

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

## THE BRAYTON READY MOTOR OR HYDROCARBON ENGINE.

Our engraving represents the Brayton hydrocarbon engine described by us not long ago as being in successful operation in this city. The distinguishing features of this engine are chat it can be started in a very short time, that it is economical in its consumption of fuel, and that, owing to the constant maintenance of combustion, it is claimed, the danger of explosion of the hydrocarbon vapor is so greatly reduced as to be practically obviated.
The consumption of the crude petroleum used in this engine is stated to be five gallons per day for a five horse machine, the duty performed by a five horse engine in use being the grinding malt per day of ten malt per day of ten
hours. The ease hours. The ease with which the motor may be handled will be $\varepsilon$ ppreciated when we state that those run for our inspection were started, without any previous preparation, in one minute, the proprietors starting the en gine themselves, not having an engineer in their emplog. Another important fea. ture of the motor is thatthe consumption of fuei ceases the instant the engine is stopped,thesioppage being effected by simply shutting off the supply of air.
In our evgraving, $\Delta$ is the working cylinder of the engine, which is jacketed by a water cylinder. B is an air pumpactuated by the working cylinder, and em. ployed to compress ployed to compress air into the two reservoirs, C C, constituting the base of the frame. D is a pump which supplies the petroleum or other suitable fuel, as fast as it is needed for combustion. The action of the engine may be thus brietly stated: The oil pump feeds a few drops of liquid fuel through a small tube into an annuler chamber containing felt; here containing felt; here the petroleum encounters a supply of compressed air by which it is vaporized
it:u mingled air and vapor are forced in proper proportion in$o$ the working cylinder, where the combustion takes place ommunication with the annular chamber being cut off and the products of combustion being left to work expansively, driving the working piston downwards or towards the end of the stroke ; the compressed air supply to the working cylinder is cut off, thus extinguishing the combustion therein ; the opening of the exhaust valve permits egress to the products of combustion, and the stroke is completed. An independent jet of hydrocarbon, burning continuously in a suitably provided chamber, lights the hydrocarbon in the working cy linder at the commencement of each stroke. The supplies of air and oil are, by very simple means, adjustable thus giving to the engines all the advantages of a variable cut oft, and thus effecting an important saving in fuel when the engine is not required to work up to its full capacity. Ordinarily but one of the reservoirs, C C, is employed, the othor being kept charged in order to allow of the immediate starting of the engine at any desired time.

The engine is substantially built, the crank and the beam, and the central shaft upon which it works, being made of cast steel. The working or air piston may be removed, when
necessary for repairs, by simply disconnecting the connect ing rod from the working beam; and by the removal of the bearing caps, the crank and the beam may be removed, leaving the engine stripped of its main parts, and giving access to any part which may need repair or renewal. The bearing and working surfaces are large in proportion to the amount of duty required of them, thus making the engine substantial and not subject to undue wear.
This motor is the invention of Mr. George B. Brayton, who has spent many years in its development and practical appli. cation. Sizes of three, five, and ten horse power are now built, and motors suitable for steam yachts and other special
ment is used with it again for a fresh observation. But a number of fresh neutral bars are kept always on hand to be mployed in succession
This instrument is very sensitive. A very slight spark rom an artificial electrical machine, or even from an electrophorus, suffices to give magnetism to the core, and to cause deflection on the traversing magnet. Its cost does not exceed $\$ 2$, and Professor Melsens is very sanguine that it will prove a useful instrument for an extended investigation of the changes and intensities of atmospheric electrici-
ty. The instrument is now used in the telegraphic offices of the Belgian lines, and formal official returns are made of in continuation with the earth wires, which are provided for the protection of for the protection of the instruments in the telegraph of fices. Professor Mel sens states that the magnetic needles in the offices fur nished with the apparatus are deflected briskly by a lightning discharge, and that they are not infrequently recallea to zero, either briskly or gradually, by a subsequent dis charge. Occasionally the deflection is re versed by the second'discharge. Professer Melsens finds that ordinary com. mercial iron wire serves generally for the construction of the iron bars for the core. He has more difficulty in procur ing iron that can be satisfactorily made satisfactorily made in finding iron that in finding iron tha gives ready indications of the disturbance. He desires very much that this sim pleand cheap instru ment should have an extended trial among telegraphists as a convenient means for investiga ting the movement. conditions, and rate of progress of atmospheric disturbances The instrument which was lately shown at the Meteo rological Society,wil De included in the loan exhibition of
scientificinstru ments

## THE BRAY'TON HYDROCARBON ENOINE

 will be on exhibition at the Centennial Exposition. For in- about to be opened at South Kensington, London, England. formation, address the Pennsylvania Ready Motor Company, 132 North 3d street, Philadelphia, Pa.
## New Electrical lnstrument.

This instrument is termed Marianani's rhé electromètre, and is intenced for the investigation of electrical discharges between the atmosphere and earth. It consists essentially a coil of copper wire turned round a pasteboard tube, and carrying a traversing magnetic needle mounted upon a vertical pivot immediately above the coil. The apparatus is so placed that the magnetic needle is ranged north and south by the earth's magnetism, and that the coil then crosses its rial line at right angles. A small iron bar is inserted as a core within the axis of the coil. Whenever a spark of elec trical discharge of high tension passes through the coil, the internal iron bar becomes a magnet, and deflects the magnet ic needle traversing above, the deflection of its north poin being to the east or to the west, accordingly as the spark passes in one or the other direction through the coil. When the iron bar has been thus magnetized by a spark, it has to be deprived of its magnetism by heating before the instra
$\frac{\text { A Bi-Centennial Relic. }}{\text { Professor Edward J Young, of Hurvard College, recently de }}$ Professor Edward J Young, of Harvard College, recently de incidents of much interest pertaining to the town, and parti cularly to King Philip's war and the battle fought at Green Hill. He referred to some relics in that town, one of which was described as follows: "Thedwelling now owned by the venerable Mr. Willard Walker, which was built by his great-grandfather 200 years ago, and which has been in the possession of the family ever since, is almost entirely unchanged. There is one beam in this house measuring 12 by 14 inches. The building is covered on all sides with 4 inch plank or pitch pine, which is set up end wise and reaches to the roof, and is held on the inside by wooden pins. It is thus made bulletproof. The chimney, likewise, is immense and has several enormous flues, while the fireplace was large onough to contain logs that were eight feet long. The win dows were originally of diamond-shaped glass set in lead but these have been removed. It is a relic which ough never to be destroyed. No money ought to be able to buy it."

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MUNN \& CO., Editors and Proprietors. published weexir at
NO. BT PARK ROW, NEW YORK.
O. D. MONA. A. B. BEACB.

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VOLUME XXXIV., No. 20.[New Skrirs.] Thirty-first Year
NEW YORE, SATURDAY, MAY 13, 1876.

the scientific american supplement.
No. 20.
For the Week ending Mav 13. $1 \times 76$. TABLE OF CONTENTS.


On February 12, 1873, Congress passed an act by which the gold dollar was made the unit of value, the trade dollar of silver, weighing 420 grains, established, and silver money rendered no longer a legal tender for sums exceeding five dollars. The effect of this measure is, it is claimed, practically to demonetize silver, and a bill to amend it, by making silver a legal tender up to sums of $\$ 20$, is now before tor Jones, of Nevada, who represents one of the greatest sil ver-producing districts in the world, and who has recently made an able speech in behalf of a silver currency. From a review of the mutations and quantities of the precious review of from the earliest times to the present, it appears that any diminution of the stock of specie, whether resulting from failure of mines or from arbitrary legislation, is fraught with the greatest disasters that can befal society. England, said the Senator, by making gold the only standard of value, in 1816 was brought to serious financial straits, only relieved by the discovery of gold in California, and this, despite the fact that gold was a peculiarly British product. By existing laws, he United States is committed to resumption in specie combined with a demonetization of silver, and Senator Jones believes this to be an impossibility, and that one or the othe course must be abandoned. As no one, save those committed to the inflation heresy, will dispute the necessity of early resumption of specie payments, it follows that silver must be brought to the level of gold; and it is in support of this view that the Senator addresses a valuable array of facts and figures, some of the more striking of which we quote below able fact that the relative values of gold and silver, $15 \frac{1}{3} \mathrm{lbs}$. of silver being equivalent to 1 lb . of gold, have scarcely va ried, and it is probable that similar stability will be maintained in the future. The reason is that the nature and qualities of the two metals are so nearly alike that any improvement applicable to the axtraction or recovery of the one $m$ ust be applicable to the other ; and further, their geological didstribution is such that in many of the largest deposits they liein the same matrix. At the present time, the world's store of specie is one half silver; the estimated figures in 1872 were Gold, to the value of $\$ 5,800,000,000$, and silver, $\$ 5,600,000$, 000. As a matter of curiosity, we have calculated, roughly the volum each dimension, and the silver, one of 177 feet. A medium sized room, therefore, would hold all the gold in the world The gold supply is, however, diminishing; the river beds of California and Australia, the Senator says, "have been washed, the surface gold has been secured, the water line has been worked, and below it are only those sulphurets
which as yet have not been successfully treated." The annual production in gold in 1801 aggregated $\$ 13,000,000$ a year, in $1829 \$ 5,000,000$, in $1852 \$ 182,000,000$, in 1875 $\$ 97,500,000$. This shows, not only a falling off, but great fiuctuation in production; and, moreover, in 1875 British the United States so that gold is now a British product. The present gold product is insufficient to meet the demands of the world for that metal in use in the arts, and to keep good the loss and wear of coin. On the other hand, in marked contrast to the above, the annual supplies of silver, essen tially an American product, have always been steady and are now but little above the average. In 1805 the average of
coin per capita, throughout the world, was $\$ 283$; in 1862 it coin per capita, throughout the world, was $\$ 28$; in 1862 it
was $\$ 4.75$. Between these periods both the production and the per capita rate of coin have doubled; and this swelling of the measure of value lies in the increase of gold and not of silver. The production of the latter metal at the beginning of the century was $\$ 35,000,000$; in 1875 it had reached but $\$ 72,000,000$.
Senator Jones points out that it is the stock of precious metals in the possession of the world that measures prices the latter would be to reduce all prices one half, and con vulse every country in the world except those which may refuse to take part in such demonetization. Further more, heinsists that we never can resume specie payments by gold alone. By continuing to excludesilver from equal participa tion with gold in the United States currency, and attempting to resume specie payments, we occasion a demand, say of
$350,000,000$, to pay off the greenbacks and furnish bank reserves and $\$ 50,000,000$ of silver in lien of fractional notes. The quantity of precious metal needed to maintain prices at their present level in the occidental world is $\$ 4,000,000,000$ and of this, if the United States succeeds in resuming specie payments, it must hold $\$ 350,000,000$ in gold. It is impossible for the country to obtain this by 1879, with the present production of gold only at $\$ 97,500,000$; more than half of this yearly yield is needed in the maintenance of morey, to pay for the abrasion and loss Deduct these sums, and there is a surplus of $\$ 10,000,000$ a year, whence to obtain our $\$ 350,000,000$, so that at leas thirty-five years will be needed to amass the amount. Bu the increase of population will make an increased demand for gold exchanges and use in the arts, equal to at least $\$ 6,000,000$ annually ; and the annual gold product is, besides, diminishing. When these elements of the circulation are all moderately provided for, there will remain perhaps $\$ 500,000$ a year surplus, and we shall be 700 years getting our $\$ 350,000,000$.
With these difflculties, the Senator contrasts the ease with which specie payments could be resumed on the basis of the donble standard of gold and silver. The total coin in the world is $\$ 5,700,000,000$, and the annual supply of both motal
to draw upon is $\$ 170,000,000$. Instead of having to draw upon the occident alon, whould draw apon the whole world. Three hundred and fifty millions in gold forms one seventh of the entire stock of that metal; the same sum in both metals is less than one sirteenth. If a draft of one seventh would occasion a fall in prices of 15 per cent, a draft of less than one sisteenth would occasion a decline of less than 6 per cent; and while 15 per cent during two and a half years-equal to 6 per cent per annum-would sweep away all and more than all the profits of industry, which on the whole do not net more than 3 or 4 per cent, 6 per cent in two and a half years-equal to $2 \frac{2}{5}$ per cent per annum-would enable us to get back to a sound measure of values without the loss of more than a very small portion of our industrial profits.

## LA GRANDE CHARTREUSE.

Although modern society has generally concluded that the usefulness of the monastic life has long since passed away, there are many precious legacies in art and literature, which born and nurtured in the cloisters of the middle ages, have descended to these times. When the outer world was given over to rapine, and the favorite amusement of men of wealth and high birth was highway robbery, it was surely a good thing that men desirous of cultivating the arts and sciences, and of keeping alight the sacred flame of literature, should find retreats which the wildest marauder respected, and which, moreover, were centers whence many streams of charity and benevolence took their course.
The ancient order of Carthusian monks was celebrated through many centuries. St. Bruno and six of his disciples repaired, about the year 1080, to the beautiful country watered by the Rhône and the Isère, in the southeast of France, and here founded the monastery called La Grande Chartreuse which is to this day the headquarters of the order. Another mportant organization occupied the site of the Charterhouse schools and asylum in London, the name of which is obvious y derived from the monastery. The worthy ecclesiastics are now, however, appearing by their attorneys in our courts to defend their right to a trademark affixed to the bottles of a cordial of great delicacy called "chartreuse," for the manu facture of which the monks are justly celebrated. Some base imitators in this city, it appears, have adopted the trademark, and, by foisting a home-made article on the mar ket, have brought discredit upon the old Carthusians. But Judge Shipman, after hearing argument in the case, at once directed an injunction to issue, and the bogus traffic will now be stopped.
It seems singular that so ancient and venerable a body should appear in the forefront of our modern civilization laiming its rights like any manufacturer or inventor of our day. Much of the art, learning, and literature, so carefully nursed by the monks of bygone days, has passed away, and their acience has long since gene, no one knows whither Their houses and lands are, even in Italy itself, given over o secular purposes, their numbers are reduced, and there is ittle left of many of their orders but the names; but there till remains in all its force, protected by the ægis of the United States Patent Office, their capability of producing potent liquids of exquisite flavor.

## WORRY AND ITS PHYSICAL EFFECTS

To so every day and common a state of mind as worry ranging, as it may, from a passing "fit of the blues " up to he most poignant mental anxiety regarding life itself, little mportance is popularly attached; and especially among so xceptionally nervous and rapid people as the Americans, the act of a person succumbing under mental strain is of too rdinary occurrence to give rise to extended comment. To the list of the insane immured in asylums and brought thither through heredity or by their own excesses, thousands re added, suffering with broken minds induced by anxiety but the great majority of people thus affected continue in heir places in society, by no means lunatics, nor maniacs, nor idiots, bat nevertheless of brain unsound in parts. The world sometimes dubs them "eccentric;" and, if they be distinguished, their odd habits, absence of mind, and like traits furnish rich material for the biographer; in other cases the eccentricities become crimes, and indiscriminating justice may declare the life forfeited because of the work. igs of hidden faculties, uncontrollable, because disorgan zed.
Worry, then, is dangerous, more so than the alcohol which kills the drunkard, for the latter involves a taste and a habit which may be put aside; the former is the creature of ne cessity, and creeps insidiously into every man's life. Its physiological effects, therefore, should be clearly and ade uately realized. And the knowledge of the ills may, in ome instance, prevent the existence of the cause.
During the early stages of dementia induced by mental nxiety, Dr. Richardson tells us in his " Diseases of Modern Life," there is nothing more than an increased tension of the minute vessels which supply the brain. In later stages, the ubstance of the nervous tissue itself undergoes a modifica. ion by which its activity is permanently lost. These are he physiological consequences, most briefly summed up. The irst symptom is a want of full bodily vigor; then follows raving for more work, disturbed sleep, acute sensitiveness to external impressions, and, finally, strange figares and sounds are seen and heard. This condition may continue for years, and the sufferer in time may begin to accept abnor mal creations as natural. Dr. Richardson cites a case of a merchant, who for weeks retained in his vision the spectre of three lights, oval in shape, of the size of an egg, and so clearly defined to the observer that he would watch them ail consciously as they floated before him on the wall, the
foundation of all hypotheses of ghost-seeing, of ecstatic vis ions, and even of poetic frenzy. A curious instance directly in point, which came to our notice very recently, is that of a well known writer on the press, who, for some time past, has devoted attention to the subject of morbid mental conditions. This gentleman, in a letter to a daily journal, states himself to be the victim of the horrible spectacle of two men hanging from a gallows, a sight which he once beheld while acting as a city reporter. The suspended corpses are clearly brought before him by the sound of rain (the execution occurred during a rainstorm), and also by the sound of laughter, since, through some uncontrollable impulse during laughter, since, throagh some uncontrolable impulse during the hanging, he was induced to utter an untimely peal of
merriment. That the writer's brain is injured, possibly by merriment. That the writer's brain is injured, possibly by the excessive mental strain peculiar to his profession, seems
probable; and the lesion is manifested, as already described, probable; and the lesion is manifested, as alr
It is a well known fact that we have two natures, one purely organic and emotional, the other subject to the reasoning powers. The organic nervous chain exists in the body as a link between emotional mental acts and vascular sapply. An impression from without, made through the organs of the senses upon the emotional centers, is reflected directly from them to the vascular expanse. The part flashes or blanches, and the heart hesitates, palpitates, rebounds, or intermits; so that these centers, excited by anxiety, or grief, or joy, or sorrow, influence the waves of blood passing through the system, and the brain promptly feels the imperfect regulation of the supply. Under varying tensions of the vessels, there are flashes, chills, coldness of the extremities, and other oppressive symptoms, while in addition appear the distressing ringing or hammering sounds in the head. These sounds are arterial murmurs, vibrations of the blood which presses with each impulse of the heart on the bony surround-
ings of the relared carotid canal, situated at the base of the skull. The canal is in direct connection, by solid conducting substance, with the organs of hearing, and thus the faintest vibration is detected. The sound produced when it is sudden and unexpected, as in moments of fear, is occasionally mistaken for a sound proceeding from without with no obvious cause.
Thus the sufferer is likely to see visions and hear strange noises, impalpable so to speak, but as purely physical as the most common things in life. In some instances they are actual perceptions of real facts or objects, caught by an extremely susceptible and delicate nervous surface. In others they are an intensified recognition of movements within the body; but in the vast majority of instances they are ac-
tual impressions made at some time on the organism and now recalled and rendered more definite by constant recur rence.
At this point, if the mental powers be allowed rest and the fountains of care be closed, recovery may take place; but if the over strain continue, the disease assumes still graver form. There is a maddening desire for work, more work,
coupled with the sad sensation that the physical powers are failing; and then there are lapses of memory. The man of business forgets important details, he is irritable, distrusts everybody and himself most, makes mistakes, and yet persists in accumulating more work on himself. The poet and novelist become over sentimental and morbid; the man troubled with remorse for guilt confesses his crime, or commits suicide. The downward course is rapid; in one case epilepsy occurs, in another paralysis, a third developes some hereditary malady like cancer, a fourth dies from nervous failure and local disease of some vital organ. The majority, escaping these special ends, become prematurely old and sink helplessly into death. The brain becomes disorganized, the balance is broken, and anarchy succeeds to what once was order.

