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NEW YORK, APRIL 19, 1873.
[\$3 $\underset{\text { IN ADVANCE. }}{\text { per Annum, }}$

## STEAM PUMPING ENGINES FOR INDIA STATE RAILWAYS.

We herewith illustrate one of the pumping engines just completed by Messrs. Hathorn, Davis \& Campbell, of the Sun foundery, Leeds, England, for India State railways. These engines, says the Engineer, from which our engrav ing is taken, are of the vertical type, with six inch cylinders and eight inch stroke; the pumps are worked by means of a spur pinion on the crank shaft, and spur wheels on the countershafts; the pump rods are fixed to the spur wheels in such a way that the stroke of the pumps can be lengthened or shortened at pleasure. The engines run at 165 revolutions per minute, and the pumps at thirty revolutions. The pumps two in number, are double acting five and one quarter inches diameter by ten inches stroke, lined with prass, and are capable of delivering collectively, eighty gallons of water per minute, thirty feet high. The valves are arranged so that they can be got at without disturbing either suction or delivery pipes.
The engine and boiler are fixed upon a stone foundation at
little above the water level. The boiler is of the vertical type, five feet eleven inches high by two feet six inches diameter, with internal fire box, having two cross tubes. All the plates are three eighths inch thick, of best Staffordshire iron, except the fire box, which is of Farnley iron. The workmanship and material are alike excellent, and well main tain the reputation of the firm.

## Paint on Wrought Iron Plates.

This matter has been carefully investigated under the auspices of the Dutch State Railways, and the result was brought before the Society of Dutch Engineers by Van Diesen. Of thirty-two plates, half the number were plunged in diluted hydrochloric acid for twenty-four hours, then neutralized with lime (slaked), rinsed in hot water and while warm, rubbed with oil; the other half were mechani cally cleaned by means of scraping and brushing. Four plates of each kind were then prepared with one coat of red
lead, two sorts of oxide of iron, and coal tar. This was done at Harkort's works in July, 1867. The plates were then exposed to the influence of the weather for a period of three
years and re-examined, when it was found: 1. That the coating of red lead had stood well on plates of either method of preparation, therefore in this case no preference could be assigned. 2. That oxide of iron, by Kampand Soe ten, gave better results on plates cleaned chemically than on those cleaned mechanically. the coat on the former being in as good a state of preservation as the red lead. 3. That oxide of iron by Anderghem gives as good results on plate cleaned chemically as the two previous materials, but is in ferior to them if applied to scrubbed surfaces. 4. That coal tar is much inferior to any of the preceding; from scrubbed surfaces it had almost entirely disappeared.-Iron.

Award to an Edinburgh Engineer.
The late Lord Mayo, while Governor General of India, ffered a reward of $£ 10,000$ for a machine to clean and pre pare the valuable rhea fiber for the market. Mr. Greig, en ineer, Edinburgh, invented and patented an ingenious ma hine for that purpose, and about a year ago he proceeded to India in order to compete for the valuable prize. No other mpetitors wortiay of the name appeared at the trials Colonel Hyde, the Master of the Mint of India, was appointed by the Government to superintend the trials which took place at the Sahrunpore Botonical Garden. An American machine, belonging to the Government of India, did not compete; indeed Mr. Greig was, practically, the only com petitor. 'The report by Colonel Hyde upon the trial was published in a recent number of the Gazette of India. It is most suggestive, and is almost entirely in favor of Mr Greig; and the trials of the machine proved to be so hopeful that the Government paid over to Mr. Greig forthwith $£ 1,500$ of the premium. The fiber which was cleaned by the ma chine has been sent home for report. It has been proved by the experiments that no mechanic can succeed unless he has fresh rhea stalks to work upon, so that the fiber is to be fresh reas arice to ter the lists. Mr. Greig turned out the fiber at a cost of $£ 13$ 6s. 3d. per tun, not including interest on the cost of the machine.


## §rientific Ammicam.

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## TMRME.


