stone is double its width. $R$ is a kind of masonry met with in Italy, composed of alternate courses of headers and stretchers.

Fig. 11 represents various forms of

## Chimney cowls.

As shown at $a$, the flue has enveloping side passages which assist the draft by induction. Atl the spindle of the cowl is stepped in a socket, the collar revolving in flanges upon the upper side of the cap plate. $c$ is a cowl for a car roof; its mouth may be adjusted in either direction. $d$ has a cir

cular series of openings to encourage upward draft, a de flecting frustrum, and conical cap. $e$ is a cover for a marine stovepipe. The side wings are held open by the top shield. In $f$ the issuing current of air and smoke is deflected out ward by the cone, and, impinging on the obliquely set plates of the fan cap, causes the latter to revolve.

## CENTENNLAL NOTES.

I'he work of removing exhibits is still in progress, visitors are few, straw and packing boxes are everywhere, the screech of the locomotives and the noise of the cars have replaced the music of the chimes and of the band, the storms have beaten down vegetation and converted the neatly kept flower beds into puddles, the fall weather renders the buildings chilly and damp, and altogether there is an air of desolation and faded glory about the Centennial grounds, which, when contrasted with the magnificent scenes presented during September and October, leaves one with a well defined depression of spirit, and a tendency to
moralize over the mutability of human undertakings. moralize over the mutability of human undertakings.
There is, and probably will be, a dearth of news regarding There is, and probably will be, a dearth of news regarding the fature of the Centennial remains until after the sale of
the buildings, now close at hand. Then will follow the speedy elimination of State edifices, annexes, etc., and only those structures which are in some wise connected with the projected permanent exposition of art and industry will be left.
Our still well filled note books remind us that the end of the great fair came upon us almost unawares; for we have much that is interesting yet to describe. To those who have seen the Exposition, our notes will serve as useful reminders; to those who have not, the details of the good things exhibited are always of timely interest.

THE FRENCH WOODWOREING MACHINERY
was an admirable display, principally from the works of M. F. Arbey, of Paris. Three machines, which won awards from the judges, are novel in construction. One of these is a planer with helical knives and a permanent sharpening apparatus. The spiral cutters present many advantages over the straight lnives, always cutting equally and making the operation of cutting continuous. Very thin knife blades are used, so that but a short time is taken to sharpen them, and this is done with the utmost accuracy by an emery wheel, permanently attached to the machine, which has
only to be set and then allowed to run, when it does the only to be set and then allowed to run, when it does the
work automatically. A stave-cutting machine is exhibited, in which the revolving circular saw (which cuts the stave of any desired lateral curve and of any bevel) is brought up to the stave, instead of the stave being carried to the saw. It is constructed for the special purpose of economy in the use of wood. A lathe.for copying sword handles and other small articles of irregular shape is also an ingenious machine. A feeler follows the original, as in a carving machine or pantagraph, and reproduces it by the cutter, which is set in the same relative planes over the stock to be turned or carved. A lathe for turning the legs of tables, etc., also ex hibited, does excellent work, and cuts a spiral groove down
the body of the leg. All the exhibited machines are marked
by beauty of form and solidity, and, in ingenuity of combi ation, more nearly resemble American machinery (though different therefrom) than any others of foreign production.

## THE FRENCH MOTORA.

The Gramme electric machine was used for driving an lectric engine, which was exhibited pumping water, being onnected with a pump by belting. It has no connection with other machinery, except the copper wire leading to the generator of electricity. As in this double conversion o power into electricity and electricity into power, less power is obtained than is expended, the machine is apparently of no practical value, but is interesting as showing the relaons existing between power and electricity.
Mignon \& Ronart, Paris, exhibit a domestic motor, which is a steam engine with vertical tubular boiler of novel construction. Steam is generated by a gas flame, automaticall egulated according to the requirements of the engine.
Bischof's gas machine reminds one of the German gas machines, which attract considerable attention by their explosions of a misture of gas and air. The explosion drives up a piston, the descent of which by gravity furnishes the motive power, and prepares the way for a new explosion. Bischof's machine appears to be made on the same princi ple, and is of $1 \frac{1}{2}$ horse power. These machines are made from $\frac{1}{60}$ horse power to 100 horse power. They are said to be noiseless, an advantage which cannot be claimed for he German engines.

## - Ansther interesting French exhibit was the novel

## SOAP AND CANDLE MAKING MACHINERY.

The blocks of rough soap to be made into toilet soap are first cut into thin shavings in a planing machine, and th shavings are then ground with coloring matter, essential oils, and scents, until they form a homogeneous paste. The machine for grinding contains granite cylinders, which pass the paste automatically between them, and finally into the upper portion of the hopper, so that the services of only one attendant are required for several machines. After the paste has been ground, it passes to a machine called the peloteuse, or mixing mill, which stretches and draws it out and prepares it for being molded and stamped. The peloand prepares it for being molded and stamped. The pelo-
teuse does instantly what at one time required several weeks of scraping, washing, and drying. It is a mortar, in which the soap paste is packed until it is freed of air, and from which it is then forced by increase of pressure, passing through draw plates of any required cross section. A self acting cutter divides the stream of soap into blocks of any desired size or weight, just as cutters on brick machines di. vide the continuous streams of clay into bricks. The blocks of soap are then taken to a press, which shapes or molds the candle-making process, a double hot press, with iron cylinder and forty hollow plates, produces from 150 to 165 pounds of stearin in twenty minutes-the time necessary for pressure to be applied. A double horizontal cold press contains 175 loaves, and may be loaded, operated, and un loaded in an hour and a half.