In every brain, in fact, there is set up primitively a kingly force, to which all other forces bend. The king may be good or bad, he may be an hereditary king or a usurper, but he holds the balance; kill the king, and, in ninety nine cases out of hundred, the kingdom is made chaos and dark night."

## THE APPARENT SIZE OF THE MOON AT THE HORIZON

 A correspondent forwards us an article containing the views of Dr. Montucci, of Paris, on the above-named subject. As the learned doctor has expressed a wish that it be published in some widely circulated scientific journal in this country, we accede to his request, making, however, some comments on his theory." Everybody must have noticed the enormous size of the full moon when it rises at dusk, just when the sun has set. That it is owing to an illusion is notorious, first, because our satellite cannot undergo any real change in size during its short progress from the horizon to its culminating point, and secondly, because, whether observed at the former or the latter, the micrometric measurement of the visual angle
under which it is seen is always the same. This curious circumstance has always been a puzzle to scientific men. La Place says that, since the celestial hemisphere above our heads appears to us depressed, the rays coming from the horizon must seem to us longer than those from the zenith. Other physicists, finding this explanation unsatisfactory, assert that our judgment is led astray at the horizon by the trees and houses bordering on it, and which, having a size
known to us by habit, induce us to compare the moon to known to us by habit, induce us to compare the moon to
these objects, and so to think it larger than it is at the culminant point, where it is quite alone, without any type of comparison in the vicinity. To prove this explanation o theirs, they prick a hole through a card, and look through it at the moon on the horizon, thus covering all the terrestria objects that might lead us astray; and in this.way the moon'
disk is indeed reduced to a much smaller size. In an article published in the Memorial Diplomatique, Dr.Montucci expresses his astonishment at finding that atmospheric refraction, the only reasonable cause of the phenomenon in his opinion, is not only overlooked in this question, but actually rejected by all school book writers on natural philosophy, as well as by graver men. The demonstration by the pricked card he shows to be worthless: ' for,' says he, 'go about in the evening and look at the gas lamps through the card, and you will find them suddenly dwindle down to pins' heads, because you reduced the radiation of light by narrowing the field of vision. In the same way, if you look at the moon, it becomes less, just like the gas fiame; but do not imagine that it is thereby reduced to its culminating size. No, you cannot have two sets of weights and measures; if you look at the moon through the hole when she is at the horizon, you must do exactly the same when she is at the zenith; and then you will see her smaller than you ever saw her.' The
card being thus set aside for ever, Dr. Montucci proceeds card being thus set aside for ever, Dr. Montucci proceeds
to examine whether the illusion can be brought about by a type of comparison, and he enumerates several reasons why it cannot, among which is this: When the moon rises close to a large mass of houses or a mountain standing out in high relief above the real horizon, she loses her eraggerated diameter very quickly as she goes higher up; so that, by the time she has reached the top of the prominent object, she has diminished considerably. But that object is still there, it has not changed : then how comes it that, the type of comparison being the same, the object compared has diminished? Illusion from that source cannot therefore be pleaded here. Dr. Montucci next takes up refraction as the sole explanation possible. The misty atmosphere pre sents itself to the eje of the observer as a concave lens the moou is outside, and forms with the atmosphere a diver gent lens, which enlarges objects on a dark ground. Hence the moon, as well as all terrestrial objects, are increased in size on being projected by refraction through the atmos-
phere. This view of the case, the author confirms by variphere. This view of the case, the aut
We must confess that the statements, reasonings, and con lusions of the writer excite our surprise, as the fact is that this curious illusion has never been a puzzle to such scientific men as have taken the trouble to consider it carefully. They all agree with La Place that the celestial hemisphere appears depressed above us, and that objects near the horizon look much further cff than those near the zenith; our judg ment is not led astray at the horizon by the trees and houses bordering on it, but, on the contrary, these objects give us some faint idea of the great distance of the moon, for in thi case alone it becomes perceptible that the moon is so much
farther off than the largest distant objects, and the comparison allows some kind of appreciation of the moon's size while when the moon is at the zenith, there is a total lack of objects of known size with which to compare her, and we are thus led astray by the impression of a smaller distance, and so underestimate her size. The fact is that experience trains us in our judgment of distances in a horizontal direc tion; but when we look upward, for lack of intervening objects for purposes of comparison, we always underrate the real distances. A six foot man, at 700 feet distance, when on the ground looks to be of natural size, notwithstanding that we see his whole figure under the small angle of less than a third of a degree; but let the man be raised to the op of a tower 200 feet in hight, and let us go a little nearer, so as to see him at the same distance ( 700 feet) as be-
fore, and therefore under the same visual angle, or let us ven increase the angle, and the man will look very small in deed. Almost every one has experienced the surprise with which we observe that the real size of any object, with which we have become familiar by seeing it always in an elevated position, is so much larger when placed on the ground than it appeared to us while elevated.
Pricking a hole in a card, and looking through it at the moon's disk near the horizon, is a very imperfect and clumsy way of effecting an otherwise good and conclusive experi ter should be punched in a quarler of an inch in diame ond of a tube, of cardboard or other material, 28 inches long then the hole will appear, to the eye placed at the other end of the tube, under an angle of half a degree, which is the angle under which the moon always appears to us, whethe she be at the horizon or at the zenith, and when she is at her
mean distance from the earth. If we look through the tube mean distance from the earth. If we look through the tube
at the moon, when she is near the horizon and appears large and also when she is near the zenith and appears small, we shall see that she is in both cases of exactly the same size, overing the hole nearly perfectly.
The only effect which atmospheric refraction can have is to lift objects, situated outside of our atmosphere, highe bove the horizon than they really are, and this action in horizon itself, it amounts to orer to the horizon. At the ngle under which we usually see the sun and moon; so that when the sun or moon appears to touch the horizon with its ower edge, it is in fact below the same, and without the at mospheric refraction would show just a trace of the upper edge. As this refraction is greater at the horizon itself than
half a degree above the same, the lower edge of the sun or moon is apparently lifted up higher than the upper edge This has the effect of causing the luminary to appear with diminished vertical diameter; so that it appears fiattened, an appearance which has no doubt been observed by many of ur readers; and this takes place to an exaggerated extent when the atmosphere was laden with vapors.
The explanation given by Dr. Montucci is by no mean
Tow, and is found in many abmentary text book no mean
omy. It appears in a little treatise for school use, published 40 years ago by Arago, and it has been frequently copied by other authors, as apparently the easiest mode of explaining t. phenomenon; it cannot, however, stand the test of scru $y$, as the upper surface of our atmosphere, being paralle to the surface of the ocean, cannot be more curved than the ocean, but is actually less curved, having a somewhat longer radius. As, however, the surface of the ocean can be con sidered level for all practical purposes, the upper surface of our atmosphere may more reasonably be treated as a flat sur face, owing to its larger circumference: but it can in no way be considered to act as a lens. This old thery has bo long since exploded that it is surprising to see it brought forward at the present day.

## PROGRESS OF THE CENTENNIAL

Imagine over a hundred carloads of every conceivable pro duct of art and industry arriving daily, and an immense army of workmen working as if for dear life, early and late and some idea of the present condition of affairs at the Cen tennial will be realized. That the American exhibition wil be far from complete at the opening day is certain; but for tunately the same is not the case with the foreign contribu tions, and hence a reasonably good display may be looked for on the 10 th of May.
Three new bridges are being built over the tracks of the Pennsylvania Railroad in order to complete the approaches to the Centennial grounds. One is constructed on the rigid suspension principle, another on the stiffened triangular truss system, and the third is an iron truss structure. The last is one of the largest street bridges in the country, and will cost $\$ 300,000$
$\Delta$ new building has been erected near the west end of the main building for a general reception room for all visitors. It contains parlors, baggage rooms, toilet apartments, writ ing conveniences, and telegraph and mail stations, and is the headquarters of the corps of Centennial guides.
The interior decoration of Horticultural Hall is now near completed, and the main hall presencs a magnificent dis play of tropical plants. All of the garden beds have been aid out, and a large quantity of flowers are in full bloom.
The Japanese building is complete, and exquisitely fur nished in a style corresponding with the better residences in Japan. The walls are elegantly papered, and the windows apan. Turnished with a peculiar style of paper in lieu of glass. re furnished with a peculiar style of paper in lieu of glass.
The Chilian exhibit has arrived by steamer at Aspinwall, The Chilian exhibit has arrived by steamer at Aspinwall,
and will shortly reach Philadelphia. It includes a magnifi and will shortly reach Philadelphia. It includes a magnifi
cent collection of precious ores, and native wines, besides a cent collection of precious ores, and native wines, besides a
large quantity of machinery. Some of the small South American republics, not distinct exhibitors, occupy part of the Chilian space. Among these, Guayaquil has sent sam ples of a straw hat made from the delicate young palm leaf t takes several months to make one hat, as it can only be worked upon by night in order to escape the action of the sun and heat. No seam or joint is visible, and each hat is ralued at several hundred dollars.
The Granger's encampment at Elm Station, on the Pennsylvania Railroad, is now so nearly completed that the build ngs will be ready by the opening day of the Centennial. The terms are only $\$ 1$ per day for room rent and 50 cents pe meal. $A$ branch railroad line will run to the Centennia rounds, and a nominal fare will be charged. The Grangers have the preference in securing quarters, but the genera public is accommodated on the aboveterms. Working men will probably find these accommodations very convenient.
The great 100-tun Krupp cannon has safely arrived. The principal display of war material will be found in the United Stares section. A very interesting feature in that portion of the exhibition is a small working model of a Hitchcock forge, which will be so arranged that at stated periods miniature guns will be actually constructed, built up from iron sections. The Gatling gun will be shown in all its modifications, and there will be a complete set of small-arm making machinery in practical operation.
The carriage building is about finished. It is of wood heathed with corrugated iron, and of very ornamental de sign. The exhibits consist entirely of pleasure carriages, a ll carts, farm wagons, omnibuses, etc., will be displayed n the Agricultural Building. Palace and street cars will however, be exhibited, together with all improved carriag ppliances.
The Art Gallery is rapidly progressing, and in parts of it he hanging committee have already begun arranging the pictures. The judges' pavilion and the Massachusetts building are finished, and present a beautiful appearance The Pennsylvania building, begun very recently, will no e completed for several days.
The London Artisans' Institution and several French working men's associations are making preparations to send delegations of workmen to the Centennial. We have as ye heard of no similar action on the part of trade association and large manufacturing concerns in this country. We ave already pointed out at some length the advantages to $b$ gained by affording every possible facility for workmen visit the exhibition, and certainly no other such opportunity for observation and study will be afforded our mechanic during the present generation. This country will never be able to compete with Europe in the matter of artistic work manship until our workmen have the same advantages, in the shape of galleries and collections of industrial art, that are possessed by their European brethren. In respect to ar productions, the Centennial will be especially rich; and with proper opportanity for study, American operatives can gain and of information and ideas which will be not only val able to them, but directly beneficial to all our industries.

## IMPROVED AUTOMATIC TANE FILLER

© Mr. Angus'us Haerle, of Cincinnati, Ohio, has recently (March 7, 1876) patented an improved device for filling water, beer, oil, and other tanks. It consis's of cocks in the filling pipes, and a cock in a relief or signal pipe, attached to the filling pipe and connected with a float in the tank in such manner that the float closes the cocks of the filing pipe and opens the one in the relief pipe woen the tank is full; and when the water falls a litule, the float opens the filling pipe and closes the other, and thus automatically maintains the required quantity in the tank.


Fig. 1 is a sectional elevation, taken on the line, $x x$ of Fig. 2; and Fig. 2 is a top view. $A$ is the tank, for water, beer, or other liquid. B is the filling tabe; $C$, the cocks in the same for shutting off the supply when the tank is full. $D$ is the relief or signal pipe for the escape of the liquid when cocks, $C$, are closed, to relieve the feed pipe of the pressure, and to show, by the liquid running through it, that the tank is full. $E$ is the cock in the relief pipe, and $H$ is the float. The cocks are connected to the float by an arm, $G$, and rod, $F$, which are so adjusted that cock, $E$, opens a little before cocks, C, close, so as not to shut off the escape of the liquid, and cause pressure to r.se in the filling pipe, and in the reverse operation, the cocks, C, open a little before cock, E, closes, for the same parpose. Besides re lieving the pipe, B, from undue pressure, the escape pipe D, shows, as above explained, when the tank is full.

## Arican Hippoputamus Hintere

The late Dr. Livingstone, in his " Last Journals," give the following in teresting account
"At tbe Loang aa of Zumbo we came to a party of hergditary h'ppopotamus hunters. cilled makombwé or akombwé They follow no other occupation, but when their game is getting scanty at one spot they remove to some other par of the Loangwa, $Z$ smbesi, or Shiré, and baild temporary huts on an is!and, where their women cultivate patches the Hesh of the animals they kill is eagerly exchanged by the more settled people for grain. They are not stingy, and are every where welcome guests. I never heard of ang frand in dealing, or that they had been guilty of an outrage on th poosest; their cbief characteristic is their coursge. Their hanting is the bravest thing I ever saw. Each canoe is manned by two men; they are long light craft, scarcely hal an inch in thickness, about eighteen inches beam, and from eighteen to twenty feet long. They are formed for speed and shaped somewhat like our racing boats. Each man uses a broad short paddle, and as they guide the canoe slowly down the stream to a sleeping hippopotawus not a single ripple is raised on the smooth water; they look as if holding their breath, and communicate by signs only. Asthey come near the prey, the harpooner in the bow lays down his pad dle and rises slowly up, and there he stands erect, motion less, and eager, with the long-handled weapon poised at arm's length above his head, till, coming close to the beast he plunges it with all his might in towards the heart. Dur ing this exciting feat he has to keep his balance exactly His neighbor in the stern at once backs his paddle, the har pooner sits down, seizes his paddle, and backs too to escape the animal, surprised and wounded, seldom returns the at tack at this stage of the hant. The next stage, however, is full of danger.
" The barbed blade of the harpoon is secured by a long and very strong rope wound round the handle: it is intend od to come out of its socket, and, while the iron head is firm iy fixed in the animal's body, the rope unwinds, and th handle floats on tho surface. The hunter next goes to the handle and hauls on the rope till he knows that he is right
over the heast: when he feels the line suddenly slacken, he is prepared to deliver another harpoon at theinstant when hippo's enormous jaws appear wi'h a terrible grant above the water. The backing by the paddles is again repeated, bat hippo 0 , ton assaults the canoe, crunches it with his great jaws as easily as a pig would a bunch of asparagus, or shivers it with a kick by his hind foot. Deprived of their canoe, the gallant comrades instantly dive and swim to the shore under the water; they say that the infuriated beast locks for them on the surface, and, being beow, they escape his sight. When caught by many harponns, the craws of several canoes seize the handles and drag him hither and thither, till, weakened by loss of blood, he saccumbs.
"This hunting requiros the greatest skill, courage, and nerve that can be conceived-double armed and threefold brass, or whatever the Æoeid says. The makombwe are certainly a magnificent race of men, hardy and active in their habits, and well fed, as the result of their brave exploits; every muscle is well developed, and, though not so tall as some tribes, their figures are compact and finejy proportioned ; being a family occupation, it has no doubt helped in the production of fine physicsl development. Though all the people among whom they sojourn would like the profits they secure by the flesh and curved tusks, and no game is preserved, I have met with no competitors to them except the woayeiye of Lake Ngami and adjacent rivers.
"I have seen our dragoon officers performing fencing and managing their horses $\varepsilon 0$ dexterously that every muscle seemed trained to its fullest power and efficiency, and perhaps had they been brought up as makombroé they might have equaled their daring and consummate skill; but we have no sport, except, perhaps, Indian tiger shooting, requiring the courage and coolness this enterprise demands. The danger may be appreciated if one remembers that no sooner is blood shed in the water than all the crocodiles belew are immediately drawn up stream by the scent, and are ready to
worse."