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## the evil of trade organizations

We find in the Boston Daily Globe an explanation of the reason why so many young men rush to the cities to accept the position of clerks, while so few take to the trade of the mechanic; and we quote the paragraph for the purpose of founding a few remarks upon it

One Reason Whr.-The multiplicity of clerks and the scarcity of young men following trades in cities are matter then to it are almost universally derogatory to the first clas named. It may never have struck people that the school of instruction in the mechanical arts is practically closed nowa days. Any one who wishes can be a clerk, but not every one an be a mechanic, no matter how earnestly he may desire it The trade organizations, which limit and prohibit the taking a apprentices to various occupations, are cruel combination gainst the youths of the country, and crimina conspiracie growing up a vast community of idlers, hundreds of whom are driven, almost by necessity, into crime.'
There are two classes of persons who exert a very-baleful influence upon society; one comprises the capitalists who by combinations seek to close up the avenues of labor, and the other is made up of trade associations which prevent men from exercising their inalienable right to labor where they an find work. It is difficult to say which of the two is the more reprehensible. The despotism of capital and the tyr anny of the rich are favorite themes upon which to ring the changes upon all public occasions; bat the greater despotism of trades' unions has been permitted to pass without comnent. The result is that, as stated by the Boston Globe many men are not permitted to learn trades unless they will make degrading pledges, and they prefer to enter professions where such distasteful conditions are not imposed. The con sequence is that there is a dearth of mechanics and a plethora of clerks. Would it not be well for mechanics to reflect upon the great injustice of compelling everybody to submit to their dictation as to the manner of learning a trade and the right to practice it wherever and whenever the apprentice may please? Are they not really exerting a greater despotism and oppression than they ever have to endure at the hands of the rich capitalists of whom they so frequently complain? It is well known that in the United States, which boasts of its republican institutions, there are certain trades which no negro and no woman would be permitted to learn. It is true there is no statute law prohibiting any person of whatever shade of color or sex from taking out indentures of apprenticeship to learn anything they please; but there is a higher law of combinations, which is enforced with cruel certainty, that prevents not only the blacks and the women from having a fair chance in the struggle for exist ence, but also cuts off many a white man from following the bent of his genius. This goes to prove that it is always dangerous to play the part of an oppressor. The moment we become despotic in one thing we acquire a dangerous love of power and soon carry the thing to excess. The right of everybody to strive to become rich by honest, intelligent and patient labor is wholly inalienable, and it was to establish this right and the freedom to worship God according to the dictates of his own conscience that the Puritan first planted his foot upon American soil and laid the foundation of a future empire. We recall a few eloquent words spoken by Mr. Peter Cooper on the occasion of the presentation of an address from the graduates and pupils of the Union, and we cannot do better than to quate them here
" Let me then record that, during a long life passed in ac
to all classes, and especially to the innocent, to result fro strikes, lock outs, or other forcible measures designed to in terfere with the steady and regular march of productive in dustry ; and I feel justified in an earnest appeal to both work men and capitalists henceforth to regard each other as equals and friends; and to imitate the great example so recently set by the enlightened governments of Great Britain and the United States, in the submission of their differences to arbitration, and not to expect to reform social evils by combinations designed to force either side into the acceptance of unpalatable terms, by the stern logic of starvation and indiscriminate ruin. Reform, to be of any permanent value, must be based upon personal virtue, not force; and it seems to me that the millennium will nct be far off when each in dividual shall set about reforming himself rather than society, and conforming his life to the great law of loving God and his fellow men.
These are words worthy to be engraved upon the lintels of every workshop in the country; and if the precepts so eloquently presented by Mr. Cooper could be practiced by all classes of the community, we should hear fewer complaints of tyranny and oppression, and the mechanic would find his profession enriched by the presence of young men who are now driven to seek other avocations by the despotism of trad๔organizations.

## DRIVING POWER OF LEATHER BELTS

We have received many applications for iniormation about belting, and our columns have become encyclopedic on the subject; and our subscribers are now beginning to call for precise statements and for definite rules for proportioning belts to the work required to be done by them. We therefore present the following as a brief summary of some of the more important and most fully determined facts bear ing upon the subject.
The driving power of a belt may be limited by either of wo things, its friction on the pulley or its strength. If it slip easily on the pulley, the limit of its driving power is reached long before it is strained to its maximum of strength, and, consequently, the belt is inefficient. If the friction is very great, the belt yields, if overstrained, by breaking or by tearing out the lacings.
To secure the best effect, the endeavor should always be made to obtain the greatest possible friction on small pulleys, and the strongest possible belts and lacings, or other onnections, where the pulleys are large.
The relative frictional values of different surfaces over which belts may be run are given, by experiment, as fol