## NOVEL SAFETY APPARATUS FOR BOILERS

consists first of a combination of safety valve and of a float, which, under certain conditions of pressure or water level acts upon the second part of the apparatus, which is a damper in the draft flue. When the limit of calculated pressure is reached, the clapper rises, the steam fills the apparatus, the whistle sounds, and the piston goes down, carrying with it the damper, which closes the flue. When the pres sure has fallen, a counterpoise re-opens the damper. When the water falls below a determined level, the float raises the valve, and the same results follow.
the french engineering exhibits offered abundant material for study. M. de Lesseps' proposed system of ascending Mont Blanc, by railway, was shown in a sectional drawing of the mountain side and the engi neering works. The cars under this system would be run for a short distance on a level, then raised by hydraulic pressure to a new level, and run a short distance to a new station, from which they would be again lifted, and so on, until, ascending the mountain by forty-nine such lifts, they reached the top. The plan, in other words, proposes the building of a series of platforms or steps, up which the cars should be lifted by hydraulic pressure. With the display of patterns of steel rails, used on French railways, are given the details of experiments upon iron rails, which showed that those of the best quality did not resist the wear and tear of a traffic of twenty million of tuns, while those of or dinary quality succumbed to a circulation of fourteen millions. With regard to steel rails, all the trials show that the flange wears in a uniform proportion of 0.039 inch of thickness for a traffic of twenty millions of tuns; and as they are constructed for a wear of 0.39 inch, it may be calculated that the duration of the steel rails will correspond to a traffic of at least two hundred millions of tuns, that is, that they will last ten times as long as the best rails in wrought iron. The weight of the rail, if of steel, can be reduced so as to bring the cost of steel rails to about that of wrought iron rails, and considerations like these have led to the general introduction of steel rails on the French railroads. Drawings of the elevating machines for the water supply of the canal from the Aisne to the Marne were also exhibited. This canal establishes water communication between the metal mines of Saint Dizier and the coal mines of the north of Belgium. It passes through a permeable stratum of white chalk formation, and there is no adequate supply of water at a convenient level. The water must, therefore, be raised
from the Marne by the aid of powerful machinery. Five from the Marne by the aid of powerful machinery. Five
turbines placed in a line, and about 30 feet apart, are used

The three central ones work vertical double action pumps, and one system is connected with another by coupling gear
joining the crank pins. The turbines at either end serve joining the crank pins. The turbines at either end serve
as a reinforcement, taking their share of the work only when the crank is put in gear with the adjacent system. The mechanical product in water raised, that is, the relation between the actual work done by the system and the gross power furnished by the fall, amounts to $0 \cdot 67$, and the cost of delivering 32,700 cubic feet of water at the summit level was calculated in 1871 at about 20 cents.

## the french art enamels

embody several wonderful copies of paintings by the ancient masters. The metals used to enamel on are gold, silver, and copper; and the enamels or vitrifiable paints, with which the metal is covered and decorated, are peculiar preparations of lass to which metallic oxides impart the required colors In general, three parts of lead and three parts of tin are ox jdized by continued heat and exposure to the air To the dized by mixed artz uartz or fint, and two parts of come salt. The whole s then melted in a crucible together, and produces white onamel and the basis of colored enamel, which latter is made by the addition to the white enamel of other metallic oxides. Yellow is produced by the addition of the oxide of lead; red by the oxides of gold and iron mixed together; green by the oxide of copper; blue by the oxide of iron; violet by the oxide of copper, and black by the combined oxides of copper, cobalt, and manganese. With his plate, or piece of gold or copper, prepared to receive the enamel, he workman sets about his work by breaking up and pulverizing his small cake of enamel. When this substance is thoroughly reduced to powder, it is made into a pasty form by the addition of water. The moistened mass is then laid smoothly on the metal with a spatula, and, when dried, is melted or fired under a muffe in a small furnace. This process is repeated if the enamel is desired of extra thickness; ess is repeated if the enamel is desired of extra thickness;
but for art purposes the first or surface enamel has seldom but for art purposes the first or surface enamel has seldom
more than two coats. With his white or black surface, as nore than two coats. With his white or black surface, as
the case may be, ready for his drawing or decoration, the artist transfers to it the outline and shading of his picture in chalk or charcoal. Guided by this, he adds enamel from time to time, with his spatula, to make the required sha ings and lines, by piling it up in some places and thinning down in others. When a certain figure or object is par tially completed, it is fired and then again covered with on mel, until it is completed to the satisfaction of the artist So with the whole picture, which undergoes sometimes as many as fifteen or twenty firings before it receives its last firing and polish.

## the fine lace made by machinery

was one of the most remarkable exhibits in the entire French Department. Hand made lace of almost cobweb texture is exceedingly expensive, and in the cases devoted to its dis play there was a large robe valued at $\$ 800$, a single hand kerchief at $\$ 200$, lace flowers at $\$ 400$ per yard, and so on through a superb collection. Yet all this exquisite material could be found in another case, perfectly imitated by machinery. There was a complete dress in point d'Alençon, in which the famous stitch peculiar to that lace was accurately produced. It would have required a skilled connoisseur to to detect the material from that made by hand labor, yet the latter would be worth probably $\$ 5,000$, while the price asked for the machine lace was but $\$ 250$.

## ASTRONOMICAL NOTES.

Obserfatory of Vabsar College.
The computations and some of the observations in the following notes are from students in the astronomical department. The times of risings and settings of planets are approximate, but sufficiently accurate to enable an ordinary

## ver to find the object mentioned. Positions of Planets for December, 1876 .

Mercury.
Mercury cannot be seen until late in the month. On Decomber 4, it is in what is called superior conjunction; its path is nearly that of the sun, and it is at the part of its or bit farthest from us. After the 27 th, Mercury may be seen in the southwest, just after sunset, a little north of the sun's place. Mercury sets on the 31 st at 5 h .43 m . P. M.