The Solar Protuberancen.
For some time past the protuberences on the sun's surface have appeared less namerous. Father Secchi states that the minimum is, however, not yet attained, and this is shown by the sudden charges in the phencmenon. On one day scarcely more than three protuberances can be foand, while on the following dey they mey be counted by dozens, evi dencing the fact that the solar activity in course of diminudencing the fact Secchi also notes the rectilinear form of the hydrogen eruptions, which, with a thickness of several seconds, rise without deviation to a distance of two or three minutes (equal to 60 terrestrial diameters) from the sun's edge. The solar atmos phere is now so calm that the expansion, which takes place at the extremity of the incandescent columns, appears per fectly symmetrical on the two sides of every jet.

## A SIMPLE FLOWER VASE.

Everybody is, perhaps, a ware that a very tasteful hanging basket for growing plants can be made from a wire ox maz zle lined with sod or moss. A variety of wire baskets of

elegant patterns, for the same purpose, a realso sold in hard ware stores; but these, however, lack the charm which al ways attaches to an article which is the product of one's own handiwork. About the simplest and most ingenious plan for naking flower baskets and pots which has come under our notice is that recently patented by Alfred D. Lae, of Scio Ohio. A web or plat of sod is first cut of sufficient size to form the vessel when folded in proper shape. A mold of the desired form being previously made of wood, the sod is wrapped about it; and then turns of cord or wire, preferable the latter, are wound spirally about the exterior so as to confine the sod. The ends of the wire are then tightly secured the mold removed, and the empty space left by the latta, pearance of the finished pot is excellently shown in the an
nexed engravirg. Any desirtd shafe csn be made, and the eots themselves may be ornemenied with vines and flowers planted on their outer sides. In propagating and traps planting, the pot may be set directly in the bed, when the roots of the plant will find their way through the turf. The atter also holds water and ards in nourishing the plant onclosed.

IMPROVED MACHINE FOR STRAIGETENING METAL BARS In the annexed engraving is represented a new machine for straightening metal bars, which involves a novel arrange ment of rollers, which, it is claimed, enables the work to be done with less power and less strain on the machinery than when done simultaneously in both directions by alternate

horizontal and vertical rollers. Fig. 1 is a longitudinal section, Fig. 2 a plan, Fig. 3 a transverse section, and Fig 4 an end elevation. A represents the series of borizontal ollers for bending or straightening the bars, B, vertically represents the series of vertical rollers for bending o straightening the bars horizontally, and $D$ represents the rawing rollers for forcing the bars between the straightening rollers. The upper horizontal rollers are adjusted, and have adjusting boses and adjusting screws for setting them for bars of different sizes, and the vertical rollers of both sides are adjustable for the same purpose. In this example, the rollers are grooved suitably for bending railroad rails, fo which the machine is more especially designed; but it is also applicable for bars of any form, the grooves being shaped accordingly.
Patented through the Scientific American Patent Agency Febrnary 22 1876, by Messrs. Aquila Howells, John K. Howells, and William Garrett, of Cleveland, Ohio.

## Dye Leaves.

We do not remember ever having seen mention in the pab lic prints of the leaves from which a dye is extracted. This quality in certain plants is an interesting one for the bota nists who occasionally sojourn with us for awhile, hunting up orchids and other specimens of the vegetation of this locality. A study and analysis of the merits of these may be of vast worth to him who is first in the examination of the subject, and the leader in making their value known to the commercial world
Of the leaves that are made use of by our country people is one of a claes commonly called the cbina. From it a re tint is extracted, with which the strawhats, from the vicinity of Penonome, are dyed. To all appearances it is a fixed dye, which exposure to rain and sun does not materially alter. We are not acquainted with the secret of the mixture, tha is, if there be any mordant employed to give it its fixity. If it bea fixed dye, not needing a mordant to give it a perma nency and inalterability, it may prove to be of great value in commerce and the arts; for of all the vegetable dyes thas far known and tested, there is but the single exception of indigo which possesses the quality of durability without the necessity of a base or mordant to make it a lasting dye that does not fade away easily. Should this china turn out to be permanent and not readily deteriorate by the action to be permanent and not readily deteriorate by the action
of temperature and moisture, it may become a valuable acof temperature and moisture, it may become a valuable ac-
quisition in the manufacture of textile fabrics, and render quisition in the manufacture of textile fabrics, and render
the making up of cotton cloths something cheaper than what it is at present.
This china is a wild plant that is found in abundance $i$ many of the mountainous districts of the Isthmus. It is a vine (bejuco) that attaches itself to tall trees, and the leaves are shed in the dry season. There is no trouble in collecting them,as the time of the year is propitious for such work. It only left to be seen whether they be a falysis, they me hat fact be established by a competent anal the country.-Panama Star and Herald.

IT is said that eggs may be preserved for six months by dipping them in linseed oil, and so placing them in a layer of sand that they do not touch.

## IMPROVED KEG AND BARREL MACHINERY.

Iu our last issue, we published five engravings of the im proved barrel-making machinery introduced by Messrs. E. \& B. Holmes, of 59 Chicago street, Buffalo, N. Y. We now resume the subject, continuing it to its close, and illastrating four other machines, which complete the series.

Fig. 6 is a stave equalizer, with reel feed and conveyer. This is adapted to sawing off staves to uniform lengths as re uired, and will equalize staves of different lengths for mqking casks of all sizes, from the smallest kegs to barrels. It ahas a continuous reel feed and conveyer; also two circul ar saws upon the same mandrel, which can be adjus ted and placed at different distances from each othar. The stave is placed upon the feeder and is presented to the saws, which cut off both ends. The reel then carries it to, and drops it upon, the conveyer, which delivers it wherever desired.
In Fig. 7 is shown a machine for dress ing and jointing headings of all lengths and sizes for casks, from small kegs to hogsheads. One or both sides of the material can be finished as desired. The machine is constructed with a heavy iron frame upon which is mounted a large iron wheel. On the wheel are placed cutters for dress ing and jointing the heading. The inner set of cutters is for dressing the heading, and the outer for jointing. There is also a sliding clamp located upon the frame, in which the piece of beading is placed and clamped, and passed up to the cutters, which dress it and take it out of wind. The piece of heading is then taken from the clamp and placed and placed upon the jointing rest, and
brought in contact with the cutters, which give a smooth and perfect surface to its odge.
Fig. 8 is a machine for jointing staves for kegs and small casks. This is so constructed that the operator can instantly change the curve or bilge of the stave, through a foot lever, by which the operator raises or lowers the clamp or rest upon which the stave is placed. The clamp is fastened by an eccentric at any point desired. The stave is placed upon the holder, and is passed up to and against a concave disk, in which are cutters which make ${ }^{2}$ perfect joint upon the edge of the stape. The machine is made with or without the casing, which, in connection with the revo! ving disk, forms a fan, to remove the shavings and dast to the fuel room or where desired.
In Fig. 9 is represented a machine for bending and ren. dering flexible wooden hoops. By the operation of this device all the stubborn and unyielding portions of the hoop are rendered flexible. The hoop is put into this greatly im proved condition without breakage, thas saving a large amount of valuable stock; and the work of the cooper is greatly expedited. The machine is made with an iron frame in which are placed three iron turned or finished pulleys. A strong belt is so placed upon the pulleys as to drive them all when one is put in motion. The hoop is entered between the belt and the middle pulley, which is carried around the pulley and held close to it by the belt, which prevents its breaking. Hoops are passed through this ma chine very rapidly.
Lack of space precludes our presenting more than the brief description here given of these valuable machines. We are in formed that the inanufacturers are the only parties in the Uni ted States, or in the world, who make and furnish full and com plete apparatus for making all kinds of barrels and kegs. A fine representation of all varieties of their machinery will be found in section 37 , columns $50.51,52$, of the machine ry department of the Centennial Exposition.


Fig. 7.-BARREL HEAD DRESSING AND JOINTING MACHINE. For further particulars, address the inventors and manu facturers as above.

Nrcx ${ }^{-1}$ deposits, from which ore containing 30 per cent of pure nickel has been obtained, have recently been discovered at Onaillou, New Caledonia.


Fig. 6.-BARREL STAVE EQUALIZER AND CONVEYER.
then they are subjected to heat; then there follows conges tion, reaction of heat, pouring out of fluid matter, and the other local phenomena of catarrh
loisea d's patent fuel.
We have already chronicled the excellent success which Mr. E. F. Loiseau has encountered in introducing his pat ented process for the manufacture of fuel from the hithert


Fig. 8.-Keg stave jointing machine.
wasted coal slack. Preparations are now in progress for making the the fuel on an extended scale, and sup plying it fur public use. A factory located at Port Rich plying it fur public use. A factory located at Port Rich-
mond, Pa., bas a set of Mr. Loiseau's machines capable mond, Pa., bas a set of Mr. Loiseau's machines capable
of making 150 tuns per day, and admiting of the sale of the material at one dollar per tun less than the price of stove coal. Contracts have been entered into for immense quantities of coal slack, so that before very long we may ex pect to see the enormous heaps of that refuse, which now simply encumber the ground in the vicinity of the breakers in the coal districts, disappear. For several months past the Philadelphia and Reading Railroad Company has been experimenting upon the fuel, and it is found to gield more heat and produce more steam than similar quantities of large coal.
We published some time ago complete illustrations, with desoriptions, of Mr. Loiseau's very ingenious machinery. The benaty of the process is its continuity : 95 per cent anthracite slack, 5 per cent clay, and some adhesive material enter one end of the series of apparatus, and the compound never
stops moving antil it emerges at the other end in the shape of neatly molded hard lumps, covered with a waterproo varnish, and ready for instant use.

## A SOBMARINE RAILWAY.

One of the most remarkable and at the same time imprac ticable plans, which have bepn suggested for rapid and agreeable transit across the Eoglash Channel, bas recently been exhibited at the Palais de l'Industrie in Paris, by its inventor,Dr. Ls Combe. He calls his project " the submarine boat," but the boat is really a portion of a huge carriage which is to ran upon a railroad laid on the sea bottom. There is no tunnel, nor anything thereunto resembling. The road bed is of béton, which is to be laid by divers, and on this are fastened three galvanized iron rails. The outer ones are for the wheels of the carriage, and the inner one is raised so as to be embract by inner one is raised so as to be embract d by rollers, centrally athached to the latter
order to prent rolling derailment.
Thed to the at points watertight, is se is driven by a screw actuated by compressed air transported in suitable reser voirs. The latter also supply fresh atmo sphere for respiration within the boat, and a machine is provided for removing any ex cess, as well as the vitiated air. The inte rior is illuminated by the electric light, the current beirg led to the vestel by a wire from Dover; said wire also serves for telegraphic purposes.
The inventor proposes to arrange guard rails so as to keep the track always clear, and te provides a double doored chamber in the vessel, so that, in case of necessity, diver can emerge to examine the line Should by any possibility the vessel stop, buoy is immediately sent to the surface of the water, carrying an air tube, $s$ o that the supply of air may not fall short; and in case of grave accident, the vessel can be altogether cut loose from the carriage, when i will rise to the surface ard float. A series of buoys on the surface will mark the line of the road. Dr. La Combe thinks that his project is practicable, and believes that his vessel could make the journey of twenty-one miles in abou half an hour.

PURIFICATION OF SULPHURIC ACID
The method generally employed, consisting in removing he arsenic by sulphuretted bydrogen, is tedious and costly. Professor Thorn, of Pesth, says the Moniteur Industriel Belge, bas devised a more simple process. The acid coming from the lead chambers and marking $50^{\circ} \mathrm{B}$ is carried in a lead vessel at a temperature of from $189^{\circ}$ to $212^{\circ}$ Fah., and a quantity of sulphate of soda ioissolved in water, correspond ing to the quantity of arsenic contained in the acid, is added The sulphide of arsenicis thereby formed in yellow flocculent masses, which aggregate and float upon the surface. On withdrawing the acid, the sulphide remains on the bottom withdrawing the acid, the sulphide remains on the bottom
of the vessel, whence it is removed. The operation is easily of the vesse, whence it is removed. The operation is easily
carried on, and but very little sulphurous acid is produced. The purified acid contains from 3 to 4 per cent of sa)phate of soda, which offers, in the mejority of applications, no in convenience. In experiments made at Pesth, acid at 50 B contained 0098 per cent of arsenic, on leaving the cham bers, and 0004 per cent after purification.

ARTIFICIAL MEERSCHAOM, HORN, AND CORAL
A new way has been found of making excellent imitations


Fig. 9.-MACHINE FOR BENDING WOODEN HOOPS. f meerscbanm, horn, and coral, out of potatoes and carrots. To make the false meerschanm, the potatoes are peeled and macerated for 36 hours in water acidulated with 8 per cent sulphuric acid. They are then dried on blotting paper, and
in hot sand under pressure upon plates of chalk or plaster for several days. The chalk supporting plates must be renewed daily. The resulting material can be readily carved. If greater durability, whiteness, and elasticity be desired, the potatoes are macerated in water containing 3 per cent of soda instead of the acid above mentioned. To produce the horn imitation,the potatoes, atter being treated as last stated are boiled in water containing 19 per cent of soda. By substituting carrots for potatoes, a good imitation coral is pro duced.

## A REMAREABLE ERUPTION.

A curious land slide recently occurred on the line of the Hud son River Railroad near Dutchess Junction, N. Y. At about 200 feet above the Hudson river, there is a level platean which rises slightly to the foot of a large eminence called Suddenly a portion of the plateau was lifted from its place and hurled, with its load of trees and shrubs, into the cove beneath, dashing up the water like a tidal wave over the railroad track and destroying the fences beside the same. A crater about 200 by 150 feet in size was left. Four hours af terward, another slide took place, accompanied by an explosion, and during the succeeding night still another upheaval occurred, which was followed by a torrent of water gushing from the crater. So great was the force of the explosions that trees nearly a foot in thickness were hurled from their places to great distances like straws; and one massive timber was driven into the solid bed of the railroad to a depth of 8 feet. The phenomenon was due to a vast accumulation of water which had formed in the sandy land. This had been fed by the watershed of the Sugar Loaf and by the recent rains, until the huge underground lake found vent with the tremendous force described. The most recent reports at the time of writing (three days after the event) state that the water is still escaping, and the land still crumbling away, a condition of affairs which will probably continue until the water has spent its force.

## Corrtspundemer.

## The Cause of the Glacial Epochs <br> To the Editor of the Scientific American:

It may be said of the earth that she has five distinct mo tions, which are these : First, a rotary motion, on an axis, say, in herself. Second, an orbital motion, on an axis, say, in the sun. Third, a retrogyratory motion, on an axis cen tered in the center of the sun's orbit. Fourth, a retrogres sive motion round the center of the sun's orbit, and always at the same rate as Sol's motion. Fifth and last, a motion at right angles to the plane of her equator. It is by this motion that the earth's obliquity to the plane of the ecliptic is gradually becoming less and less.

It was held by La Place and several other astronomers that the obliquity of the earth to the plane of the ecliptic would ever be permanent, and that the earth would, as $i$ were, "rock to and fro, never departing more than two or two and a half degrees from her present inclined position." We claim that there is not a power, neither in the earth nor the sun, that will sustain that idea. The earth must (and we claim that the forces in her and in the sun compel her to) revolve round an axis running through her equator, as it were from one side of it to the other: and thus comes first say the equator, next her pole or poles, if you will; next her equator again, next her pole or poles; and so on for ever, to the sun.
It is by this motion of the earth that she has had all her glacial epochs; and the motion is not at all peculiar to the earth. No doubt all the planets have seen their glacial times, for they all revolve in the manner alluded to. See Uranus at the present hour; he is passing now through such an epoch. Fearfully grand it must be, compared,to those of the earth; but it is nothing to what it would be were the plane of his equator in the plane of the ecliptic or of solar motion. No, that is the period when the vastly broad and thick sheets of ice gather over and all around his poles for many thousands of miles. Look at Jupiter, and think of the vast ice sheets which must now and for many centuries to come cover his poles and nearly one half of each hemisphere. How exceedingly thick and vastly broad must Jupiter's glacial ice fields be at this present moment.