## Pulley of iron, covered with leather.... 35 per centum.

 polished.turned, but unpolished.... 30
25
15
To obtain greatest friction, the grain side should be placed next the pulley, as the friction is very much greater when so placed. The neater appearance of a belt placed with grain side out must be sacrificed if full efficiency is to be attained. This difference sometimes amounts to one third. With the rain side to the pulley, there is less liability to crack also Where pulleys are driven at very high speed, centrifugal orce has the effect of reducing the pressure of
pulley, and thus of diminishing its friction
The strain which is allowable upon a belt is variously esti mated by different authorities, but is most frequently given about 300 pounds per square inch of cross sectional area:
C. D. Abel gives one sixty-fourth of a square inch for C. D. Abel gives one sixty-fourth of a square inch for each five pounds, or 320 pounds per square inch.
General Morin gives 355 pounds as the strain, per square inch, which may be borne for a long time without injury Haswell gives 350 pounds.
From the facts stated, it will be seen that the width of belt required will be determined readily, when the power to be transmitted is known and the speed at which the belt is run.

Mr. J. H. Cooper, whose papers in the Journal of the ranklin Institute (January, 1869, p. 42) we have referred to before
ton:

$$
W=\frac{7,000 \times H P}{S V} ; \quad W=\frac{700,000 \mathrm{HP}}{S V \mathrm{~V}} .
$$

The circular of Hoyt Bros. gives $\mathrm{W}=\frac{5,334 \mathrm{HP}}{\mathrm{SV}}$.
$\mathrm{W}=$ width in inches ; HP = horse power transmitted $; \mathrm{V}=$ elocity of belt in feet per minute; $S=$ length in feet of that portion of the circumference which is covered by the elt; $t=$ teusion.
That is, by the first rule, divide 7,000 times the horse power by the product of the velocity of the belt and the length of that portion of the smaller pulley which the belt touches; the quotient is the width required in inches.
An old rule among millwrights allows a belt one inch wide, running 1,100 feet per minute, for a horise power.
Care should be taken in putting up belts to lace or otherwise unite them so as to obtain a uniform strain across the whole wi
Properly proportioned for its work, well made, well placed and properly cared for, a good belt should last many years, and then, if wide, may be cut into narrower belts for lighter work, and good service be obtained from it in its new appli-

The pulleys should be turned and polished, or. when small covered with leather. They should be carerully balanced for high speeds and, in many cases, tightening pulleys will
be found convenient, and sometimes indispensable, for ad-

## COPYRIGHTS.

The copyright law of the United States offers a variety of privileges of considerable value for business purposes, and we often wonder why they are not more extensively taken advantage of by enterprising individuals. One reason, doubtless, is because the scope of the law is not generally understood. We will therefore offer a few remarks upon the subject.
The 86th section of the patent laws of 1870 provides that any citizen of the United States, or any person resident therein, who may be the author, inventor, designer, or proprietor of any book, map, chart, dramatic or musical composition, engraving, cut, print, photograph, or negative thereof, or of a painting, drawing, chromo, statue, statuary, or of models and designs intended to be perfected as works of the fine arts, may obtain copyrights, which shall secure the exclusive privilege of printing, reprinting, publishing, completing, copying, executing, finishing and vending the same.
The
The copyright is in fact a patent, although not applicable to machinery. A copyright lasts for 28 years, at the end of which time it may be renewed for 14 years longer, by the author, inventor or designer, or, if deceased, by his wife or children. In applying for a copyright, no sworn papers are required, and no signatures; in fact, no forms or ceremonies are involved, nor tedious official delays. Parties who do not wish to attend to the matter themselves may for five or ten dollars have the copyright promptly procured for them by almost any respectable agent, the whole time required being only from two to four days.
There is no form of protection that is more easily obtained or which gives better satisfaction so far as it extends than the copyright, and the simplicity and excellent practical working of the law ought to afford useful instruction to those who constantly aim to add complexity to our mechanical pa-
Under the copyright law, it is to be observed that design or ornamental objects or configurations, prints, engravings, cuts, pictures, cards, and pamphlets of every kind may be secured. Almost every business concern finds it necessary to produce same peculiar woik of this kind, large or small. Thus if a man makes a new drawing of his building, his machine shop, interior of office, view of the town showing his works, or any new and pictorial form for a border, or design to be used upon goods, circulars, or other purposes, he may, by simply securing a copyright, prevent others from iritating the same. It is obvious that the uses of the copyight are very extensive.
But it should be remembered that the copyright must be ap plied for before the work is publicly introduced, or, in othe words, before it is published. A valid copyright cannot be had for a work that has been issued to the public prior to application for the copyright. Nor can a valid copyright be obtained for a mere trade mark, word, or name.
Further information in regard to obtaining copyrights may be had gratis by addressing Messrs. Munn \& Co., 37 Park Row, Solicitors of Patents and Publishers of the Scientific AMERICAN.