Venus.
The planets Venusand Mars keepnearly the same diurnal path in the early part of December. They can both be seen n the morning. Venus rises on the 1st at 4 A. M., and sets at 2 h .44 m . P. M. On the 31 st , Venus rises at 5 h .9 m . A.M., and sets at 2 h .33 m . P. M.
The rapid motion of Venus carries it east, and on the 31st of December it is about $20^{\circ}$ from Mars in that direction.

## Mars.

On December 1, Mars rises at 3h. 55m. A. M., and sets at h. 34 m . P. M. On the 31st, Mars rises at 3 h .38 m . A. M. and sets at 1 h .28 m . P. M
Mars can easily be found on the 1st, by its nearness to Venus, being a little west of that planet. The star Spica can be seen, on nearly the same parallel, still farther west. Jupiter.
Jupiter is very unfavorably situated. It rises at $\mathbf{7 h}$. $\mathbf{2 3 m}$. A. M. on the 1st, and sets at 4 h .36 m . P. M. On the 31 st , it rises at 5 h .57 m. A. M., and sets at 3 h .3 m . P. M. Its satellites cannot now be seen.

## Eaturn.

Saturn is the only planet which, through the whole month, can be seen in the evening. It is still moving very slowly among the small stars of Aquarius. On December

34 m ., and sets at 10h. 49m. P. M. It can easily be found, as soon as twilight is over, at an altitude of about $36^{\circ}$, when
it souths, and changes little in position during the month. it souths, and changes little in position during the month.
If the motions of Saturn are wa'ched for the whole month, If the motions of Saturn are wa ${ }^{+}$ched for the whole month,
it will be seen that it moves in an easterly direction, and toit will be seen that it moves in an easterly direction, and toward the zenith. On the 31st, Saturn rises at 10 h . 26 m . A. M., and sets at 9 h .2 m . P. M. A telescope of ordinary power will show the ring of Saturn, but it requires a good one in order to see its numerous satellites.

## Uranus.

Uranus is coming into better position for observation. It rises on the 1 st at 10 h .11 m. P. M., and sets at 11 h .54 m . the next morning. On the 31st, Uranus rises at 8 h . 11m. P.M. and sets at 9 h .54 m . the next morning. Uranus is a few de grees west of Regulus and farther north in declination
moves very slowly among the stars. toward the west.

## Noptan.

Neptune rises at 2 h .41 m . P. M. on the 1st, and sets at 3 h . 9 m . the next morning. On the 31 st Neptune rises at 0 h 42 m . A. M., and sets at 1h. 59 m . P. M

Sun Spots.
The report is from October 18 to November 18, inclusive The photograph of October 18 shows a small spot coming on. On October 19 two small spots appeared following this, and around the group facula were seen. From October 19 to October 30 photographing was interrupted by clouds. In the picture of this latter date, the disk appears to be free from spots. On November 18, when the next observation was made, a very small spot was seen on the eastern limb. The observations of November 16 and November 17 showed the small spot moving across the disk and a pair of large spots coming on. These large spots will, no doubt, be in sight until the 25th of November.
During the past month photographing and observations have been much interrupted by clouds.

The American Climate and the Voice.
Dr. Lenox-Browne, surgeon to Her Majesty's Italian Opera, in a paper recently read before the London Musical Association on " the Voice as a Musical Instrument," says that the notion that our American climate is destructive to fine voices is unfounded. People who never learned to sing
properly may complain; but the well trained vocalists do properly may complain; but the well trained vocalists do
not suffer. He also combats the idea that alcoholic stimulants or voice lozenges are beneficial to the singer. The lat ter are merely irritating, and the numerous pots of beer, which some celebrated operatic artists are reputed to indulge n, are useless to assist the voice. A glycerin lozenge, Mr. Sims Reeves states, is useful, and on very rare occasions a small quantity of claret and water may be necessary; but all alcoholic stimulants are detrimental.

Two New Explosive Compounds.
Lignose, invented by M. Falkenstein, is the name of a new blasting agent, and is made of woody fiber prepared the force of block blasting powder, but is very irregular in the force of block blasting powder, but is very irregular in
its action and is very sensitive to moisture. Pantopollet is its action and is very sensitive to moisture. Pantopollet is produced at a dynamite manufactory at Opladen, on the in. The blasting action is quite good, and the force equal to about three times that of ordinary blasting powder. It yielded, however, during the experiments a very unpleasart smoke and odor, and produced severe pains in the heads and chests of the workmen.

The rule of the British Bricklayers' Association, by which the bricklayer is made to do his work with one hand in his pocket, is perhaps as efficacious a means of degrading work as has yet been devised. But, if we had the ear of the lawvantage of a rule requiring that all bricklayers in good standing should have the left hand amputated. This would standing should have the left hand amputated. This would very little danger of mistake, between a unionist and a nonunionist. It would cheapen trousers by making the left hand pocket unnecessary, and so leave more money for beer and tobacco; and it would be the strongest possible guaranty against forgetfulness of the cardinal rule. It would not in terferewith anything the bricklayer might want to do, for one hand is enough to fill a pipe or lift a beer mug. The loss of convenience in dressing and undressing would be a small matter, for,since this has to be done at home, the bricklayer's wife could be made do it for him; and for disciplining a wife, one hand is probably almost as good as two, besides which the cherished privilege of kicking and stamping on her would be left unimpaired. Moreover, the sacrifice, or perhaps we should say the riddance, of the left hand would have the serious advantage of unfitting its owner for military service, while the resource of turning a hand organ would remain.-American Architect and Building Newos.

## Magnetism and Carbon

MM. Treves and Durassier have recently shown that the distribution of magnetism in a magnet is strongly influenced by the proportion of carbon in the steel. On comparing steels containing $1, \frac{1}{\frac{1}{2}}$, and $\frac{1}{2}$ per cent of carbon, it was noted
that, the less the percentage, the more uniform the distributhat, the less the percentage, the more uniform the distribu
tion. Carbonization tends to concentrate magnetism toward the poles.