Turning to the earth, we find, by quoting from certain of our authors, that at the beginning of this century the obliquity was $23^{\circ} 27^{\prime} 54^{\prime} 78^{\prime \prime}$, and that it shall be, by the ond of this century, $23^{\circ} 27^{\prime} 9 \cdot 08^{\prime \prime}$. That gives, for the nineteenth century, $45 \cdot 70$." Now supposing the motion to be regular and uniform, the earth will complete her revolution, and, say, her glacial epoch revolution, in a period of about $2,832,700$ years. Therefore, we have four glacial epochs in less time
than three millions of years. Five hundred and twentythree thonsand three hundred years ago, the poles of the earth lay in the plane of the ecliptic. Then each pole, during its winter, would be subjected to intense cold and darkness for more than three months, and in summer to thirty days ( 720 hours) of almost perpendicular sunshine. Daring such epochs as that, tropical vegetation would grow right at the poles, and animals, accordingly, would feed and dwell there. Broad and thick sheets of ice would accumulate an-
nually, and cover nearly a whole hemisphere at a time, alnually, and cover nearly a whole hemisphere at a time, al
though but thin around their edges. And the speedy thaw ing of them would cause great floodings and carryings of dé bris from certain localities to other parts. But now to the coming epoch.
In about 184,800 years from now, the equator of the earth will again lie in the plane of the ecliptic. That will be the middle of one of the greatest glacial epochs which come to
ur earth. It comes on and goes off gradually, of course, and therefore it will begin some fifty or sixty thousand ears befors
Then will be the time when the vast circular fields of ic grow in thickness to perhaps several miles, especislly at and near the poles. Tbink of ice accumulating for perhaps 100, 000 years, and conceive of its thickness. Think of the at ractive force of the and drawing such huge fields outwardl toward the equator, and causing them to move with an east ward tendency all the time; and see how it becomes possible for the ice mass to tear the crest off one mountain and set it down on the top of another lying in its path. It was, doubtless, during the latest one of the kind (that is, some thing near $1,231,000$ years ago) that the crest of a certain mountain was placed on the top of another. I forget thei ames just now, but the fact is well known to geologists.
These are the periods which, as it were, turn animal and regetable creation upside down. Thegradual change of in lination of the earth to the sun causes all her climatic changes; and thus creatures and vegetation, foreign to cer tain localities now, will be found in others than they ar now in, in the far future, as has been the case many time n the past; for the earth has seen several glacial cycles, and her animal and vegetable genera may truly be called wandering, restless, and ever shifting things,for neither, in dividually, has any permanent abiding place on the earth No, not any one thing !
I humbly recommend the above theory to geologists and ther scientists, men whose practical knowledge and superior alent can show the facts up to better advantage than I cea
Gloucester City, N. J
John Hepburn.

## New Registering Barometer.

## It the Eiditor of the Sciontific American

I send you a sketch of a registering barometer, which dif fers from the ordinary barometer in having a longer tube The cistern is below the end of the tube a distance equal to the greatest difference of the barometer, with sufficient clear-
 ance for the mechanical partimmersed in the mercary. From the open end of the tube projects upward a small insu lated wire, preferably of tempered steel terminating in a platinum point. This point is amalgamated, and is hook shaped, the end being bent down so that it is the lowest uninsulated part. This wire is represented at 1 in the en graving ; the wire and all of its connec tions are insulated from $a$ to $b$. At 2 is a standard, to guide the working parts. The bearings, $c, d$, and $e$, are
in holes drilled in the standard; and the sliding parts should be covered by small ron tubes, slipped on over the insu lating substance and thatened with shellac or its equivalent. The atendard should be made of iron. For workyng the instrument, I use an ordinary striking clock, and I deepen all the teeth of the count wheel so that the count hook will drop and atop after one stroke. Above this, there is in the train a wheel which makes one revolution to each stroke ; and on the end of the arbor of of this wheol is a crank, which will stand with the crank pin up, when at rest. This crank should have throw sufflicient to cover all of the variation, from high to low, and a little over. The
fy should be of large size, to give a very slow motion to the crank, to prevent producing waves and fluctuations in the mourh, and for the same resson the tube shou as possible In connection with the crank motion there should be a pair of feed rolls, carrying a paper ribbon for the record. There should be a ratchet motion to bring the paper to a new place for each record. I use chemical telegraph paper for the record, as it requires a smaller battery, not liable to produce sparks to turn the connections, one or two small cells of the gravity
battery being sufficient. The connection to the crank is battery being sufficient. The connection to the crank is
made with the rod at $f$; the top of the wire, 1 , is adjusted so that, when at rest, the end of the wire inside of the tube, at $b$, will always be above the highest point that the mercury reaches. Connection with the battery is made by putting one pole in communication with the mercury in the cup, and the other with a plate which the paper passes over, and lies upon. The record can be taken hourly, half-hourly, or at as short periods as 5 minutes. If it be desired to take it once an hour, the hand arrives at the hour and, instead of striking, the wire inside of the tube begins to descend; when the platinum tip touches the mercury, electric communication is made through the mercury in the cistern to the top of the tube, thence through the steel wire down the tube and outide to the clock movement. This crank movement carries an iron wire, which moves down, pin-like, over the paper;
at the instant that the platinum tip touches the mercury, the at the instant that the platinum tip touches the mercury, the
current passes through the paper and produces a blue mark current passes through the paper and produces a blue mark to the bottom of the stroke; when, or just before, it begins to rise, the iron pen lifts from the paper, to prevent traccuracy: as the mercury, wetting the platinum point, will lift above the actual level by capillary attraction, and will keep the connection too long, and so will spoil the accuracy of the

I put in connection with the iron pen a thermostat, which raises or lowers the pen, making allowance for the expan sion of the mercury by heat, so that a thermometrical recor could be tept at the same tio and on the same paper. On he paper I place points of copper in connection with th battery, and these make lines at right angles with those of the barometer record, which will be perpendicular. These copper points are placed to indicate inches or their fractions. They are adjustable to the exact point, and then are set by crews. They are all in electric communication, but the conductor to them has a greater resistance than the iron pen, to prevent their taking too much force from it. The paper going between the copper points is lined lengthwise in red and these lines are crossed by blue lines, of greater or less length, according to the state of the barometer, all ending like at the bottom, each line representing the period of time wich the clock registers. I can dispense with all but one of he copper points; and if this represents the 30 inch point, can measure from this. It is, however, but little trouble to raduate to very small divisions, if necessary. The coppe oints I make by soldering thin pieces of copper, with th edges toward the paper, to pieces of steel wire. I place $t w$ of them very close together for the whole inches, the fin white line between being the inch line.
The advantages I claim for this barometer are cheapness in making and running. There is no work for the mercury to do whatever, as the mechanical part is all done by the clock ; and it will do the most accurate work possible, if it is ade nicely. I should be pleased to hear, from any one wh ries this plan, as to its success.

Wm. A. Barnes.
Bridgeport, Conn.

## THE MOON.

lecture deliverid at the ativens inbtitute of thohmologi by profrbsor c. a. young, of dartmouth collegi.
If this were a literary instead of a scientific lecture, it could not be more appropriately introduced than by quoting some of the beautiful lines which the poets of all ages hav lavished apon the moon, the empress of the night. Th moon was perhaps the first of the heavenly bodies that was egularly observed. The ancient observations of eclipses form the basis of many determinations in the chronology of the sarth's history. To the mariner at sea, its regular passag cross the heavens has always been a means of knowing the ime. The modern astronomer is able, without lesving th me. The to determine the earth' aize more accurately by
 thatig arface. To a person observing the path of thoon from any polnt of the earth's surface, it will appear less than semicircle by an amount proportional to the radius of the earth at that point. If the moon could be observed from th center of the earth, we assume, for the sake of simplicity of illustration; that its path would appear a complete semicir le. Hence we have the means of determining the radius o the earth. Even the density of the earth could be deter mined by a careful observation of the moon's influence upon the tides.
The most convenient way of determining the distance of he moon from the earth is from two distant stations, whose positions on the earth's surface have been accuratery ascersined. One of these atations is usually at the Cape of Good Hope, and the other either at Greenwich, Paris,or Ber in, etc. The distance between the two stations, messured o the same meridian, forms the bese line, and the obearved di ection of the moon, when it crosses the meridies, will give s the angles at the base, from which the distance oan be cal ulated. This distance is in round numbers, 298,000 miles abort ime the goo
 termint so accarate that he probable error does not exceed 15 or 20 miles. This dis ance is not, however, constant, because the moon's path is ot a circle but an oval, the eccentricity of which amounts to about $\frac{1}{18}$
The size of the moon's diameter is determined by measur ng its apparent diameter in the telescope, the difficulty of he operation consisting in the fact that the brightness of the disk causes it to present a circumference which is not defined with perfect sharpness. Having measured the appa ant diameter of the moon, and knowing the value of the earth's diameter, as seen from the moon, a simple proportion will give us the moon's real diameter, $2159 \cdot 6$ miles, or about the ${ }_{1} \frac{1}{20}$ part of the distance between the earth and the moon that is to say, 120 moons placed in a line would fill up the distance. The determinations of the value of the moon' diameter are correct to within two or three miles. Then, as the volumes of spheres are to each other as the cubes of their diameters, the volume of the moon is $7930^{3} \div 2160^{3}$, or abou $\frac{1}{9}$ that of the earth, that is, 49 moons rolled up together would make a ball as large as the earth. The determination of the density, and consequently of the weight, of the moon is more difficult than that of the most remote of the planets. One method of accomplishing it consists in studying the affect on the tides when the attractions of the sun and moon conspire to raise them, and when they act in opposite direc tions. In this way a relation is established between the masses of the sun and moon. If the sun and moon were a equal distances from the earth, their attractions would b in direct proportion to their masses, but the sun is abou 400 times further off; hence the law that the attraction i inversely as the square of the distance must be also applied This method, however, is not very accurate. A better one de pends on the fact that the earth and the moon revolve abou their common center of gravity, and that the position of tha
two bodies. The earth describes a much smaller orbit about two bodies. The earth describes a much smaller orbit about
that center than the moon, and would be displaced from the that center than the moon, and would be displaced from the
position which it would have if it traveled alone around position which it would have if it traveled alone around
the sun. This displacement will appear in the observed position of the sun,and can be calculated. It has been found to be $6 \frac{1}{2}$ seconds of arc; and from this it results that the earth's mass is $81 \frac{1}{2}$ times that of the moon. Hence the moon's density is $\frac{3}{8}$ that of the earth.
The force of gravity on the moon is only $\frac{1}{6}$ of that on the earth, that is, a man able to jump up 3 feet on the earth would be able to jump up 18 feet on the moon's surface.


FYg. 1.-THE CRATER OF PLATO.
The moon's path around the earth would always be an oval of exactly the same dimensions if the earth alone acted $u_{1}$ on it; but owing to the attraction of the sun, the moon is sometimes in advance and sometimes behind the place she
cent, and marble 50 for cent. Sir John Herschel had come to the same conclusion. "I have frequently," he stated, "compared the moon setting behind the gray perpendicular façade of the Table Mountains illuminated by the sun just risen in the opposite quarter of the horizon, when it has been scarcely distinguishable in brightness from the rock in contact with it."
Until quite recently, it was supposed that no heat could be detected in the rays of the moon. They were collected in the focus of a large mirror,and directed upon a very delicate thermopile connected with a galvanometer. The lecturer had this apparatus upon the table, and showed the effect of the heat of a candle placed at a distance. It was discovered by Melloni that the feeble heat coming from the moon was rendered insensible by the earth's atmosphere, and Professor Smyth, on repeating the experiment on the summit of Teneriffe, about 10,000 feet above the level of the sea, discovered that the heat of the full moon was equal to $\frac{1}{8}$ that of a candle placed at a distance of 15 feet from the apparatus. The moon is hottest between the last quarter and the new moon, because it has then been exposed continually to the sun for 14 days. Its temperature mast then be from $400^{\circ}$ to $500^{\circ}$
sults are well known. The lecturer then threw upon the screen a large number of photographic representations of the moon's surface, showing the principal mountains, craters, valleys, and other points of interest. Some of these mountains have a hight of 18,000 feet.
Fig. 1 represents the crater of Plato, the bottom of which has been observed to grow darker as the sun rises higher above it, which is by some supposed to be due to its being covered with some sort of vegetation. Notice also the ravine below, looking like a deep railroad cut. Fig. 2 is a view of the crater Wargentin, which presents the peculiar ity of being entirely filled up, while the other lunar craters resemble that of Kilauea on one of the Sandwich Islands, a great basin about 1,000 feet deep, out of which numerou cones rise.
Fig. 3 is a representation of a comparison of craters on the moon with the appearance of the volcano Vesuvius and the country in the vicinity of Naples. Both were studied topographically and modeled in plaster of Paris, with the most scrupulous care, by Nasmyth, and the accompanying engraving was made from a photograph of his models.
The only difference between the lunar craters and that of


Fig. 3.-SURFACE OF THE MOON
again, during the long night. 14 days long, it must cool down to something like $100^{\circ}$ to $200^{\circ}$ below zero.
No atmosphere exists on the moon, as is proved by the ab sence of refraction, when the moon passes between us and a

Fig. 5.

star. If there were an atmosphero, wo wuila continue to see the star some time after its disappearance behind the disk of the moon; but this is not the case. The star is instantly extinguished. The observations on this point are so accurate that a refraction of 4 seconds of arc could be easily detected. If therefore, there be an atmosphere at all, it must be more rare than that under the receiver of an air pump after we have exhausted all the air we can.
The moon always turns the same face towards the earth and weonly obtain glimpses of the edges of the opposite hemisphere, on account of the irregularities of its motions called librations. Hence we conclude that it turns once around its axis while it performs one revolution about the around its axis while it performs one revolution about th earth; otherwise we should see the whole of its surface.
If the moon ever had an atmosphere, as is very likely, it may have been absorbed, or it may have entered into combination with the rocks on its surface; but this is mere con jecture. As there is no atmosphere, there is also no moisture and hence the moon cannot be the abode of beings constitu ted as we are.
It has been stated that the powerful telescopes of modern times bring the moon down to within 40 miles of us; but that is not sufficient for distinguishing any of the works of inhabitants, if there be any. $\Delta$ city would appear as a mere dot The surface of the moon has been carefully studied with cesses by the latter method were obtained by Dr. J. W. Dra per, of New York, in 1840, and Ratherfard's excellent ro-


VESUVIUS AND ADJACENT COUNTRY, ITALY. Kilauea is that the former are of enormous dimensions. Co pernicus, for example, is 56 miles in diameter; its central moantain is 2,400 feet high, and the terraces around it rise to a hight of 12,000 or 13,000 feet above the bottom, and are composed of ridges, cliffs, and deep ravines.
Figs. 4, 5, and 6 illustrate Nasmyth's theory of the formation of these craters. The first eruption, keing probably the most violent, projected the stones, lava, etc., to a considera ble hight, and these, in falling, would accumalate in ridges encircling the crater at some distance. The hight to which they would rise would be much greater than on the earth, they would rise would be much greater
because the force of gravity is much less.
During the second eruption, which would probably be less violent, the projected matter would not rise so high, and in alling back it would cause the formation of the central cone During the subsequent eruption, when the force of the volcano was almost entirely spent, the lava would simply overflow and tend to fill up the basin to agreater or less extent. There is a gradual change going on in the orbit of the moon, which deserves to be noticed. The ellipticity of the arth's orbit is slowly diminishing; so that it is becoming Fig. 6.

more and more nearly circular, and its area is becoming great or every year. As a consequence the earth tends to draw the moon nearer and nearer to itself, and causes it to describe a constantly diminishing orbit. The end of this might be to pull the moon down upon the earth. The change is, how ver, so oxceedingly small that we need not entertain an apprehensions for our posterity for many years. C. F. K.

IMPROVED RAILWAY SWITCH SIGNAL.
The invention herewith illustrated is a new apparatus for moving switches, which is so constructed that it is impossible to move the lever without the latter turning the colored light or flag so as to indicate the position of the switch to approaching trains. This is effected by mechanism which causes the lever to turn one quarter of a revolution whenever it is altered, and thereby to rotate the lantern or flag attached to its upper portion.
The lever, as shown in Fig. 1, is made in two parts, the lower one of which is attached below to the rod leading to the switch, and above is forked. The upper part of the lever is pivoted at the fork of the lower part, as shown in Fig. 2, and is sup ported by a cap at A. Said upper portion carries ported by a cap at A. Said upper portion carries that, when rotated one quarter revolution on its that, when rotated one quarter revolution on its
vertical aris, the change may be made from white vertical axis, the change may be made from white
to red signal, or vice versd. Formed on the lever is a rounded lug, B, Fig. 2, which, when the lever is perpendicular, enters a curved recess, C, Fig. 1, in the upper edge of the top bar of the switch stand It will be obvious that, when the lever is moved in either direction, the lug, in leaving the recess, wil cause the lever shaft to make a quarter revolution On the under side of the upper bar of the switch stand, and just beneath the recess, $C$, is a lug, $D$ Also on the lever shaft are ears, E. When the lev or is moved from an inclined to a vertical position or is $\mathbf{F}$ from inchnt the ears, E , strike against the lug, D , and turn the lever so that the lug, $B$, is caused to enter the re cess, C. It will be clear also that, when the lever
is thrown completely over from end to end of its is thrown completely over from end to end of its
frame, by the means already described, it will be turned half a revolution.
By this mode of operating the switch, the last dis placement, even to one third of an inch, is indicated by the signals being turned, so that it is practically impossible for the switch tender to set the switch wrong without the same being clearly shown There are no extra movements beyond those ordin arily required, namely, to unlock, throw back and lock the lever. Patented through the Scientific lock the lor American Patent Agency. For further particular relative to rights to manufacture, etc., address the
inventor, Mr. Charles W. Spayd, Box 620 , Wilkes barre, Pa .