## THE SCOPE OF THE INFINITESIMAL

In a recent article on the astronomical effects of the ocean tides, we gave for the consideration of our readers some figres so large as to exceed all our ordinary notions of magni tude in regard to observation of time or extent of space; w will now pass to the other extreme, and contemplate some in initesimally small quantities, measured in space by milliont parts of inches and in time by billionth parts of seconds.
The first step in this direction was made by Isaac Newton when he calculated that the thickness of the film forming a soap bubble varied from 3 to 6 or 8 one millionths of an inch he accomplished this feat by observing the colors and comparing them with those produced when a lens with a convex ity of long radius is closely pressed on a piece of plane plate glass, those colored rings being then formed which are still named after him, and in which the determination of the dis tances of the surface, at different points corresponding to each other, is a simple problem of elementary geometry.
The first steps in determining short periods of time were made when it was proved that sound travels the distance of made when it was proved that sound travels the distance of
one foot in less than one thousandth part of a second, while light requires only the $1,000,000,000$ th part of a second to ght requires only the $1,000,000,000$ th part of a second to
traverse the same distance. When, later, the undulatory the ory of light became established beyond any doubt, it was found that the length of the luninous waves varied from a fourteen millionth part of an inch to a twenty-seven millionth; while in regard to their duration, it was proved that a wave of red light lasts the $450,000,000,000,000 \mathrm{th}$ part of a second, while a violet wave lasts only about half as long. Recently another step has been made in the research after the infinitesimally small dimensions of space. Whatever the nature of the ultimate constituents of matter, which we call atoms, may be, whether they have any material extent or are mere centers of forces of different kinds, one thing is certain, that their centers must be at certain distances; and investigations combined with legitimate deductions from the same have brought the investigators to agree that the distance of the centeis of the atoms constituting ordinary solid and liquid bodies is very nearly one $250,000,000$ th of an inch. This gives for one cubic inch at least $250,000,000^{3}$ or 15,625 $000,000,000,000,000,000,000$ atoms, a number most prodigi ous, as it is easy to calculate that a single drop of water, weighing one grain, contains as many atoms as there would be grains of ordinary fine sand in a layer covering our whole earth
to a depth of 1,000 feet. Those atoms are kept in place by the coöperation of attractive and repulsive forces balancing each other: they are connected in piles and groups, or molecules, each group containing definite numbers; and the agglomeration of these groups forms a regular atometic or molecular network, out of which the well known chemical formulas may be easily explained in a graphic way.
In the act of crystalization, these groups arrange themselves in a symmetrical manner, according to tie attractions and repulsions which place the molecules in position, wherefore we may consider the form of a crystalized substance as an exterior expression of interior hidden forces. This symmetric and uniform manner of arrangement explains at once why most crystals will, by heat, expand more in one direction than in another, why the light waves are transmitted in one plane or direction more rapidly than in another, and why this inequality in the distance of the atoms and groups of atoms or molecules will produce the phenomena of polarization and double refraction
The hypothesis of certain speculative philosophers that the ultimate limits of the investigations in matters of small dimensions is infinitely beyond human computations, as we know to be the case with the mattersof large dimensions, the distant recesses of the universe, and the infinity of space, as revealed by astronomy, is thus set at rest. We know the limit of the atomic distances, but also that, when we have improved our microscopes till we may magnify objects thousands of times as much in their linear dimensions as we can do now, we will still be utterly unable to see the space between the atoms.

## THE WRECK OF THE ATLANTIC

One of the most dreadful marine disasters that it has ever been our province to chronicle has recently taken place on the coast of Nova Scotia. The White Star line steamship Atlantic, one of the largest of the fleet of ocean steamers
plying between New York and Liverpool, on the morning of April 1st ran ashore and soon afterwards sank. The captain appears to have miscalculated in his reckoning.