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## 

## NEW AGRICOLTURAL INVENTIONS.

## IMPROVED PLOW

John R. Newton, Rusk, Tex.-By suitable construction, by re moving the scraper and the mold board, the plow can be used as a subsoiler. By removing the scraper, the plow can be used as a
turning plow for breaking up land, throwing up beds, etc. By returning plow for breaking up land, throwing up beds, etc. By re-
moving the mold board, the plow can be used as a scraper and culmoving the mold board, the plow can be used as a scraper and cul-
tivator. When all three parts are attached, the plow will scrape, tivator. When all three pa
cultivate, and hill the plants.

Improved rotary cultivator
Sevier Tadlock, Hope, Tex.-This is an improved machine for ening ditches to drain land and form fences, and to grade rail roads, etc. Upon the rim of a large wheel, apart, are attached
cross spades, and hinged right-angled spades, which form three sides of a series of rectangular boxes. A chute covers the open tops and sides of the boxes, and extends to below the wheel to cut the bottom and one side of the slice of soil while the spades cut
its other side, thus dividing it into cubical blocks. As the machine its other side, thus dividing it into cubical blocks. As the machine
is carried forward, the spades carry up the blocks of soil through is carried forward, the spades carry up the blocks of soil through
the chute and discharge them into the trough. A carrier screw is the chute and discharge them into the trough. A carrier screw is
operated by the advance of the machine, to move the soil deposited in the trough outward and drop it to the ground.

IMPROVED CULTIVATOR.
Garland A. Parsons, Dover, Ark.-This embodies a novel conor adjusting a cang cultivator to set the plows at various dis tances apart, for adapting them for different conditions of the plants, and other conditions.
mproved portable fence.
George F. Stevens, Schuyler, Neb.-The panels of this fence are to connected that the fence may be conveniently put up and saken down. The panels are secured by interlocking rods which enter the ground. Over the connecting portion
grooved blocks are fitted and detachably fastened.

IMPROVED PLOW
George W. Parish, Savannah, Ga.-The object of this inventio is to provide a plow separate and distinct from the beam, stock and handles, as an article of manufacture, which shall be so constructed as to be quickly, easily, and substantialy atlached to the ordinary scooter stock now in common use. To this end, the in
vention consists in constructing the plow with a plate extending from the moldboard to the landside at an angle corresponding to the inclination of the stock, and slotting the said plate with an opening into which the bolt ot the scooter stock passes, so as to engage with the plate and hold the plow securely to the stock.

IMPROVED RICE CULTIVATOR.
George W. Parish, Savannah, Ga.-The object of this invention is to provide a cultivator for rice, in the early stages of its growth which will not sod the rice, and which may be readily adjusted to the width of the rows. To this end, it consists mainly in the con struction of the cultivator teeth, and the combination of the same
with a pivoted metallic frame, consisting of four loosely pivoted bars, forming a variable parallelogram, which may be adjusted to bring the teeth closer together in oblique lines, or farther apart.

## NEW HOUSEHOLD INVENTIONS.

IMPROVED CARPET SWEEPER.
Samuel F. Leach, Chelsea, Mass.-This invention consists in mounting the brush cylinder on a self-adjusting spring-pressed noise and permit of its removal from the top of the case or box without emptying the dust receptacles.
improved folding chair.
John A. Ware, Morris, Ill.-This invention relates to certain imrangement of the back, scat, arms, and legs, whereby the chair may be adjusted for various positions in an easy and convenient manncr, or be folded up into a small compass and made mor readily portable. It also consists in the means for connecting the seat to the back so as to permit them to be upholstered and stil successfully folded.

MPBOVED CLOTHES DRYER.
Finley H. McMartin, Big Grove, Iowa.-This is a novel combinaion of jointed end pieces and horizontal rods, forming a clothes rack that may be spread for drying elothes, or folded closely togeliar construction, to be used in connection with the clothes rack, which forms a support for one of its ends.
improved washing machine.
Henry P. Lentz, Somerset, Ohio.-This invention relates to certain improvements in that class of washing machines called pounders, the same being adapted to pound the clothes in an open
tub with a vertically reciprocating movement for the purpose of cleansing the same by an agitation of the water produced by the impact of the plunger and the production of air currents. The improvement consists in the peculiar construction of the plunger,
whereby the clothes may be more readily and thoroughly cleaned, and the splashing of the water outside of the tub more effectually prevented.
mproved folding chair
ohn A. Ware, Morris, IIl.-This invention relates to certain imrovements in folding chairs designed to render the use of this stifness and rigidity to the same when disposed for use, while at the same time permitting the ready folding of the same into convenient dimensions for easy transportation. It consists mainly in constructing thearms with a limited toggle or knee joint adapted fold upwardly when the chair is folded, or lie straightened ou matically locks the back in proper position against its forward movement.

## NEW TEX'IILE MACHIERY.

IMPROVED SPOOLER.
Samuel F. Cobb, Alberton, Md.-This invention relates particucombination of the conse with traversing bars carrying the thread guides and working horizontally in slats formed in the sides of the arches or frames, in which the spool spindles are journaled. A spur gear is attached to, or formed on, one end of the cam cylinder and meshes with a pinion on the driving shaft. The pinion is elongated to allow the cam cylinder to be adjusted lengthwise, to compensate for wear of the cam slot and other friction surfaces. The machine can be so changed as to increase or decrease the rator to make as even and regular layers, when spooling number four yarn, as when spooling number fifteen-presenting, all the while the spool is being flled, a smooth even surface to the thread,
o that the spnol must be finished as commenced. In other spool ing machines, the traverse is generally wcrked without this proan uneven ridgy surface, and the difficulty increases as the spoo ncreases in size.