## Hard Paper.

French manufacturers have a method of render ing paper extremely hard and tenacious by subjec ting the pulp to the action of chloride of zinc. After it has been treated with the chloride, it is submitted to a strong pressure, thereafter becoming as hard as wood and as tough as leather. The hardness varies according to the strength of the metallic solution The material thus produced can be easily colored It may be employed in covering floors with advantage, and may be made to replace leather in the manufacture of coarse shoes; it is also a good ma terial for whip handles, the mounting of saws, but tons, combs, etc. A great deal is used in large sheets for roofing. Paper already manufactured acquires the same consistence when plunged, unsized, in a solution of the chlo ride.

## SHEPHARD'S IMPROVED CHURN.

We illustrate herewith a churn of novel construction patented through the Scientific American Parent Agency, March 28. 1876, by Mr. E. W. Shephard, of Wilmington, Ohio. The arrangement of parts is such that the cream is thrown

into violent agitation, while swift currents are set up and in stantly broken, so that the butter is brought, it is claimed, with great rapidity
The body of the churn is formed of ten staves, flat on their
inner sides, as shown in the section, Fig. 1, so as to produce a number of interior angles. In the bottom of the vessel is an antifriction socket to receive the dasher shaft, to the lower part of which shaft are attached the $\mathbb{S}$.shaped crossbars, $\mathbf{A}$, Fig. 1. Between said bars are secured four upright paddles, B, placed with their forward edges inclined inward, and rabbeted


## SPAYD'S RAILWAY SWITCH SIGNAL.

By means of the simple arrangement of crank and bevel gearing shown above the churn, the dasher is swiftly rotated, and the currents produced in the cream are broken by the angles in the churn body, and also by the ribs, C, arranged around the interior. The mode of securing one half of the

churn cover is plainly exhibited in the engraving; the other half is loose, so that it can be taken off to allow of the inspection of the progress of the churning.
For further information, the inventor may be addressed as above.

Bleaching Shellac.
Lemming's method for the purification or bleaching of shellac consists in either boiling with, or filtering the hot shellac consists in either $\begin{aligned} & \text { alcolic solution through, well burnt and recently heated }\end{aligned}$ animal charcoal. When necessary, this operation is reanimal charcoal. When necessary, this operation is re-
peated until the solution is colorless, when it is filtered peated until the solution is colorless, when it is filtered
through fine silk, and finally through fine filter paper. To insure success, the solution should be in the proportion of about five ounces of shellac to one quart of alcohol (rectified spirits of wine). Dr. Hare published a method for bleaching the lac by means of chlorine. He dissolved one part of shell or seed lac in a boiling solution of one part of pearlash in about eight parte of water. The solution was then cooled and impregnated with chlorine gas till the lac was all precipitated. The precipitate thue obtained is white, but the color deepens by washing and consolidation; dissolved in
n alcohol, lac bleached by this process yields a varnish which is as free from color as any copal varnish. The ap plication of chlorine must be made by a person acquainted with chemistry. Heace chloride of lime is safer as a bleach. ing agent, the lime being afterward dissolved out from the precipitate by dilute muriatic acid.


#### Abstract

Atmosphertc Ammonia. M. Schloesing has recently studied the exchange of ammonia which takes place between water and the atmosphere. The water which condenses in the clouds and which falls in rain would at first sight appear to despoil the air of all the ammonia contained. Such, however, is far from being the case Sirteen analyses conducted at different tempera tures show that the water never dissolves all the turosic at $77^{\circ}$ Fab the armospheric anmonia. At Tal., the wate takes up but 3 per ${ }^{\circ}$ monia in the air; at $68^{\circ}, 4$ per cent; at $59^{\circ}, 6$ per cent; at $50^{\circ}, 11$ per cent, and finally, at $41^{\circ}, 19$ per cent; at $50^{\circ}, 11$ per cent, and finally, at $41^{\circ}, 19$ per cent. From this it appears that, the lower the temcent. From this it appears that, the lower the tem- perature, the greater is the amount of ammonia


 dissolved.
## the benton patent copper float

In the annexed engraving is represented a copper float, such as is used in steam boilers, etc., made by a new process. The manufacturers claim tha the float is the only one yet invented which will stand the action of steam in a boiler for any length of time, without leaking and becoming filled with water, and consequently useless. The device, it appears from actual test, is extremely strong, and is altogether indifferent to the effects of sudden and wide changes of temperature

Two hollow hemispheres are spun out of sheet copper of suitable thickness. These are connected at their circumference by being slipped upon a cir cular ring, $\mathbf{\Delta}$, that is slightly beveled at the edges, to correspond with the curvature of the hemis pheres. The latter are also beveled so as to bind intimately on the ring when they are driven there on.
The float is next suspended in a galvanic copper solution, and a perfect joint is made by the filling up, with copper, of the beveled edges of the hemis pheres. The float is then removed, and such of the solution as has entered the interior is blown out through two small holes, bored for the purpose These holes are then plugged and the plugs, covered with a tbin film of copper, by again placing the globe in the solution. $\Delta$ second layer may also be deposited over the joint to secure the strong and perfect connection of the parts.
The test to which these floats are subjected are very severe. They are first placed in a steam-tight tank, into which steam is admitted until they are highly heated, the water of condensation being constantly drawn off. The steam valve is then shut, and cold water is suddenly admitted until the tank is about three fourths filled. The lower half of each float under test is thus suddenly covered, while the upper half remains hot. Under these conditions, we are informad, no sighs of separation at the joint, tbrough contraction or ex pansion of the metal, appear. The floats are also tested with a cold water pressure of 400 lbs. to the square inch. The manufacturers state that they have experimented with the joint by beating out the copper until it was as thin as tissue paper; and that they will guarantee it to stand until the cop per itself is eaten away. Oar engraving shows a mode o slinging the float in copper wire, to which a brass is attached slinging the foat in copper wire,
to keep the device in proper position.
to keep the device in proper position.
Patented through the Scientific American Patent Agency Patented through the Scientific American Patent Agency
February 1, 1876. For further information address the


Grease can be removed from billiard or other cloths by a paste of fuller's earth and turpentine. This should be rubbed upon the fabric until the turpentine has evaporated and a white powder remains. The latter can be brushed off, and the grease will have disappeared.

## THE CONE-BERRIED SOLANUM

Awong the plants suitable for indoor cultivation, those which bear berries are generally considered to be the most ornamental. Among the solanums, which are very most ornamentai. Among the solanams, which are very
much sought after for this purpose, the subject of our illustration is likely to become a general favorite. There are several varieties of this species in cultivation, which differ from each other in size and in form of the berries; but the conical berry of the solanum capsicas. trum is somewhat of a novelty. A correspondent of the English Garden, from the pages of which we select our engraving, states that a plant of this variety, about 1 foot high and 1 foot in diameter, was recently seen profusely covered with these berries, which are, when mature, of a bright orange color. It is one of a batch raised from seed sown in March. The seedlings were potted out; and about the last week in May, they were potted out; and about the last week in May, they were
planted out on a western border. Here they received planted out on a western border. Here
no attention, except occasional waterings until the auno attention, except occasional waterings until the au-
tumn, when, just before the berries commenced to color, tumn, when, just before the berries commenced to color
they were carefully lifted, and potted in 32 -sized pots. they were carefully lifted, and potted in 32 -sized pots.
They soon formed new roots, having been kept in a They soon formed new roots, having been kept in a
close atmosphere for a few days after lifting; and at close atmosphere for a few days after lirting; and ac
Christmas, the plant, from a portion of which the accompanying illustration was prepared, was loaded with berries, handsome both in shape and color. We have no doubt that this variety, when better known, will be generally cultivated.

## TWO BEAUTIFUL YUCCAS.

The yucca family of shrubs are all, we believe, indigenous to this country; and they are now being much enous to this country; and arey are now ineing much cultivated in Europe, and are highly valued for the
boldness and vigorous growth of their foliage, and their boldness and vigorous growth of their foliage, and their
ornamental appearance when in blossom. There are ornamental appearance when in blossom. There are
many varieties of them, some of which we have hereto many varieties of them, some of which we have hereto.
fore illustrated; but we believe that the two specimens here presented are little known to the general public. The yucca Treculeana was first brought from Texas in 1850, and is much cultivated in France, whither it was first imported by Mr. Trecul, after whom it is named. It forms a very stout stem, and the fully developed leaves are from


3 to $4 \frac{1}{2}$ feet long by 2 to $2 t$ inches broad, dark green on both sides, with a hard, sharp point, and very fine regular teeth The inflorescence of this species is an exceedingly dense, The inflorescence of this species is an exceedingly dense,
many branched panicle, not much overtopping the nearl $y$ erect upper leaves. A warm sheltered situation should be selected for it. It will be seen that this plant is one of the most remarkable of its kind as regards general appear
and the size to which its leaves attain. The flower stem, and the size to which its leaves attain. The flower stem, which rises up to a hight of 3 feet or more, consists of a mass of branchlets about 18 inches in length, bearing multitudes of cream-colored flowers, shining as if glazed. Our second specimen is the yucca gloriosa of Linnæus; and it has well been styled the most majestic and beautiful of the genus. It has been known in Europe since the end of the sirteenth century; and it was, when first found on our coast (from Florida to North Carolina), about 2 feet or rather more in hight. It is now, however, by no means uncommon to see these plants reach as high as 10 or 15 feet, in favoraole situations; some times, indeed, it stands when in blossom as high as 20 feet, the blossom with its stalk attaining 6 feet. This species flowers freely in sunny situations, after it has reached a certain age; but plants from suckers are usually some years before they flower. The trunk branches after flowering, and it is not unusual to see old spec imens many times branched, forming very heavy heads, which should be supported. It is very variable, though, perhaps, not more so than the other species of the gen us, but its varieties are better known. The ordinary form or type has upwards of 100 leaves in a dense tuft 24 to 30 inches long, and 3 inches broad at the middle, narrowed in luxuriant specimens gradually upwards to a brown sharp point,and downwards to $1 \frac{1}{4}$ to $1 \frac{1}{2}$ inches above the base; it is green or slightly glaucous when young, very rigid, even the outer older ones remaining erect face, concave, with longitudinal folds; margin, entire, with a distinct brown line; panicle, 3 to 6 feet long, according to the vigor of the plant, not downy or hairy; flowers, large, among the handsomest of the genus, al. most globular or goblet-shaped, when the petals are incarved ; petals, oblong, narrowed into a point at the top, from $2 \frac{1}{2}$ to 3 inches deep, the inner ones from 1 to $1 \frac{1}{6}$


## SOLANUM CAPSICASTRUM

inches broad, the outer ones narrower, and distinctly band od, or more or less tinged, with bright red down the back or sometimes the flowers are almost a pure white, seedlings varying much in this respect.

## Chinese Method of Welding.

The Ironmonger says that Mr. Balestier, who went on mission to the East, describes the Chinese method of welding cracked ironwares by cementing them with cast ifon while in a liquid state. In a cast iron pan, which Mc. B. required to be welded, the operator commenced by breaking the edges of the fracture slightly with a hammer, so as to enedges of the fracture sightly with a hammer, so as to en-
large the fissures, after which the fractured parts were large the and held in theirnatural positions by means of woodplaced, and held in theirnatural positions by meansof wood
en braces. The pan being ready, crucibles, made of clay, en braces. The pan being ready, crucibles, made of clay,
were laid in charcoal and ignited in a small porable sheet were laid in charcoal and ignited in a small poriable sheet
iron furnace, with bellows working horizontally. As soon as the pieces of cast iron with which the cracibles were charged were fixed, it was poured on a layer of partly charred husks of rough rice, or paddy, previously spread on a thickly doubled cloth, the object of which is to prevent the sudden cooling and hardening of the liquid metal. While in the liquid state, it is quickly conveyed to the fractured part under the vessel, and forced up with a jerk into the enlarged fissures, while a paper rubber was passed over the obtrudirg liquid inside of the vessel, making a strong, substantial, and neat operation.

## Two Bee Questions Answered.

A couple of vered questions about bees were recently an swered by Professor C. V. Riley, at a bee keepers' council in St. Lonis. The first query was: Do bees make or gather Loney? The Professor says they make it. Thus does Science
proclaim that the venerable Dr. Watt was wrong when he


YUCCA GLORIOSA
asserted that the busy bee "gathers honey all the day from every opening fower." The nectar lying in flowers never woold become honey,says Professor Riley,no matter how manipulated by the hands and minds of men; but it is taken up by the bees and passed through a state of semi-digestion and excretion, resulting in the manufacture of what is called honey, yet still retaining in par the flevor or perfume of the flowers, by which we de termine one kind of honey from another. Professor Riley's views were corroborated by a paper read by a botanist and chemist of Louisana, describing the pro cess of change undergone by nectar in the stomach the bee, in order to become honey.
The second question is an interesting one to fruit raisers, as it involves the mooted point of whether bees do or do not idjure fruit. Professor Riley, on being ap pealed to,produced an illustration of the order of hymen optera,stating that the mouth of the bee is the most com plicated'structure in insectanatomy. Its construction how ever, is the same as that of the wasp, and no one denies tha the wasp is capable of destroying fruit. The Professor thought beekeepers were prejudiced against the idea o sach power in the possession of a bee,but it is true. Still while being capable of injuring fruit, the bees rarely do so except in seasons of severe drought and when urged by necessity. This fact is no derogation to the usefulness of the insect, for the exercise of its power as a pollenizer is of undoubted value to the orchardist, even with all its depredations apon fruit.

## A NEW FORM OF FERNERY.

We publish herewith an engraving showing a cross section of a new form of fern house, recently erected in Scotland by Messrs. Boyd, of Paisley. The arrangement is so well shown in the illustration that but little ment is so well shown in the illustration that but litte
description is necessary. The building here shown is of large size, 30 feet highin the center, and 60 feet long; but the plan can of course be adapted to circumstances. In this case strong brick walls are carried up both sides and at one end, from which the rockwork slopes irregularly down on either side, forming a miniature ravine with a water all,

he stream meandering round the crags and among the state y tree ferns. The building is covered by a glass roof, sup ported by strong iron girders, and the interior is left with ut a single pillar or tie rod, leaving the space wholly to the erns and rockwork.

## Useral Recipes for the shop, the Household

 and the FarmA correspondent of the Ohio Farmer gives the following method of making a simple corn marker: Take a plank 7 feet long, 16 inches wide, and $1 \frac{1}{2}$ inches thick Pin this on three blocks, 5 by 8 inches thick and 16 inches long, putting one block at each end and one in the middle. With this length the marker is easily turned at the ends. For a tongue, get a smooth tough pole, and at the ends. For a tongue, get a smooth tough pole, and
fasten it to the center of the plank in such a way that, fasten it to the center of the plank in such a way that,
when the team is hitched up, the marker will stand level. when the team is hitched up, the marker will stand level.
Now take a lath, 1 by 2 inches thick and $10 \frac{1}{2}$ feet long. Drive a staple into the plank at each end of the marker and one in the middle. Pass the lath thrcugh one outside staple and the end just through the center staple. Fasten a chain to the outer end, and the marker is completed. The chain marks where the middle block or marker must follow the next time across. The lath must be shifted at each end so as to keep the chain on the unmarked land. When using oit, stand on the middle of the plank and keep the tongue directly over the chain mark. If the first mark was made straight, all the rest will be so, and equally distant apart. If desired, the lath may so, and equally distant apart. If desired, the lath may it can be turned from side to side without lifting. Secure it in position by another bolt, passed through the lath and plank, near the ends of the latter.