When the ship struck, nearly all the boats were instantly swept away by the heavy sea, and in about ten minutes, according to the captain's statement, the ship keeled over on her beam ends, so that, with the exception of her bow and -ril, her hull became submerged and large numbers of passengers were drowned. Out of 976 persons on bo
were lost, most of whom were steerage passengers.
The experience of countless wrecks has established beyond peradventure that boats, however well constructed, are yond peradventure that boats, however well constructed, are
not to be depended upon; and each succeeding casualty, not to be depended upon; and each succeeding casualty,
with its scores of victims, renders more apparent the urgent with its scores of victims, renders more apparent the urgent
need for some method which will serve to lessen the dangers need for some method which will serve to lessen the dangers
of the sea. We have, repeatedly, brought up the subject, and at the time of the Metis and Bienville disasters of last year, we especially asked for it the earnest attention of in ventors. We now do so again, and we would more especial ly advise those who are now wasting their time and genius upon flying machines, perpetual motions, and other impracticable and useless schemes, to devote their full energies to this over-pressing need. We want an effective and reliable lifepreserving device. Let it at once be invented and proved capable, and the law is strong enough to compel its introduction and use.

THE PRESENT CONDITION OF ARCTIC EXPLORATIONS
At the present time three great scientific expeditions are exploring the arctic regions. The Austrian party, under Payer and Weyprecht, are near Nova Zembla and to the north of Siberia; the Swedish expedition under Professo Nordenskjöld is cruising north of Spitzbergen, and the Polaris, fitted out by our own government and commanded by Cap ain Hall, is still in the regions north of the American conti nent. Owing to the prevailing bad state of the ice in the
Arctic Ocean during the past winter, the crews of several Arctic Ocean during the past winter, the crews of several
whalers have been shut in on the coasts of Spitzbergen; several smaller expeditions have been despatched to their re lief. The steamer Albert. equipped by the Norwegian gov ernment and commanded by Captain Otto, sailed for Tromsoe on the 20th of November, but,on account of the tempestuous weather, was compelled to return soon afterwards, after having reached lat. $77^{\circ} \mathrm{N}$. The voyage was not without scientific result, as the temperature of the sea at the surface was carefully taken and found to be, even in the coldest weather, above the freezing point. At 230 miles northeast of the Isle of Baren, in lat. $75^{\circ} 45^{\prime}$, the temperature was found to be as high as $40^{\circ} \mathrm{Fah}$.
In spite of the ill success of the Albert, the sailors of Tromsoe lelieved that the western coast of Spitzbergen was pen, and that the Gulf des Glaces, the place where the hipwrecked whalers were supposed to be, was accessible The bark Isbjärn was therefore dispatched and reached Baren
on the 7th of January, only to return however, the captain on the 7th of January, only to return however, the captain reporting that to the north and easi the sea was ice as far as
the eye could reach. The weather was intensely cold, $-50^{\circ}$ the eye could reach. The weather was intensely cold,- $50^{\circ}$
Fah., and very stormy, while the season of perpatial nigh Fah., and very stormy, while the season of perpcitul nigh
was at hand. From this report, as compared with that of the Albert, it may be noted that there is no ice from the coast of Norway up to the Isle of Baren; but in the latte ocality, large quantities exist even in summer, being evi dently transported thither by a cold current. A third expe dition was fitted out for Bremen by M. Rosenthal, and consists of the steamer Groenland with 70 men. The vessel left on the 28th of January last, end although she has not been heard from, it is hoped that she has succeeded in penetrat ing the ice and relieving the survivors of the Norwegian whalers.
Dr. Petermann has recently publisheat a map of the north
ern coast of Siberia between the mouth of the Yenessei river and that of the Lena. This region will serve as a base for the operations of the Austrian expedition. Recent advices from Russia state that the President of the Geographical Society of St. Petersburg has introduced a plan of a new scientific exploration of the northern part of Siberia, which will be carried as far as the Archipelago of New Siberia. Without doubt, this expedition will be productive of valuable results. Already, on the banks of the Lena, rich mines of graphite have been found and worked, while the surrounding regions contain numerous remains of mammoths and other great mammifers of extinct species. The exploration of this zone is confided to M. Tchek his party left Irkoutsk during March last.
France is taking but slight part in arctic investigation. Some time since we mentioned that a M. Pavy was about to sail from San Francisco, California, but it appears that an affaire du cœur not only prevented his sailing but brought him to pecuniary ruin; consequently the expedition was abandoned. In England it is stated that Mr. Leigh Smith, who, with Captain Ulve, discovered the extension of North East Land (one of the great islands of the Spitzbergen group), three degrees of longitude further east than previous observations had indicated, proposes to revisit that region with a screw steamer of 250 tuns.