## NEW WOODWORKING AND HOUSE AFD CARRIAGE BUILDING INVENTIONS

## improved wagon brake

Josiah B. McAfee, Topeka, Kan.-This invention is an improve ment in tbat class of wagon brakes in which two levers are em ployed, the same having a common fulcrum and being so con nected by a dog or pawl that,when the levers are pressed together aid pawl is released from a curved ratchet bar. The improvemen lates to the construction and arrangement of parts, whereby th when the brake is thrown back out of action.

## NEW MECHANICAL AND ENGINEERING INVENTIONS.

## improved car brake.

David H. Levy, New York city, assignor to himself and Edwar W. Linzner, of same place.-This is an arrangement of clutches o renches attached the car axle, or to a ing to stop a car in case of emergency in the shortest possibl ing to
time.
improved car axle.
Ezra J. Bowen, Kent, O., assignor of one third his right to Orange E. Page, and one third to Thomas Egbert, of same place.-This is ogether with inlets and outlets for the air, whereby it is claime that much of the heat generated by friction in the shell will be arried off by a circulation of air

## MPROVED VELOCIPEDE

James Fishwick, Cincinnati, O.-This invention is designed to provide a simple, cheap, and substantial velocipede, more espec ally designed for the use of girls, but equally adapted for use by oys. It consists in an improved construction of the driving me ansm, IMPROVED DOUBLE-ACTING PUMP.
William B. Farrar, Greensborough, N.C.-This is a double-actin ump having but half the usual number of valves. It consists in wo cylinders of different diameters, opening into each other an ton fitting in the smaller cylinder, and a lower piston fitting in th larger one, and both connected by a pipe also provided with valve. The two pistons are operated simultaneously and togethe by the piston roa, so that upon the upward stroke the water above he smaller piston is lifted out at the spout, and water is drawn be the downward lither large piston into the larger cylinder, while upo upwardly through the tubular opening in to the upper cylinder, and by reason of the difference in the capacity of two cylinders is also forced out of the spout.

## NEW HISOELLANEOUS INVENTIONS.

improved facing hammer.
Edgar F. Lemoine, Emmerton, Va.-This invention relates to rtain mprovements It consists in the particular constructio and arrangement of the tool, in which the handle is constructed with a shoulder and a squared or rectangular stem screw, thread ed at its end, upon which squared portion cutting blades with cor responding perforations are held by double inclined plates whic are clamped between a screw nut upon the threaded end of th stem and the shoulder of the handle
improved beam scales.
George W. Grove, Linnville, $O$.-When the tare is to be weighed, , for instance, in retailing butter, the vessel is weighed first; which slides on an upper beam. is moved outward untilits inne end corresponds with the pointer of the link of the counterpois weight. The butter is then putin, and is balanced by adjusting the weight, and the net weight of the butter will be read from th bar opposite the pointer. If the gross weight is to be obtaine isst, the article and its package are weighed, and the sliding ba
moved inward until its outcr end corresponds with the pointer The article is then taken out of the package, the package is the weighed, and the net weight is read from the bar opposite the pointer, counting from the outer end or said bar. The bar wil count up any בumber of pounds by adding or subtracting the ex tra weights, as is done in common scales.

IMPROVED STIRRUP
Ransom Sabin, Shelby, Mich., assignor to himself and John Magee, same place.-This stirrup is made open at top and side, and provided with a bar and tongue, pivoted to the side flanges at the upper end to receive the supporting strap. This offers an easier rest to the foot, and prevent

IMPROVED POISON BOTTLE
James W. Bowles, Louisville, Ky.-This is an improved bottle fo storing and keeping poisons in such a manner that the peculia shape of the bottle serves as a warning against the careless use of
the contents; and the invention consists of a bottle made in the shape of a coffin resting on the head end as a base. Theneck is ap plied to the upper or foot end.

IMPROVED CARTRIDGE BOX.
Solomon T. Satterwhite, Nashville, Tenn.-This consists of a ircular case composed of two detachable parts, forming a centra and an annular compartment. In the annular compartment fit and revolves a frame divided into two transverse chambers, in each of which is contained a cartridge, While the central compart ded with an opening upon its periphery through which the car tridges drop, and ination als provied with a spring detent to deter in the outer case, and is slotted so as to permit the introduction of the finger to turn the ammunition frame.
improved device for teaching musical transposition. Thomas J. Allison;:Gladewater, Tex.-This corsists of a key ard with sliding instruments, which afford an easy and graphic IMPROVED EAR
Anthony Hessels, New York city.-It has become fashionable of late to wear the diamond and other studs or drops in the ears with out rings or other suspending parts that may be readily seen. In the ear hole and locked to the ear by a fastening spring ring applied to the shank at the rear side of the ear


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ent Ferrules. $\Delta$ didress B . M. Co , so. Newmarket, $\mathrm{N} . \mathrm{B}$. Water, Gas, and Steam Pipe, Wrought Iron,
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Telegraph and other electrces machines, have removed To Teog Water Street, New York.
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 Dim,