It has recently been found by experiment at Cornell University that, as farmers generally know, by sprouting garden seeds before sowing there is a gain of three or four days in the time of ripening.
For plating iron, steel, brass, lead, and zinc with tin, the following has recently been proposed. Prepare a solution of perchlorideof tin by passing chlorine tbrough a concentrated solution of salt of tin. Dilute the pro
duct with 8 or 10 times its volume of water, and filter if necessary. The article, half scoured with sulphuric acid, is to be polished with sand and the scratch brush, then washed with water, and hung by a zinc wire for 10 or 15 minutes in the perchloride of tin solution. Afterwards take it out, rub it with the scratch brush, dry it, and polish it.
If brooms are wet with boiling suds once a week, they wil become very tough, will not cut a carpet, and will last much longer. A handful or so of salt sprinkled on a carpet will carry the dust along with it and make the carpet look brigh and clean. A very dusty carpet may be cleaned by dipping the broom in cold water, shaking off all the drops, and sweeping a yard or so at a time. Wash the broom and repeat until the entire carpet has been swept.
The following compound is said greatly to facilitate the washing of clothes. Dissolve 2 lbs. of bar soap in about 3 gallons of water as hot as the hand can bear. Add 1 table spoonful of turpentine, and 3 of liquid ammonia. Stir, and steep the clothes in this for three hours, keeping the vessel tightly covered. Then wash the cloches in the usual way. The soap and water may be used a second time, in which case a teaspoonful of turpentine and the same amount of ammonia must be added. This treatment is calculated to save much labor in cleansing summer clothes stained by fruit, etc.
Very durable and neat mats for floors can be made from old coffee sacks. A piece of the bagging of suitable size is bound with some dark fabric and secured to a frame of four laths. By means of a hook of wood or iron, like an enlarged crochet needle, carpet rags are carried through the materia so as to skip every other thread and to leave loops halt an inch long, the ends, of course, being fastened. Old red flannel can be used to make tasteful borders.
A new and simple blowpipe consists of two large jars con nected near the bottom by a piece of rubber tubing. One is filled with water and put on a shelf above the tableon which the other stands. The water passes into the latter, and, in doing so, forces the air out through a stopper and piece of tubing into the blowpipe, which is supported separately. With jars of 1 gallon capacity and a blowpipe with an orifice of 0016 inch , a steady air current of 10 minutes' duration is obtained; and to keep it up one has merely to trans pose the jars.
A compound of grease and zinc filings is found to be an excellent preventive against rust for iron bolts inserted in wood. It is used to line the bolt hole
Pulverized anthracite coal, spread on the soil to the depth of half an inch, is said to have a remarkable effect in brightening the colors of towers of potted plants.
To keep striping pencils in good shape and ready for use, grease them with tallow from a candle and spread the hair straight on a piece of glass; keep them preserved from dust.
A good bronze paint for iron is made of ivory black, 1 oz. . chrome yellow, 1 oz ., chrome green, 2 lbs. Mix with raw linseed oil, adding a little japan to dry it. Thisgives a fine bron\%e green.. If desired, gold bronze may be put on the prominent parts of the object when the paint is not quite dry, the powder being rubbed in with a piece of plush.
A weak solution of cyanide of potassium cleans gold lace well.
To prepare skins for fur, mix bran and soft water suff. cient to cuver the skins. Immerse the latter and keep them covered for 24 hours; then remove, wash clean, and carefully scrape off all flesh. To 1 gallon of water (hot) add 1 lb . of alum and $\ddagger \mathrm{lb}$. of salt. When dissolved and cool enough to admit entrance of the hand, immerse the skins for 24 hours, dry in the shade, and rub. Stir the liquor again, immerse the skins for 24 hours, dry, and rub as before, immerse for 24 hours in oatmeal and warm water, partially dry in the shade, and finally rub until entirely dry. This leaves the skin like whiteleather, and fit for immediate use.
Never dilute varnish with turpentine, as it kills the gloss If too thick, warm it by the stove or place the cup on a warm iron.
To bend amber, drop it into hot beeswax. After it has been immersed for a few minutes, remove it, and, holding it before the fire, bend it to the desired shape.

## AGBICULTURAL MACHINERY.

Wo extract from Knight's '• New Mechanical Dictionary,"* this week, a series of engravings of various agricultural im plements, which doubtless will prove of timely interest to farmers. In Fig. 1 are represented several forms of CULTIVATORS,
under which heading may be included harrows, grubbers, drags, shovel plows, and like implements. The A-shaped harrow, $a$, is well adapted for new ground and in fields where there are occasional obstructions. The rear corners may be readily raised by a hooked stick, so as to allow it to pass a stump without swerving the team. Better still is a bow of hickory, as shown at b. Another mode of affixing handles is exhibited at c. Wilkie, of Teddington, Scotland, was the inventor of the cultivator proper; he devised the plurality of shares, the expanding frame, and the caster wheel His cultivator is shown ar $d$. The share frame is so suspended from the traction frame as to be raised bodily, by a parallel movement, by means of a single lever at the rear. The teeth are prongs curved to enter the soil obliquely. Finlayson's cultivator, $e, f$, is made of iron, and the prongs are arranged on parallel transverse bars of the frame, which is supported on a caster wheel in front and two wheels at the rear. The depth of tilth is regulated by a lever, which is connected to the carriage of the caster wheel so as to raise the apex of the frame when the lever is depressed, and con
versely. Wilkie's horse hoe and drill harrow, $g$, has a cen tral fixed share and adjustable side shares, which are expan ded or contracted according to the state of the crop or the Fig. 1.

width of the balk. Following the shares is a frame with harrow teeth. Either the share or the harrow teeth may be removed, and the remainder used separately. The depth is adjusted by the caster wheel in front. $h$ shows another form, somewhat modified. In Fig. 2, $a$ is Colman's cultivator, and

Fig. 2.

that below it is known as a skim cultivator with a long curved, flat share, whose depth is regulated by a crank and screw.
were invented by the Chinese, ages ago. Their machine is Fig. 3.

hing more than a wheelbarrow with a hopper for the seed and three spouts by which the seed reaches the ground; it hus drills three rows at a time. Fig. 3 is an English grain
soeding and manuring the land. All kinds of grain and seeds may be deposited at any required distances apart and at any depth, either with or without manure. The machines are constructed of various widths and made to deposit the seed in rows from 6 to 15 in number. Fig. 4 is a form of hand drill, mounted upon a stock resembling that of a single shovel plow. Forward is a hollow tube shod with a share an leading the grain from the box. E. A share following turn

a furrow upon the sown grain, and the wheel, B, following compacts the soil upon the seed. Fig. 5 is a

LIqUid mandre cart
which consists of a tank on wheels for the conveyance of liquid manure, to a field, for distribution. It is made of boiler iron, riveted, and is filled by means of a portable pump Fig. 5.

and hose, shown in position. The tank is hung apon c+nters so as to remain level on inclined ground. Fig. 6 is a ma nure drag, an implement with hooked tines for lauling ma nure over the surface of the ground. It is gaided by rear Fig. 6

handles, and a lever is provided, to bold the tines in action or release them at will. A
mechanical cow milker
is represented in Fig. 7. This is constructed on the principle of the breast pump, with cups for the several teats. The elastic cups communicate with the conical chamber of the diaphragm pump, the piston of which is worked by the handles. The milk worked by the handles. The milk is discharged by a spout
pail beneath. Fig. 8 is a
pail beneath. Fig. 8 is a
hay elevator and conveyer
 by which hay, lifted by the horse fork, is conveyed to distant parts of a barn or mow. It con sists of a carriage traveling on a fixed rope and resting on rollers as shown. To one portion of the carriage is affixed the standing part of the hoisting rope, which passes down through

Fig. 8.

a pulley attached to the fork, and then to another pulley on the carriage. A gaide line is also attached to the lower pul ley. The fork, full of hay, is first hoisted a suitable dis tance, and then, by slackening the guide line, continued pulling on the hoisting rope draws the carriage along the fixed rope to the desired point of unloading.

Torsion Balance and Experimental Radiometers. At the soirèe of the Royal Society, Burlington House,
April 5, 1876, Dr. William Crookes, F.R.S, etc., exhibited his new devices for illustrating various phenomena con nected with the repulsion resulting from radiation.
I. The torsion balance. A light beam having 2 square inches of pith at one end is cemented to a very fine fiber of glass stretched horizontally in a tube, one end of the fiber being connected with a torsion handle, passing through the tube, and indicating angular movements on a graduated circle. The whole is enclosed in glass and exhausted as perfectly as possible. $\Delta$ weight of $1-100 \mathrm{~h}$ of a grain is so it at pleasure. A ray of light from a lamp, reflected from a it at pleasure. A ray of light from a lamp, reflected from a
mirror in the center of the beam, shows the slightest movement. When the reflected ray points to zero, a turn of the ment. When the reflected ray points to zero, a torn of the depress the pith end of the beam, and thus cause the inder ray to travel along the scale to the right or to the left. If a small weight is placed on one end so as to depress it, and the torsion handle is then turned, the tendency of the glass fiber to untwist itself will ultimately balance the downward pressure of the weight, and will again bring the index ray to zero. When the weight of the $1-100$ th of 2 grain is placed on the pith surface, the torsion handle has to be turned 27 revolutions and $353^{\circ}$, or $10,073^{\circ}$ altogether, before the beam becomes horizontal. The downward pressure of the $1-100 \mathrm{th}$ of a grain is therefore equivalent to the force of torsion of the glass thread when twisted through $10,073^{\circ}$ One degree of torsion gives a decided movement of the index ray of ligbt, a torsion of $10,073^{\circ}$ balancing the 1.100 ch of a grain, while $10,074^{\circ}$ overbalances it: the balance will there fore turn to the $99-100,000,000$ th of a grain. Weighed in this balance, the mechanical force of a candle 12 inches dis tant is found to be 0.000444 of a grain.
2. The turbine radiometer. In this radiometer, the vanes are black on both sides, and are inclined at an angle like the sails of a windmill instead of being in a vertica plane. The instrument is not sensitive to horizontal radia tion, but moves readily, in one or other direction, to a candle held above or below.
3. Rediometer with the vanes blackened on both sides, showing rotation in either direction according to the way the light falls on them.
4. Radiometer showing the very small amount of residua air which is present. The vanes of the radiometer move past a piece of pith suspended by a silk fiber. Rotation with great velocity scarcely causes sufficient motion of the resid ual air to move the suspended pith.
5. Radiometer showing rotation of the glass envelope when the vanes are held in fixed space. The radiometer carries a magnet on its arms, and is floated on water so as to be free to move. The vanes are held stationsry by an outside magnet. On allowing radiation to fall on the black surfaces of the vanes, the glass envelope rotates.
6. Radiometer having inside it a platinum spiral. The repulsion of the white and black surfaces is equal when the spiral is below redness. Above a red heat the bla repelled more than the white, and rotation takes place.
7. Radiometer with one vane counterpoised by a mirror showing method of keeping the steel point from falling of
the cup. the cup.
8. Radiometer constructed of metal, showing reverse movement on cooling.
9. Bar photometer, showing the method of balancing one light by another.
10. Heat engine. A turbine radiometer, having ice be low and hot air above, working by difference of temperature. Slr John Tyndall.
Professor Tyndall, it is reported, has been offered a baronetcy, and his friends are anxious that he shall accept the honor. It is a graceful act on the part of the British government thus to recognize the labors, of the eminent investiThe aristocracy of scientific discoverers and workers is supe rior to one involving mere social precedence; and a man who by dint of persevering labor has attained a lofty place in the former stands far higher in the estimation of the world than does any member of nobility, however exalted his rank.

Gold can be applied to glass by mixing it in a powdered state with mucilage and adding a little borax, so that a paste is formed. Having been painted with this compound the article is heated in an oven. This burns the gum, whil the borax vitrifies and so fixes the gold.

## 2erent cmmetican aud fotrigu zeatents.

 REW CHEMICAL AND MIBCELLANEOUS INVENTIONS. improved signal lantern.George J. Cave, Elizabeth, N.J.-This is an arrangement of concentric shells and colored glass tubes, so combined that the me-
chanism may be readily and quickly adjusted, by a rotary movechanism may be readily and quickly adjusted, by a rotary move-
ment, to display a white light, a red light, or a green, or other arment, to display a white light, a red light, or a green, or other ar-
rangement of colors, and which shall have no projecting arms, handles, or levers to be in the way.
improved pocket book fastening.
Daniel M. Read, New York city.-This inventor has derised two ingenious fastenings for pocket books. The first consists of a corrugated base plate, between which and
cap plate a double catch hook engages.

ImpROVED METHOD OF JAPANNING BUTTONS, ETC. Charles M. Rhodes, Taunton, Mass., assignor to M. M. Rhodes \&
Sons, same place.-This improvement in the art of Japanning small articles consists in rotating the painted articles over a fre, and in contact with the products of the combustion thereof,
whereby the articles are separated, and their coating is dried, whereby the articles are se
preparatory to balding them.

Benjamin Franklin Red elastic trace joint.
Benjamin Franklin Rea, La Fayette, Ala.-This consists of a coiled spring fastened between two sections of the trace by at-
taching one end to each. Inside the coil are a couple of links, also connected to the trace section, so that, when the spring has been extended as far as is desirable, they come into action and take the strain off the spring. The spring is connected to a ring at each
end, and the links connect with the trace sections by a screw passond, and the links connect with the trace sections by a screw pass-
ing through the ring and drawiog the ring against the trace ing through the ring
sections by the links.

MPROVED SHOE FABTENING
Conrad Mayrels, Beardstown, Ill.-At each side of the opening ne wire is longitudinally fastened. Metal clasps then attach the wo parts togerher.

IMPROVED TRUSS PAD
Charles L. Warner, Homer, Iowa.-This is an improved pad fo to the base plate of a ball-and-socket joint, and suitable detaining to the ba
devices.

IMPROVED COMBINED TOP AND WHIRLIGIG
Reuben N. Garrett, Ballston Spa, N. Y.-In using the topas a toy top-shaped head is placed loosely upon the end of a pin, and th
cord is wound upon the said pin, within the fork of the usual to handle. Then by pulling sharply upon the cord, the pin and the ead will receive a rotary motion, and the head will be thrown from he pin, and will spin upon the floor. In using the top as a whirliig, the cord is wound upon the pin, within the fork of the handle d by puling upon the apid rotary motion.

## IMPROVED LIQUID COOLER

John Downing, Binghamton, N. Y.-This consists of an ice chest which are secured a series of jars. In the case of a water coole inilet pipe of the outlet pipe of each preceding far is connect suppl the inlet pipe of each succeeding jar. The outlet pipe of the as ar is connected with the discharge pipe. By this arrangement the water is drawn from the last Jar of the series, which is immediately eplaced by partially cooled water from the next Jar, and so on, th the water from the reservoir entering the first Jar, so that cold
water can be drawn almost continuously.

## IMPROVED CLOTHES LINE.

Elias Stillwell, Rockwell, Mo.-The invention relates to mean Whereby a clothes line may be gradually run out from a given po This is done as it receives the garments that are to be dried, so tha the washer may not be required to go far from the washroom in order to hang the clothes. It also relates to a mode of tightenin the line and protecting it from the weather. Eadless lines are carried over two rollers, at a suitable distance, one of which is provid dith a crank, by whose aid the lines may be caused to trave back and forth.

IMPROVED PAPER BOX.
Charles A. Whedon and Asbury S. Whedon, Cranford, N. J.of two pieces of paper, and a stand for the hat, which is also conrived so as to be made and attached in a manner to economise th cost of construction, and to facilitate its use in a folding box.

IMPROVED HAT HOLDER.
William H. Hampton, Suray, Va --The invention relates to mode of securing a hat in church, so that the owner will no longer take up room on the seat wands, place it on an uncleanly foor back of the pew a wire holder that is capable, by a rotary move ment, of being carried under the seat, the hat being thus out of be way and not at alliable to become sonled
IMPROVED sIGN PLATE.
Julius Cæsar, New York city.-This is an enameled door or other plate that is secured to a metallic border frame and attached there-
by to the door, without requiring the direct passage of the fastenng bolts through the plate.
impRoved bale tie.
William Carson, St. Louns, Mo.-This is an improvement in buckes formed in two parts, one of which is provided with a tongue to
in a corresponding notch in the other part. They are adapted to be locked together, and also readily disengaged by raising one part vertically off from the other.

IMPROVED LOCKET.
David Untermeyer, N. Y.-This locket is composed of pivoted arts, one holding a picture on both sidee, and having opposit ims that fit over and enclose the pictures.
mproved process of preserving burial cases, etc. Albert T. Bleyley, Conception, Mo.-This consists in coating altpeter, common salr, bichromatesition of glue, alum, saleratus, hereto a second coating of glue and bichromate of potash, and ird coating of shellac, alconol, and blchromate of potash
MPROVED AUTOMATIC HEAT REGULATOR FOR FURNACES Alvin C. Norcross, Boston, Mass.-This consists of one expanding ad contracting part, and another non-expandiog part, so placed in the furnaceas to be subject to the heat of the furnace for working rises and falls. The part not required to expand is located within tubular expanding part, having provision for a current of air to ow through it from outside the furnace to keep the other part from heating. The object is to enable a metal rod of ordinary expanding and contracting qualities to be used where a su
non-expanding properties has been heretofore required.

## IMPROVED HORSESHOE.

Henry Gourdier, New York city.-This horseshoe is so construc ted that the calks may be readily replaced with new ones when re quired, and the calks will be held securely in place when the shoe is in use. The tongues, formed upon the bases of steel heel
calks, and having projecting forward ends, are beveled and slotted to receive screws, and are caused to enter slots in the same place with the lower surfaces of the shoe.
machine for cutting stamens for artificial flowers, Ambrose Giraudat, Neuvs (Norwood P. O.), N. J.-This is an imting threads into suitable lengths for the stamens of artificial flowers. It cuts the threads evenly and does its work rapidly.

IMPROVED SHOT CARTRIDGE.
Thomas Wilkinson, Brooklyn, E. D., N. Y. - This is formed
by placlng perforated shot upon sets of wires between two wads. IMPROVED THILL COUPLING.
Levi Moor, Baraboo, Wis., aseignor to himself and Wills B. Rich of same place.-This is an improved device for connecting thills
and poles to the axles of vehicles, so constructed as to enable the and poles to the axles of vehiclee, so constructed as to enable the any wrench or tool. $\Delta$ apring bar, provided with a point and a flat a perforated and slotted lug formed upon the yoke of an axle clip.