## SWINDLING OPERATIONS.

Some weeks since, we published an accouft of the nefari ous transactions of an individual in the neighborhood of Galesburg, Illinois, who carried on quite an extensive business in swindling inventors. Representing himself as a
patent agent and as having facilities for the sale of rights, patent agent and as having facilities for the sale of rights,
his plan consisted in inducing the patentee to forward his mis plan consisted in inducing the patentee to forward his ing the package in the express office and pocketing the money. More recently, it seems, the scamp has played a bolder game, and by a series of artfully worded letters, hold out tempting offers for state rights in inventions, has endeav ored to persuade owners of the same to forward to him, a agent, deeds thereof, fully executed and transferring title in the property to a hypothetical person no other than himself. How many he has victimized, we are not aware; but his career as W. A. Morrison \& Co. alias W. J. Reed \& Co. is
happily ended, as he has been arrested, convicted and safely odged in the penitentiary
We confess to but little sympathy for those who are foolish enough to forward the deeds of their patent rights to any person regarding whose honesty and responsibility they have not the fullest knowleage and confidence. An executed document of this description represents value exactly as much as title deeds to a house or bank notes, and like safeguards should be placed around all. There are plenty of adventurers in the country who stand ready to prey upon inventors-men who by offering dazzling bait too often succeed in swindling their victims out of the fruits of years of labor-and this reprobate who is now in the clutches of the law is but a fair specimen of the class. There is only one word of advice to be added, and that is to look well to the standing and char acter of all with whom you deal, and trust no offers which are not verified by your personal examination.

## RESISTANCE OF WOODS TO TORSIONAL STRAIN

Professor R. H. Thurston, of the Stevens Institute of Technology, communicates to the Journal of the Franklin Institute a description of an apparatus devised by him fo etermining the torsional resistance of materials, and also he results obtained by submitting specimens of differen producing torsion is transmitted through the test piece and moves a pencil which traces upon paper a curve, the ordinates of which are proportional to the torsional moment while its abcissus represents the amount of torsion to which the specimen has been subjected, thus indicating the relative stiffness, strength and resilience, of the material experimented upon,
very perfectly. The test pieces were seven eighths of an ery perfectly. The test pieces were seven eightis of an made from the following woods: White pine, S. yellow pine (sap wood), S. yellow pine (heart wood), black spruce, ash, black walnut, red cedar, spanish mahogany, white oak, hickory, locust and chestnu
White pine yields quite rapidly as the torsional moment increases. The maximum strength of the test piece was $15 \frac{1}{2}$ foot pounds, and it was twisted completely off at a tota angle of torsion of $130^{\circ}$. The substance is thus shown to have little resilience. Yellow pine has much greater strength stiflness and resilience. The sap wood is equally stiff with he heart wood, but sooner passes its limit of elasticity Spruce is less stiff than white pine even, but possesses
greater strength and resilience, its moment of resistance greater strength and resilience, its moment of resistance of torsion of $200^{\circ}$. Ash seems to be weaker and less tough than is generally supposed. Its most striking peculiarity is its very rapid loss of strength after passing its limit of elasicity. Black walnut is very stiff, strong and resilient, and is but little inferior to oak. Its resisting moment reaches 35 foot pounds, and one specimen attainer a total angle of torsion of $220^{\circ}$. Red cedar is stiff but brittle, and loses all power of resistance after twisting through an angle of $92^{\circ}$ A torsional moment of 20 foot pounds only produced a tota ngle of torsion of $50^{\circ}$. Spanish mahogany is very stiff and trong, It is deficient in toughness and resilience, lasing its power of resistance very rapidly after passing the limit of elasticity. White oak has less torsional strength than either
good mahogany, locust or hickory, but is remarkable for its
wonderful toughness. It passes its limit of elasticity at $15^{\circ}$, but loses its resisting power very slowly. The latter remains unimpaired to a torsion of $70^{\circ}$ and yields completely at $253^{\circ}$. Millwrights are evidently correct in holding this wood in high esteem for strength, toughness and power of resisting heavy shocks and strains. Hickory has apparently the highest ultimate torsional strength combined with unusual stiffness and considerable resilience. Its moment of resistance to torsion reaches a maximum of 58 foot pounds. Locust has greater stiffness than any other wood on the list, and stands next to hickory in strength; it is also very resilient.