## 

C. B. P. will find a description of a connec-
tion for a olook, to ring a bell, ete., at an appoint

p.251, vol. 28.-T.D.D. L. WWill find the dimensions
of the sizes of wire on the British wire gage on p. 283, vol. 28.-J. B. B. will find an answer to hts query as to the weight of stone on p. 151, vol. 35 . -A.S. will find a recipe for aquarium cement on
p. 22 , vol. $28 .-\mathrm{J}$. B. will find directions for ma ring spongy platinum on p. 330, vol. 25.-J. H.can
 shoe dressing on p. 283, vol. S1.-G. H. D. Will Ann
a stain to mititate roseewood on p. 154, ,ol. 30 . This alpo answers P. McC.-W. N. H. Will find a recipe
for a liquid stove blacking on p. 219 , vol. 31. R . For a liquits stove blacking on p. 21,
will flnd directions for washing flannels and other
woolen goods on p. woolen goods on p. 287, vol. $30 .-$ H. D. O. will find directions for making an electric engine on p.
vol. $86 .-\mathrm{J}$. M. will flin directions for frosting glass on p. 2A4, vol. 30.-F. S., C. A. S., J. D. H.,
J. C., S. J., J. W. M., and others who ask us to recommend books on industrial and scientiffic sub-
jects, should address the bookselles jects, should address the booksellers who adver
tise in our columns, all of whom are trustworthy frms, for catalogues.
(1) E L Lasks: What is the best way of preparing sensitive albumen paper for printing,
oo that the paper will keep for at least $t w o$ months in the dark without turning yellow? A. After the paper has been sensitized, hang it up until the silver ceases to drop, then float it for one minute (with the back down) on a mixture of 1 oz. hydrochloric actd in 40 ozs. water. Dry thorough-
ly, and keep in a cool, dry place. , and keep in a cool, dry place.
(2) C. H. W. H. says: I wish to fuse some tin with copper for à patént artcle. How can 1 do it? A. Fuse the copper frrst, aHow to cool un-
til it Just beging to soldify, throw a handful of sal ammoniac on the surface of the fused metal and immediately stir in the fragments of tin with a stick of wood. Heatagain and run the alloy immediately into the mola. It is always ne-
cessary to add something more than the percentcessary to add something more than the percent-
age of tin required in the allog, as some of the age of tin required in the alloy, as some of the tin is unavolaably lost by oxiaation while in con with a plice of wood and remove the scum of ox ides from the surface before pouring out the metal.
(3) P. \& E. R. R. asks: What is the cause ar a tra friction on the parts, due to the bending of them, which thcreases the power necessary to nove the eugine and load.
(4) J. D. P. says: In soldering some work made of steel and iron wire. we find marks of rust with that will not rust the wirce A. No. Clean-
A. ing the rust off afterwards is the only method.
(5) J.T.W. asks:1. Please give me a recipe for paste, such as is used by paper box makers.
A. Box maker's paste is simply flour paste con A. Box maker's paste is simply flour paste con-
taining a little alum to prevent molding. 2. Please taining a ititle alum to prevent molding. 2. Please
tell me what cement can be used cold by paper box makers. that will remain in solution, and that will stick as well as when hot
strong solution of dextrin in water
(6) E. H. R. says: I have a troy weight scale for weighing vinegar, but it requires too
much time. Please give me a simple and correct A. The strength of vinegar is ordinarily dete mined by means of what is called the acetomete an instrument closely resembling the common hydrometer. If the specifo gravity of the vine gar be determined by means of an hydrometer,
and the volume of the liquid determined by cubical measurement, a simple proportion of these and the standard weight of a gallon of pure waabsolute weight of any quantity of vinegar. You can weigh vinegar in any good balance by weigh-
ing the vessel containing the vinegar and then deing the vessel containing the vinegar and then de-
ducting the weight of the vessel: or frest counter ducting the weight of the vessel: or Arst counter
poise the vessel and then weigh direculy. In the troy and apothecary weights there are 480 grains in 1 oz: in the avorrdupois scale the ounce con-
the tains 437.5 grains. In the decimal or Frence
the gramme is equivalent to $15 \cdot 434$ grains.
(7) C. B. L. asks: Why is it, that in maa A. The dead center is made as hard as is consistent with strength. The runing center is made
soft enough to turn up. To distinguish, mark them.
(8) L. B. S. asks: Can I purify air by
forcing it through a moistened sponge? Can you forcing it through a moistened sponge? Can you
give me a convenient and inexpensive process give me a convenient and inexpensive process
for removing impurities from stagnant air, pregnunt with human breath and tobacco smoke, be-
fore paesing it through a small tube? the air through the sponge seated in a small ressel of water, and then through a large pipe filled with coarsely pulverized boneblack or charcoal
(well burnt) and caustic lime. This, we think,
( ${ }^{\text {and }}$. (well burnt) and caustic lime
will thoroughly purify the air.
(9) A. G. asks: How can I tell good steel? . By the closeness of the grain, evenness of acture, and dulness of color at fracture
(10) R. B. F. asks: 1. What is the effect of a cement composed of glycerin and litharge,
applied on the inside of steam boilers for stopapplied on the inside of steam botlers for stop-
ping leaky seams and rivets ? A. The cement you ping leaky seams and rivets? A. The cement you
mention is a very good booller cement, having no
2 , How is the properties deleterious to the iron. 2. How to thick paste. It should be allowed to stand till dry, the time depending on the temperature of the atmosphere.
(11) D. C. M. asks: How can I blacken, either with paint or varulsh, a buck eolor has worn
ment of which nearla tilthe black
ofr? A. Use genuine asphalt (free from coal tar)
and spirts of wine. Give it several coattings of and dry each time in a moderately the solv ovent The varnish should, after the addition of the al cohol,
using.
(12) W. H. G. asks: What can I use for coating a wheel with emery or sand, that wil atmosphere? A. Try glycerin and white lead a glue
(13) W. J. H. asks: : Do you advise a coun
cerbalance for a piston and connecting rod of the steam engine? A. No.
(14) J. T. H. asks: 1. What are the propor losion coal gas and air required to cause an ex of coal ghan. 2. What is the expansive force, and
it What are the products of the combustion? $A$ The explosive force of this mixture is very vio lent, but it depends much upon the conditions
under which it takes place; the greater the press ure under which the mixture is ignited, the great er will be the effects of the explosion. If the mixture be in the proper proportions, the pro ducts will be only nitrogen, carbonic acid, and
water. If pure oxygen be used, the explosive water. If pure oxygen be used, the explosive
foree is much enhanced. In this case the proporton of the gazes should be as one to one, and pro 3. Will a red hot wire ignite the compound in tantly? A. It is necessary to raise the tempera turc of the wire to nearly white heat; the wir
(15) A. A. F. asks: Please give me a cipe for cement or glue for end wood, to wor
without sizing. will white lead and glue to without sizing. Will white lead and glue to
gether answer the purpose? A. Yes. (16) T. A. R. says: I have an upright tubu ar boilier; it is calied an 8 horse, and I havean
upright enginc called a $\theta$ horse. The engine will apright enginc called a 6 horse. The engine wil do our work, but seems to bave just enough to
do; for when we throw our heavy machine on, it checks her for a moment or two. We propose do so a arger engine of same make. Can we do so and get satisfactory results? A. If your
bolier gives you a surplus of steam for your present engine with easy firing, you may try a larger
(17) J. H. P. asks: What will harden plas aron Paris and make
(18) C. E. S. asks: Can you give me a recipe for a bright red paste for marking articles elatin and striking the color with vermilion.
(19) E W. C. says: I have a window gar den, a large box flued with chip dirt, and full o lowers, which it will be impossible to empty an to change the earth from without injury to the
Iowers. Will angle worms injure the plant will carbolic acid destroy the worms? A. They would be benefficial, so far as improving the ground for cultivation was concerned. Carbolic acid would injure the plants. A small amount of
Paris green mixed into the ground would be bet-
(20)
(20) W A. E. asks: Please inform me of ome coloring flutd that would change the color of cigars from light to dark, if put on after they
are made, without injury to the smoker. A Try coloring the outside wrapping with a suitable vegetable dse, but be sure that your dyestuff has not been made with poisonous ingredients.
(21) C. H. W. asks: Is there anything that will remove scratches from heavy plate glass? Ites. A. if the scratches with a blocs or iron py the surface with another block of plate glass using at first fine emery and oil, and finishing
with rouge to restore luster.
(22) H N. S. says: E. H. L. asks if some an organist. In listening to ot I was plasermer formances across a large hall, I frequently no ticed that the high tones came to my ear sooner than the low tones. I was alwaysin doubt whether the manipulation preceded the pedipulation of the keys, and thus caused the want or unity, or Whether the high sounds came faster than the low ones or not. Which was it, probably? A. M.