Joseph Fennell, CyPROVED HORSE BOOT. pward extension, and provided with a strap and rubber tube to nected with the lower part by flexible straps made flaring upwar and downward, and prcvided with a padded strap to buckle around the fetlock.
improved mail bag.
E. Walter Roberts, Troy, N. Y.-This invention is an improvemen in the class of mail bag locks, whose distinguishing feature is a chain or flexible strap, provided with a series of bolts or hangers, for en
gaging with a series of staples or keepers. The improvement con gaging with a series of staples or keepers. The improvement con
sists in providing the bag-locking chain, formed of flat linke, having hangers, or bolts, increasing in length seriatim, with an extension
hat in the form of a leather pull-piece, which projects from the pocket in the flap of the bag. Another part of the invention is the conin truction of the sliding lock bolt, to which the aforesaid chain is
struch
attached, wherebyan address card, indicating the destination of the attached, whereby an address card, indicating the destination of
bag and the place from which it was sent, is secured in place.
improved metallic seal.
Alphonse Friedrick, Brooklyn, N. Y.-This patent covers certain mprovements upon the metallic seal for which letters patent were granted to the same inventor, March 14, 1876 . To make the seal mor fecure, one of the disks is provided with a projecting eye or a per
forated ear, through which perforation the ends of a shackle wir re passed before twisticg them around the stem. This confline the branches of the shackle wire at the edge of the button, with a continuous ring of metal, and obviates the possible separation o the thin parts of metal forming the flange, and thus prevents the opening of the said flange by pulling apart the branches of the -
improved lighting attachment for alarm clocks. Frank Fiscblein, Jersey City, N. J.-This is a device for lighting, it consists of the connection of the alarm mechanism of a clock train, by a fulcrumed and spring-acted friction lever, that, on its devices above the candle er
dind $b$
improved combined calendar and time piece. Miner H. Paddock, East Clarkson, N. Y.-This invention relates time piece, so combined therewith as to indicate a calendar of th week and month and the month of the year. The improvemen onsists in making the calendar devices independent of the effec of the main spring, so that, instead of being operated thereby, the are actuated by the hand of the operator, through the winding fact of the winding of the watch is indicated upon the dial face fact of the winding of the watch is indicated upon the dial face,
and the question as to whether the watch has been wound or not seasily ascertained by reference thereto. The improvements als serve to simplify the operating parts of the calendar, and conse quently render its construction cheaper and its operation more re liable.
improved whip ferrule.
Dexter Avery, Westfeld, Mass.-This improved whip button is constructed with the braided, woven, or knitted cover of thread
turned or folded over the end of the mold into the hold for the turned or folded over the end of the mold into the hold for the
stock, so as to make a better fllish of the ends than is made when the button is covered after being put on the stocks, and also to make finished buttons independently of the stock.

## NEW HOUSEHOLD ARTICLES.

mproved fireplace fender.
Henry C. Wesson, Fulton Station, Ky.-This fender is contrived also to fold up against the jambs in a compact manner out of the also to
way.
improved curtain fixture.
Michael Haughey, St. Louis, Mo.-This is a curtain fixture that s made without the use of springs. It consists of a curtain roller weighted pawl, locking into a ratchet of the roller shaft, secure the curtain at any hight.
improved rocking chair.
Wm. E. Buser, Chillicothe, Ohio.-This improvement relates to the application of an improved fastening or means of connection between a rocking chair and the base platform upon which it is
supported and vibrated. The fastening consists of a slotted plate attached to the platform, a hook or arm attached to the rocker and working in the plot of said plate, and a spring arranged to bear up on the said hook or arm. The slotted plate attaches the chair to ering tends to hold the holds it in proper position thereon. Th the weight of the back, which would otherwise cause the chair to assume an inclined position. It also assists in giving the chair an easy rocking motion.
mproved vegetable steamer.
Enas Stangeland, Rock Del, Minn.-This invention relates to a attle, also for heating water. It is designed for the use of farm rs, livery stable proprietors, and others having the care of stock It is portable, the several parts may be easily detached and put to-
gether, and the consumption of fuel is very economical, while the steam is so applied as to speedily produce the desired effect.
improven tack hammer.
Willis C. Avery, Wallingford, Conn.-This consists of a tack ham minishing in width and depth from the body of the hammer towar the sharp edge of the pene. This offers a ready means of sticking he tack in, previous to driving it, without using the fingers.
improved tilting chair.
Alanson S. Cushing, Buffalo, N. Y.-This is mainly a novel arrangement of flanged hinged plates, rubber blocks, and springs, the whole forming a convenient and desirable device for pivot or screw chairs.

Samuel Musser, Beaver Falls, Pa.-This invention relates to cer tain improvements in that clase of fireplace heaters which have hot air chamber in the rear, which is employed in connection wit a flue and registers for beating the upper rooms of a building. The of the parts whereby the construction is simplifled and a more economical use of fuel obtained.

## NEW TEXTILE HACHINERY.

IMPROVED WEFT FORK.
Caleb H. Warfield, Whitinsville, Mass.-This is a novel construc Hon, whereby the fingers are readily soldered to the arms in hole ontaine wha groon be readily be of a hot iron, and others put in.

HEW WOODWORKING AND HODGE AND CAREIAGE building inventions.
Edwin $\mathbf{A}$. Kimball, Danville, III. - In this devico the latch serve日 also as a lock bolt. The invention consists in combining with a key-
holed case and shouldered bolt a doubleacting guard, piroted cenholed case and shouldered bolt a doubleacting guard, plvoted cen--
trally in a recess of the bolt, having portions thereof curved and trally in a recess of the bolt, baving portions thereof curved and
provided with profecting teeth. so as to enable the same key to lock the bolt, no matter in which diroction it mas be turned
improved mousina hook.
Nels E. Johnsen, Chelsea, Mass., aseignor to himself and Georg W. Gannaway, of same place.-The invent:on consists in tongued grooved shouldersor profections formed upon said parts at theit points, to adapt the parts of the book to interlock with each other.
To open the hook a spring key is withdrawn, and the eyes slipped open the hook a spring key is withdrawn, and the eyes silppo the parts of the hook to be drawn apart.

MPROVED VEHICLE SPRING.
Thomas Alsop, Elkbart City, Ill.-Tuis consists in combining ratchet and pawl with springs arranged on shafts and attached a their inner ends to loose sockets. The pressure of the wagon bod
upon the lever arm is transmitted to the spiral spring and through upon the lever arm is transmitted to the spiral spring and through
out the full length of the same to the fired socket, the spring being called gradually but entirely into action, avoiding thereby any vio lent shocks and producing the easy and elastic play of the springs.
improved ventilating carriage and carriage top. Ezra Marsb, Newark, N. J.-This invention proposes to mak losecarriages in such a way that freah air, in any desired quantity may be admitted, and the foul air allowed to eseape. The inven-
tion consistsin a carriage body, having its front top bar and posts made hollow or tubular, and provided with the opening to admit fresh air to the carriage body. The latter is also provided with an air space, made by interposing a sheet of straw board between the
upholstery and the walls, through which they are formed. The uphoistery and the walls, through which they are formed. The glass panes connected to the eash board by swiveled eyes, so that it may be adjusted to any angle, according to the relative position o dash and top. Another new feature is a frame arranged in con nection with the da as a foot warmer

TMPROVED DRAFT EQUALIZER
Alexander Meharry, Pleasant Hill, Ind., assignor to himself and William Brown, of same place.-A bar is pivoted to the tongue, an to its ends are attached small chains which are secured to hook bars. The arie to another pulley on the tongue, thence to ane arle, pulley on the axle, and then to the other hook bar. To each hook bar a whifletree is attached. By this construction the points o draft attachment are close to and upon a level with the forward ends of the plow beams; and by adjusting the position of the pulley on the tongue with respect to the axie, the weight of the tongue may be
desired.
improved wagon brake.
Jacob Hamelback, Hopewell, Oblo.-This invention relates to certain improvements in that class of wagon brakes in which the back lashof the neck yoke and the forward movement of the ve hicle when the team is stopped serve to apply the brakes. The in
vention consists in the particular construction of devices connect ing the brakes with a sliding collar, to which the neck yoke is connected; in the use of a ratchet and pawl, arranged to auto
matically hold the brakes applied, and to automatically release the same upon the scarting of the team. It also consists in the peculiar construction of devices for preventing the application of the brakes while backing.

IMPROVED BARREL HEAD.
John W. Sasscer, Jr., Horse Head, Md.-This invention contomplates the manufacture of barrels with heads that may be readily removed withour taking off or loosening a hoop, or impairing the
strength of barrel. The invention consists in making an expansi ble barrel head in four pleces, of which two are plioted to an over a third, while the fourth piece is employed to serve as an
panding key that retains the head tightly in its proper position. MPROVED DUMPING WAGON.
Jared Wells, Grand Rapids, Mich.-The bottom of the body i made in three transversely pivoted sections, each of which is con nected by a chain to a pulley, and said chains pass to a shaft oper
ated by a lever. By turning the lever the sections are tilted suffciently to cause the load to slide from the rear ends.

IMPROVED FIFTH WHEEL
David G. Wyeth, New Way, Ohlo.-The object of this invention spring and axle of carriages, wagons, and other vehicles. It con sists in the construction of a sectional socket containing a bearing with two bevels which form a swivel connection between the spring and axie, and in the means of connecting and securing the parts
together, the whole being designed to take the place of the fifth together, the whole being designed to take the place of the fift wheel and king boll as ordinarily empioyed.

IMPROVED AUTOMATIC GATE.
William A. Baker, Morenci, Mich.-This gate is so constructed that it may be opened and closed without its being necessary for the driver to get out of the vehicle. It oocupies no space outside of
the line of the fence, and its operating mechanism is raised from the ground so as not to be affected by snow and frozen ground, and it closes direculy behind the vehiele.

IMPROVED DUMPING CAR.
George A. Gregg, Quarry, Iowa.-The car is mounted on two grooved midale wheels running on the rails, and a single wheel on dumped either sidewise or endwise. The middle wheels are the support when duunping sidewise, and the side wheels when dump ing endwise. The sides and end of the box are so pivoted to an overhead support that they keep closed wh
mproved vehtcle seat lock
George E Robison, Locke, N. Y. This is an idgenious lever and that the seat can be readily mored forward or back upon or de tached from the body.

IMPROVED DUMPING WAGON.
Montgomery C. and Henry L. Meigs, Romney, Ind.-This invention relates to certain improvements upon the dumping wagon fo July 27,1875 . It consists in a detachable stid adapted to be attachthe loading scoop is drawn, by means of a doubletree of greater lepgth than the width of the wagon, the horses being attached to the ends thereof, and walking upon opposte sides of the wagon.
The invention also consists in guard rails, placed upon the sides of The invenition also consists in guard rails, placed upon the sides of forlifting the bottom sections of the wagon. It also further con
sists in a support, pivoted to the bottom of the tront end of the
wagon and provided with a notch which, when the end of the wagon and provided with a notch which, when the end of the
wagon is raised, falls upon the reach, from the action of gravits and supports the wagon in an elevated position so as to acoommo date the front wheels in short turning.

IMPROVED SAWING MACHINE.
William S. Saunders, Atlanta, Mo.-This invention consists of portable sawing machine, containing a crank and band wheel conlal featur workiog the saw by a crank and pitman. The essenhelper for holding small stick, for holding and fastening the log, rivance to facilitate the moving of the machine from place place.

## mproved car mat.

John W. Groat, N. Y.-The object of this invention is to fur laces, which shall be for the floors of cars, saloons, and othe rable, and at the same time capable of being made very ornamen al. This mat is formed of strips of wood which, by screw bolt arried diagonally between corner pieces and a flanged center piec re securely fastened in place.

IMPROVED HAND CART.
Joseph M. Jones, Paris, Ky.-This inventor combines the body of a hand cart, a cranked axle, and an elliptic spring, the latter
esting on the sliding frame, while the cranked arle pupporrs it. He is thus enabled to apply the spring to take up the shock of ja and jolts without lifting up the body too highabove the wheels. IMPROVED AUGER.
William H C. Smith, Pawtucket, R. I.-This is an improve hat the mood is chipped up to allow it to fall down conructe uger without clogging. Bits of different size and high are used nd there is a new way of attaching the bit to the auger by sid projectioss, grooves, and a fastening screw.
improved circular sawing machines
James T. Baggs, Bridgeport, O.-This invention consists of an mproved arrangement of contrivances for automatically adjustin he tilting table laterally at the same time and by the same operaon that is tilted, the lateral adjustment belog to shift the sa it so as to compensate for the misplacement of it relatively to the cows, caused by the tilting. The invention also consists of a nove -shaped frame, whereby both saws may be adjusted simultane usly, or either independently of the other.
improved dumping wagon
Samuel B. Steward, Urbana, O.-By nperating a lever or pinion, shaft secured in the frame meshes into a curved rack attached to part of the body. This ralses suid portion of the body, ontents discharged.

IMPROVED SHUTTER AND DOOR FASTENER
Thomas B. Rogers, Jr., Brooklyn, assignor to Max Hallheimer, of ame place. - A couple of bars, of unequal length, are joined to ether at one end. One is Joined to the window and the other to e window sill, so that they swing with the blina. At the joint of he bars is a clamp by which the joint can be readily made rigid th amp, there is a stud which dropsinto a sociget in the sill to faste he blind shut.
NEW MECHANICAL AND EHGINEERING INVENTIONS.
IMPROVED NAIL EXTRACTOR
Lorenzo D. Browne, Shawnee, Ohio.-This consists of an aux liary claw mounted on the top of the ordinary claw bar in such a manner that it can be used when the spike is too high for the main
claw, and can be swung out of the way readily when not required por use.

Edwin F. Williams, Bald Mountain, Col. Ter.-This invention onsists of brakes which are drawn against the face of a disk Wheel by wedges moved by a sliding head on the shaft, in turn ope rated by the levers.
improved leather. skiving machine
Edwin B. Stimpson, Brookiyn, N. Y.-Thig is a machine by hich thin, ligat, and soft lather can be readily sived in piece any form. It consibts a table, which can be revolved and he central portion of which is a rotary skiving cutter, a rotary presser, and a rotary guide for the leather. The leather is placed on the table, and the latter turned or moved about so as to pass the
margin to be skived under the cutter. The work is effectually and rapidly performed on leather of any thickness, quality, or cond ion.

IMPROVED MAGNETO-ELECTRIC MACHINE.
Thomas W. Livingston, Ainsworth, Iowa.-This invention con ists of straight magnets with aiternating polarities, and wire coils ound in one direcion, combined with a revolviag shait having both ends as many radial arms as there are magnets. The shart prings, attached to a pivoted lateral blook set by a lever into a otched plate for producing currents of uniform or reversed po arities.

## ImPROVED CAR COUPLING

John H. Lands, Reigelsville, Pa.-This consists of a pivoted lin Jat is raised from the top side or platform of the car by a lateraly
winging link frame. The latter is retained in position by a sliding uard plece with front plate until pushed back on the approach o e car to be coupled, so as to drop the unk ove coupling hook. IMPROVED CAR COUPLING.
James B. Smith, Hepworth, Ontario, Can.-This invention re lates to certain improvements upon the car coupling for which
lotters patent were granted to the same inventor on October 26, 1875 ; and it consists in the improved attachment of the drawbar the car. The rear end of the drawbar is recessed, and in the awings on a vertical pivot and constitutes the connection with the car. Upon each side of this slidiog box and arranged in the re-
cessed drawbar are disposed independent sprioge, which arrangeent enables the buffer spring to be made stronger or lighter than the draw spring, as may be desired.

IMPROVED NUT LOCK.
George E. Jordan, Angola, Ind.-This inventor proposes a con nuous strap or plate with slots or recesses for several nuts, sald

IMPROVED GOVERNOR FOR STEAM ENGINES.
Christ Ackermann, Young America, Minn.-This improvement consists in the peculiar construction of parts whereby the connea on between the valve and the balls of the governor is broken Wenevcr the belt breaks and the balls drop, so that the valve au of the machinery is prevented by outting off the ateam.

Robert MoMaugh ind boat detaching hook.
ada. - This consists of a pair of hooks, surrounded at the middile by a plvoted loop which ordinarily holds them closed. The loop is held in place by a pin entering one part of the hook and beling held there by a spring. A cam arrangement is added, so formed that,
when it is turned to bring its lever upward, it may force outward the spring, withdrawing the pin from the hook and allowing the loop to be raised.