Biot found, in his experimentson the conductivity of sound in tubes, that, when a well knownair was played on a flute at one end of a tube 1,040 feet long, it was heard at the other end without actity of different sounds is the same. For the
ore then the same reason the tune played by a band is heard intensity, which could not be the case if some sounds traveled more rapidly than others. This cannot, however, be admitted as universally true Earnshaw, by a profound mathematical investigation of the laws of the propagation of sound has found that the velocity of the sound depends upon its strengtb, and accordingly that a violent sound ought to be propagated with greater velo-
city than a gentler one. This conclusion is confrmed by an observation made by Captain Parry on his arctic expedition. During artillery practice it was found, by persons stationed at considerable distances from the guns, that the report of the cannon was beard before the command to fire Siven by the oflcer. And more recentil the experiments of Maliet and those undertaken at the
explosion at Hell Gate go to prove the assumptions of Earnshaw.
(23) F. A W. asks: Have quicksilver and chloride of silver any affinty for each other
A. No. The chloride of silver ed, melts and is converted into horn silver, except when reducing gases or carbonaceous mat--
ters are present, in which case it is converted ters are present, in which case it is converted
into the metal.
(24) D. R. W. asks: What should be put Into water which leaves an alkali coating on
the flower pots and earth, to counteract its effect? . Send some of the alkaline coating. The bes emedy would depend upon its chemical nature
(25) R. G. asks: Why does smoke ascend at one time and descend at another? A. Smok ascent of the heated air, which, on reaching certain elevation and becoming chilled by radiation and contact with currents of colder air, Hon of the heavier carbon. If the air is damp nd cola and the barometric pressure has consic erably decreased, the loss of heat is more rapia and as the barometric pressure is less than usual,
the particles of carbon are practically heavier than parties of carbon are practically heavie uicker
(26) W. Z. B. asks: What, if any, delete rious effects would result from using galvanized
iron, for evaporating pans in the process of boill Ing cider for jellies and other domestic purposes A. Zinc and zinc oxides are soluble in certain vegetable acids, like acetic, and would in solution (
(27) S. D. P. asks: What waterproof solu Ho or liquid is cheap, tasteless, and inodorous, frult, berry, and grape straw board baskets water proof? A. Try gelatin made insoluble by bichro te of potash
(28) G. H. G. says:I have htard airs played upon goblets which were partially filled with wa er, for the purpose, as I was informed, of regu
lating the different tones. What is on the little thicks which are drawn on the edges of the goblis to produce these sounds? A. We have nin of a resinous nature, sufficient to produce a
olight degre of equable friction, would answer slight degree
the purpose.
(29) L. M. H. asks: Please give me a good h
(30) Y. W. W. says: Please explain the whemical action thatzinc hasupon hard limestone to preventincrustation, and if it will have any efect on the boiler iron at the seams? A. Th acia, such as sulphuric, if present in solution, walt of zinc. This would not only diminish the amount of acld which would bo left free to form insoluble compounds with the bases present, but the zinc would be oxidized and destroyed, instea of the other metal. Possibly, as has been claimed by some,the electro-chemical action and current asist in the prevention and zinc would likewise down on the tron which would be the electro ositive element in the circuit
(31) W. M. eays: I have just completed a cistern; but during my absence a quantity of
lime was mixed with the cement in plastering the Ime was mixed with the cement in plastering the
inside, so that the water is now thoroughly impregnated with lime,and we cannot use it for any purpose. Is there any remedy besides emptying It all out? Could I neatralize the lime and ue water, and see bow much a solution of alum of a certair strength will, on mixing and allowing to tand, precipitate out the lime. This will give ful, and if after treatment with alum the water is not injured.
(32) C. W. C. asks: Can a hot white metal较 cid and zinc ? A. No. Use a suitable solder. See . 251, vol. 2
(33) W. B. eays: Pitch or josin, with gutta percha, half and half, can be made to stick tin
foil or foil paper on to tin. It is diffleult and exoil or foil paper on to tin. It is diffleult and exensive to use. Ts there any cheap material you
know of A. Try rectifled petroleum or coal tar il. Ether and caoutchouc would be more ex-
pensive.
(34) S. M. asks: What is the ordinary com position of the safety match, and what the commatch contains chlorate of potash and wax (paraffin) and the material on the box is red (amor (35) phosphorus and gum.
(35) $\Lambda$. J. H. asks: How can I make a solution of alkaline silicates, and of alumina, as de-
scribed on p. 88 , vol. 34 . under heading of " $\boldsymbol{A}$ New Mode of Hardening Sandstone ?" A. AlkaThe alumina or aluminate of soda is composed of alumina and soda, the commercial salt containing 48 parts of the former, 44 parts of the latter, together with 8 parts of chloride of sodium and
(36) G. H A. asks: 1 . What is carbolic acid? A. Carboilic actd is a body produced in the dry distilation of coal, and, in other ways, 1 rorm-
ing the chief constituent of coal tar oil. When pure it forms long colorless needles which melt at penetrating smell, resembing creosote, which body indeed largely consists of carbolic acid, and has a burning taste. 2. Has it any preservative propertles? A Yes, it is a powerful preservative More especially meat and all kind of of esrve? A. More especially meat and ali kinds or animal sub-
stances liable to decay, putrefaction, or ferment ation. 4. How is it used ? A. It is largely used in the form of carbolate of lime: or in small quantittes, or diluted, alone.
(37) G. W. R. asks: How can I separate the olein from the stearin of tallow? A. By
treating with sulphuric acid. It is performed in
large wooden tubs lined with lead, and heated by steam discharged into them by a perforated pipe. The agitation is kept up for 15 to 30 minutes, and, after reposing for a similar length of time, the
water is drawn off by a pipe at the bottom. The water is drawn off by a pipe at the bottom. The sel heated by means of a steam jacket, and the water is driven off by evaporation. The fat is then ready to be treated with strong sulphuric acid, which is done in a boiler of copper fnrnished with a steam jacket. In case the tallow is pure the preliminary treatment may be omitted. About 10 to 13 lbs. of
(38) K. J. C. asks: How can I take the smell with from coal oll? A. By careful treatmen without suitable apparatus; and well pret do it without suitable apparatus, and well prepared What is natural to it, and which it must have so
(39) W. B. W. asks: How can I electrotype natural flowers? A. First, dry the flower or lea as far as may be without causing it to shrivel, an hen dip it immediately into a dilute solution pure shellacin alo, and repeat the allow in ary in a war til a uniform covering of the resin is obtained, then allow to stand for several hours until per fectly dry. This treatment will render the lea and stem nearly waterproof and rigid. Carefull dip the flower or leaf into the gum water, so as to moisten every part, expose for a moment to the dust overit veryfinely ground black lead (pure graphite); be careful to cover every part, and remove any superfluity, as far as possible, with a fine camel's hair pencil. Make a sat urated solution of neutral sulphate of copper in pure water, and suspend in this a plate of clean copper connected with the wire from the coppe with the finest copper wire, so as to have perfect eect, by means of this wire, with the wire from the zinc plate of the battery: then immerse the flower in the electrolyte, and join it so as to re-
move any bubbles of air that may adhere to its surfaces, but avoid shakingit so as to ruptiare th thin fllm of shellac. Thecurrent for the first fev moments should be quite strong (from two rent from one small cell is all that is requisite The battery should be a constant one, such as is the deposition should be allowed to proceed un disturbed for about 24 hours, or for 48 hours is necessary. We have tried this method and obome patience and practice to obtain uniformly ood results. The nitrate of silver method of lectrotyping gives very accurate results, bu collodion, which will protect them from injury by the silver solution. We do not know of any conductive pigment or metallic salt that can be
substituted for graphite or silver, as in the above substitut
(10) P. E. S. says, in reply to E. H. H., who asked what is the cause of difrerence in the travel arget, and then a rock only " feet behind it: Sound sconveyed by vibrations of the atmosphere; the canvas being a thin body, the vibrations are put n motion immediately after the bullet strike The rock, being a heavier and moreinert body akes some littie time in accumulating the blo of the bullet, and does not communicate its $v$ difference in the time of the sound. The sam phenomenon is noticed on a clear morning by carpenter driving a nail in a board; the sound meers on the small head of the nail, and the other me the end of the nail on the larger plank.

Mnerrals, etc.-Specimens have been recoived from the following correspondents,and oxamined, with the results stated:
E. C. C.-It is a piece of hornblende.-B. B. H.-arsenic.-E C. R.-It is basalt, sandstone, and ar gillaceous rock, containing iron pyrites (sulphide of iron).-V.-It contains no platinum whatso -It is iron pyrites, of no market value.-J. R. $\mathbf{z}$. ing a little oxide of A. E. - I C sand contain
 Y. -No. 1 is iron pyrites. No. 2 is filint.-T. L.-It is a very compact variety of bituminous coal. C. J. C.-The specimens sent are oxide of iron containing a small amount of oxide of titanium -G. L.-The specimens sent are certainly very soft and pliable.- $\Delta$. M.-It is galena (sulphide of or vegetable delris vielding a of mineral ash.-Will H. J. M., of Rochester, Pa., olease send full name and larger specimen for examination? The piece sent on October 28 was帾 sumclent for satisfactory analysis.
C. E. asks: How can I change 14 carat yel ow gold into 12 carat red gold ?-A. J. A. says A friend of mine tried preserving natural iower fow day, when turned aute dark and colorless. Can you tell the cause? How are neral

## COMMUNICATIONS RECEIVED

The Editor of the Solientific Amgrioas ao original papers and contributionsupon theceipt of ing subjects
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