## IMPROVED COKE OVEN.

Sebastian Stutz, Pittsburgh, Pa.-This improvement consists in he arrangement of zigzag passages below the bottom of the coking whereby a more uniform heat may be maintained, and also in the mployment of a reservoir for the collection and utlization of the waste gases.
improved machine for cutting boot straps
John E. Plummer, Hornellsville, N. Y.-This invention is designed for cutting boot straps, but is applicable also for cutting
straps used in harness, trunk, and saddle making. It consista in a traps used in harness, trunk, and saddie making. It consists in a framedork carryiog a revolving shart having a leather holder proFided with a set of automatically operated clamping fingers o tationary knife which, as the leather holder combiceation with length of the cut section of leather into a series of straps.
improved packing for car axle boxes,

1. Benedict, Richmond, Va.-This invention relates to means for packing the axle boxes of cars and other vehicles so as to furnish a radual supply of lubricating material to the journals, and conof a liquid charaction on cork or analogous substance, so that of dily employed as those that assume more solld form, and so tha the bores may be safely manipulated even by ucskilled persons.
mproved guard for railroad crossings.
Lyman L. McCrea and Robert V. Coon, Troy, N. Y.-This is a device for preventing horses' feet from getting caught upon the
spike heads, or between the rail and planking, at railroad crossings. It consists in a guard having one edge formed to fit upon the flange and into the neck of the rail, and its other edge formed to ft againg the edge of the planking. It is concaved upon its upper side, and provided with a flange and lugs to underlap the planking and the路
IMPROVED DIE FOR MAKING HAMMERS,
Henry W. Kip, Buffalo, N. Y.-This invention consists of dies ors , and punching way for shaping, riveting, and other like hammers, and punching the eyes in a dro
partly separating them from the rod.

IMPROVED BELTING
John Neumann, Brooklyn, N. Y.-This consists of broad meta nks with notches in the ende, forming loop-shaped projections or interlage. arranged that they roll one on the other when the chain bends round the pulless. Sliding friction in the connection of the links is thus avoided. The invention arso consists of platesattached to the sides of the link to adapt the belt for grooved pulleys. Sald
plates are so arranged as to fit the sides of a tapered groove, and have a little flexure in the connection with the links, so that they ocommodate themselves to the sides. These plates are connected to the links in a simple and inexpensive manner, which also con titutes a part of the invention.
button-sewing attachment for sewing machines. John W. Fries, Salem, N. C.-This consists of a clamp for holding is worked to right and left alternately on a shiftidg plate, whic needle by a little vibrating cam on an elbow lever worked by the needle bar, and which is itself vibrated by the plate which carries the clamp.
John K. J. Foster, Horbury, near Wakefleld, EDgland.-This consists in constructing the displacer in the form of a hollow cyl-
indrical sheet metal vessel, with a tube running through the sam indrical sheet metal vessel, with a tube running through the same ongitudinally, so that several of th
upon the same pump spear, if desired.
mproved burnishing machine for boots and shoes George E. Burgess, Hudson, Mass., assignor to himself and Waldo . Brigham, same place.-This consists of a rotary burnishicg , The head at the same time constitutes a guide, by which to aid the operator in applying the shoe to the tool. A friction pad is com
bined with the tool, to afford the heat necessary to the efficien ined with the tool, to afford the heat necessary to the efficient

## EEW AGRICULTORAL INVENTIONS.

MPRROVED MILE COOLER AND STRAINER
Charles Weineis, Bloomingdale, Ill.-This is an improved mill in quick and effective manner for transportation, the cooler allowg also the efrective manner for transportation, the cooler allow on consiats of an outer water receptacle a milk receiver, with ottom strainer and threaded tube screwing into the bottom tube the outer receptacle, and of an interior cooling can, with apira Finding rib, Co
he outlet tube

IMPROVED BEE HIVE
Caleb E. Bost, Davidson College, N. C.-This invention relates to an improved construction of bee hive designed to give greater seurity to the bees from the attacks of moths and millere, and promote the health and prosperity of the bees in all seasons. It consists in the construction and arrangement of the entrance to enive for keeping out moths and millers, and in a supplementa cording to the requirements of the season.

IMPROVED RAKE.
Glover Hawley, Hawleyville, Conn.-The object here is to make rakes that have become loose upon the handie as firm and strong as new ones. A plate of wood or metal, made wider at its forward
end, and with two holes to receive the middle teeth, is secured to ho handle and head.
improved weaning bit for calves.
John H. Bailey and Louis Loupee, Toledo, Iowa.-This is an improvement on the anti-sucking bits for calves for which letters patent have been granted to John H. Bailey, under date of Novem-
ber 9,1875 , so that the animal has a better chance to eat and drink without covering up the ends. The invention consists of a tubuopen at the bit, which is made of two centrally hinged seotions, projecting toward the rear of the bit sections.

## wustures aud zetrsoual.



Agricultural Implementra and Industral Mactin-
riv ror Export \& Domestic Use. R. B. Allen \& Co...N.Y. The Patent Lubricatilg Compound of Chard \&


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Ib. Head. Has ever been uea. 1 Ho Watt steam Hammer, 150 10, ley, Cambriageport, Mase.
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 Suate to give for introductog the mill.
sddreas E . E . smith, Good Hope, III.

A. K. will find, on reference, that the per petual motion absurdity in most of its forms is iscuseed in vols. 23 and $24,-\mathbf{R}$. J. will find form ule for calculating the strength of boflers on pp ,
116,165, vol. $28 .-\mathrm{F}$. W. can nickel plate iron cast ogs by following the directions on p. 235, vol. 33 . logs by following the directions on p. 235 , vol. 33 .
J. s . can clean marble by the method detailed on J. S. can clean marble by the method deta
p. 33, vol. 32.-J. W. H., J. C. W., C.S., F. M.,
J. D., R M., and others who ask us to recommend books on industrial and sclentific subjecta, should address the booksellers who advertise in our col-
umns, all of whom are trustworthy firms, for oataumns, al
logues.
(1) R. M. C. says: We have an engine $7 t$ nches diameter by 20 inches stroke. The stean We use 60 lbs. steam boller pressure, cut.off at $\frac{5}{6}$ using 94 to 1 cord hard wood per day. We hav
und 150 revolutions per minute, written to a firm in regard to a governor for th same, and have received a reply that the steam pipe should be not less than $21 / 2$ to 3 inches, as the team now has to travel through $11 / 3$ inches pip
at the rate of 15,000 feet per minute, to keep up with the piston. Is this so ? A. The steam pipe
A. is too small if you wish to get full power out o the engine. Under the circumstancee, it seems
to be large enough, and you could probably cary a lower boiler pressure, and open the throt
(2) C. C. E. asks: What time of the year is
best for cutting oak timber for fence posts? best for cutting oak timber for fence posts? $A$
There is some difference of opinion on the subject, but we thing the weight of authoritg is in favor of cutuing the timber in spricg or autumn.
(3) C. L. M. asks : 1. What proportion has yepiece to the eyeglass, as used in compound $m$ croscopes? $\mathbf{A}$. The field lens has about doubl the focal length of the eye lens, and their distance apart is one half the sum of their focal lengths. . What proportlon has the aperture to the focus? ength.
(4) W. O. asks: During the first quarter revolution of the driving wheel of a locomotive (the wheel pressing upon the rall), does the point
in the circumference marking the eract top thereof move a greater distance forward than the exat bottom of the same? $\mathbf{A}$. Yes.
(5) W. G. says: I have tried zinc in my
bollers for preventing incrustation, and flad it very good. I wind strips of copper around it. I put in a 3 feet by 10 feet boller about 20 lbs . in 3 to 4 lbs. ingots. I pul some on the bottom, and some
on top of the flues, near the heads.
(6) M. B. M. asks: 1 . How much water
would Montgolder's hydraulio ram discharge at would Montgol6er's hydraulic ram discharge at
the spindle valve in raising 100 gallons 25 feet above the spindle valve in raising 100 gallons 25 feet above
the supplying fountain? A. It would depend on the bead and the efflciency of the ram. 2. Would the same amount 50 feet high? A. Yes, other things being equal.
(7) J. H. H. says: Our town is situated on it; and when the water runs over the dam, the windows and doors of the houses within a quarter of a mile of it shake. Is the shaking caused by the foundations of the houses stand on, or by concusfoundations of the houses stand on, or by concus-
sion of the air caused by waves, atc. ? The fallof of the water is about 12 feet. A. We incline to the (8)
(8) C. G. B. asks : How much water is evapyards) in the course of a year, and bow much dally in warm weather? A. In general practioe, the average evaporation per 24 hours is taken at 18
of aninch in depth. This only gives an approxiof aninoh in depth. This only gives an approxi-
mation for estimates. Of course, for any particumation for estimates. Of course, for any particu-
lar locality, it must be determined by experilar lo
ment.
(9) H. F. S. asks: Would two half circles round iron, 1 inch in diameter, placed in curved slots made to receive them, bear a sudden and
great force, tending to separate two blocks connected by them, without straighteniog? A. Thus arranged, they would form a very strong connection.
(10) (10) I. L. B. asks: 1. What effect is pro pressed? A. It is increased. 2. Is this effect intensifled by the extent of compression? If so,
what is the law? A. See p. 123, vol. 33. 3. How much can air be compressed? $A$. It is only limit ed by the strength and durability of the machine-
ry. 4. What would be the effect of heating or ry. 4. What would be the effect of heating or
cooling air, when compreseed, after it is permitted to expand? $\mathbf{A}$. Heailing increases, and cooling decreases, the volume or the preseure. 5. Has any automatic device been contrived by which air oan be compressed, so as to give it an expansive power
of two or moreatmospheres, and where can a deof two or moreatmospheres, and where can a de-
soription of such device be found? $\mathbf{A}$. There are soription of such derice be found? A. There are
numerous machines of this kind. You can obchinery.
thin des
(11) D. C. S. asks: 1. Is zinc paint as good as oil paint for the outside of a boat where it will come in contact with the water? A. Our experi-
ence, which is, however, quite limited, is rather against the use of zinc paint under such circum. stances. 2. What is the best composition to use in
cleaning the brasswork on a boat? $A$. Bath brick ceaning the brasswork on a boat? A. Bath brick
with oil answers very well. 3. What compoeition is the best to put on ironwork of a boat to give varnish made from petroleum is very good.
(12) H. M. W. says: 1. I am making a small engine,with a oylinder $11 / 1 \times 3$ inches. What
should be the size and weight of fly wheel? $A$. Make it 10 inches in diameter, to weigh 12 or 15 lbs 2. I wish to make a horizontal boiler 14 inches in
diameter and 2 feet long with a fue 8 inches in didiameter and 2 feet long, with a flue 8 inches in di-
ameter, using the flue for a fireplace. Would this leavesumficient water space? A. Yes. 3. Would cast iron
their use.
(13) J. J. says : 1. You state that some kinds of cast iron become casehardened to a high degre ure of cast iron that will become thus casehard oned? A. All cast iron casebardens by friction. The harder the metal is, the more it casebardens. 2. Is there any known method of casehardening of any substance while in motion? A. No.
(14) H. P. M. asks: I am making a pair ongines with live steam jackets on cylinders. hereany better mode of effectiog economy rantageous in some cases, and in others it is doubt ul whether their use is beneticial. Much depends upon the conditions under which the engine is op-
rated, and more, probably, upon the design and rated, and more, probably, upon the design and (15) L.
(15) L. H. Y. says: 1. We often see, in the morning and evening, when the sky is partly clear treakerunning to or from the sun. What cause sun's rays passing through openirgs in the clouds, while theadjacent portions are obstructed by the clouds. 2. Why does more snow fall after sunse than during the day? A. The heat of the sun retards its forming. 3. Some say that a noon mark
for the summer season will not do for winter, for the summer season will not do for winter,
that the sun is farther west. Is this true? A. There are but four times in a year in which th sun will be on the noon mark at noon. Thesear april 15, June 14, August 31, and December 24 4. What causes a circle around the sun? A. Thes are called parbelia, and are caused by the sun's ight being refracted by moisture or frost in the
(16) H. J. W. asks : Is there any acid that will burn iron plating as deep as $1 / 1 / 2$ an inch o more ? A. You may try a hot mirture of muriatic
and nitric acids with water. We do not, howand nitric acide with water. We do not, how
ever, think that any method of this kind will prove very successful.
(17) J. H. H. asks: Does the tirtue of gypsum for fertilizing land consist in the amount of sulphurio acid combined with the lime? If so,
how can I determine the relative amount of acid in two different paroels? $A$. It is generalls be lieved that the favorable action of gypsum upon vegetation is due to the absorbed ammonia whic
is yielded up. Putridity gives rise to the formais yielded up. Putridity gives rise to the forma-
tion of carbonic acid, which combines with the lime of the gypsum, leaving carbonate of lime the effcacy of gypsum-dunging, as it is termed, is however insufficient. The inveatigations of Maye have shown that in clayey soils the oxide of iron, ammonia than gypsum. The quantity of gypsum ammonia than gypsum. The quantity or gypsum
used is about 5 owts. to the acre, containirg and realizing at the most $2 \frac{3}{3} \mathrm{owts}$. of carbonate of am monia. Mayer's researches, however, show that in an acre of field land there are 272, and in chalky soil 158 ,owts. of carbonate of ammonia contained. Aocording to Lieblg's late reeearches (1888) it. apportion of its lime in exchange for magnesia and potasea. But it must be borne in mind that pulverized gypsum, as well as unburnt gypsum, when
brought into onntact with a solution brought into onntact with a solution of potassa,
sets into a difflculty soluble mass. We must, sets into a difflcultly soluble mass. We must,
then, wait for an adequate theory untll the several reactions have been more olosely studied.
(18) C. R. C. says: I wish to convert waste silk into its raw state. How can it be done? Bo
ing twisted, it is almost ueeless. Is there any chemical process by which the twist may be disengaged and the subst
(19) C. A. B. \& B. ask: How can we make a peratures, but which can be softened by heat? A. Melt together in an iron pot equal parts of pitch and gutta percha; apply while hct.
How can we make artificial camphor, described
by Dr. Ure? $\Delta$. Transil the dried hydrochloric acid gas into the artifcially cooled essence of tur-
pentine so long as it is absorbed. As soon as this pentine so long as it is absorbed. As soon as this
absorption ceases, the compound must be submitted to the action of a freezing minture of snow and salt, by which it is separated into two portions, one of which crystallizes while the other remains hquid even at $0^{\circ}$ Fah. The production o the liquid compound is favored by elevation of temperature. If the temperature of the essence
be raised to $212^{\circ}$ Fah. during the absorption of the hydrochloric actd, the liquid compound only it formed. Both the solid and the liquid are found on analysis, to possess the same composition. The solid body bas been termed bydrochlorate of cam-
phene or of dadyl. It orystalizes in white prisma, phene or of dadyl. It orystalizes in white prisma,
which have an aromatic smell and taste resembling those of ordinary campho:. It is insoluble in waThis artifclal camphor melts at $239^{\circ}$ Fab, and boils at $329^{\circ}$, at the same time undergoing partial
(20) H. L. asks: How can I make gasoline, for burning in a stove which I am constructing?
Gasoline is obtained as a product of the digA. Gasoline is obtained as a product of the dig-
tillan of petroleum. It is among the lightest olls that come over on the first application of heat, its volatility and inflammable nature ren-
dering it a dangerous substance in inexperienced bands. It would be cheaper and fafer for you to bands. It would be cheaper and fafer for you to
purchaseone of the stoves in question, and with it
explicit directions for its manipulation, rather than attempt the construction of one from any
directions that we could give you. This answers e veral other correspondents.
(21) A. B. says: We are using inkstand nem, as the log pood falls to the woiltom, nond above is clear water. How can I remedy this? $\mathbf{A}$. The common metals are not suitable for the construc-
tion of inkstands, no matter what variety of ink is employed. Glass vessels are the best and mos onomical.
(22)S. P. says: I desire to get a light from an oil lamp or a coal gas flame) that bas n
chemical activity or actinlem whatever. I under tand that a yellow light has no such activity, and that photographers use a yellowlightin their dark ooms withoutits exertiog any apparent efrect on the negative. How can I do this? A. The actin sm of lamp or gas flame is almost imperceptible. not require the colored glass you mention.
(23) J.P. O. asks : What chemical will de A. Tri mercurv
(24) W. J. F. says: Please give me a form ther method than pasaing dry bydrogen by an red oxide? $\mathbf{A}$. Y ce. The monoxide is thrown down from its solution as a bulky, whitigh hydrate, by
theaddition of a little solution of potaesa; it soon the addition of a little solution of potaesa; it soon
becomes brown, however, if allowed to remain in becomes brown, however, if allowed to remain in
contact with the air, by the absorption of oxy sen.
(25) C. D. M. asks : Can dynamite be dilu perties, so that it can be experimented on by inat the same time retain its character istics so that its actions may be understood? $\Delta$. Such experiments could not possibly be made free Prom danger
practicable.
Minerald, ETC.-Apedmena have been re seived from the following correspondents, and oramined, with the results stated
D. F. M.-It contains no silver.-J. C. H.-The inorganic constituents of the sample are alum-
ina (considerable), potasea, soda, lime, and traces ina (considerable), potasea, soda, lime, and traces of iron and strontia. It would require a complet whish form a very considerable portion of the whish form a very considerable portion of the incisa. We cannot eay whether this contains any irjurious matter or not ; but many of the gums of the same species have acid and intensely poison ous properties. We cannot clasiffy No. 2 withou

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published here. All such queations, when initial only are given, are thrown into the waste basket, as it would ill half of our paper to print them all; but we generally take pleasure in answering briedy by mall, if the writer's address is ${ }^{\text {eliven. }}$
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