## DIAMONDS APPLIED TO DRESSING MOLDINGS IN STONE

The Gear Stone Machine Company, of Boston, have recently exhibited in this city, a newly invented machine for working stone, which surfaces, makes straight and irregular moldings panels, letters, upon edges and faces, carves, and in fact operates upon the hardest rock with as much facility and with nearly the same degree of rapidity, that a steel cutter penetrates a wooden board. The apparatus consists in simply a horizontal arm working freely from a standard and jointed at the middle. Rotary motion is transmitted by belting to a vertical shaft at the outer extremity, to which the cutting instrument is attached. Suit able appliances are provided for regulating pressure, vertical movements, etc., of the tool, and the table is made capable of adjustment to any desired hight. The chief merit and efficiency of the machine lie in the use of carbons or black diamonds and their arrangements in the cutting tools. The latter are made of steel, and the diamonds are so secured in them as to conform to the shape of the style of molding required. The operation consists in placing a wooden pattern upon the stone and clamping both firmly to the table. The workman then grasps handles above the cutter, and thus causes the latter, while swiftly revolving, to follow the lines of the model
Trials conducted in our presence fully satisfied us as to the practical success and utility of the invention, as we saw the instrument cut moldings in stone, in a few seconds, which would take a man some hours to complete. The most refractory substances, such as hard granite, seem to present no more obstacle to the passage of the tool than the softest limestone, and the work is turned out finished with even more smoothness than would be possible by hand labor. For raised moldings, edge cuttings, and surfacing, the machine developes equal efficiency. There can be no question but that this is one of the most important applications of the diamond yet discovered, and its general introduction must tend to largely diminish the now great cost of preparing and dressing stone for building purposes.

## The Canadian Patent Office Record and Mechanics Magazine

A new publication under the above title has been recently commenced at Montreal, Canada, by the well-known publisher, Mr. George E. Desbarats. It is issued monthly at $\$ 1.50$ per annum, and embraces an official list of all patents granted in Canada, with the claims and reduced diagrams of the patent drawings. Added to this is a department of mis cellaneous information, containing illustrations of recent in teresting discoveries, general scientific news, etc. The whole upon its enterprising publisher, and deserves success.

## Tracing Papor

A convenient method for rendering ordinary drawing pa per transparent for the purpose of making tracings, and of removing its transparency so as to restore its former appear ance when the drawing is completed, has been invented by C. Puscher. It consists in dissolving a given quantity o castor oil, in one, two, or three volumes of absolute alcohol according to the thickness of the paper, and applying it by means of a sponge. The alcohol evaporates in a ferv min utes and the tracing paper is dry and ready for immediat use. The drawing or tracing can be made either with lead pencil or india ink, and the oil removed from the paper by immersing it in absolute alcohol, thus restoring its original
opacity. The alcohol employed in removing the oil is, of opacity. The alcohol employed in removing the oil is, of
course, preserved for diluting the oil used in preparing the course, pres
next sheet.
Artist's Rubber a yd ing Eraser.-Quive a useful arti cle of the above description has recently come under our no tice. It is made of a patented composition and rubs out pencil marks with great celerity. As an ink eraser it is much superior to any of the compounds known to us now sold un der the name, as it actually removes the ink, while it excels the ordinary scraper by leaving the paper with a surface that can be immediately written upon. It is supplied in a variety of convenient forms, at very reasonable prices, by Mr. J. H. Green, of No. 26 Beekman street in this city Dealers in stationery and artist's materials will find this a profitable article to keep in stock

Progress of the Hoosac Tunnel in March, 1873. Heading advanced from east end westward, 155 feet; from west. eastward, 162 feet; total extension of headings during March, 317 feet. Total lengths opened to April 1st, 22,79? feet; remaining to be opened, 2,238 feet, being 402 feet les than half a mile.

A Large Diamond.-The finding of a $288 \frac{1}{2}$ carat diamond at the diggings at Vaal river, South Africa, is announced It is alleged to measure $1 \frac{1}{8}$ inches in diameter, and is there It is alleged to measure 18 inches in diameter,
fore one of the largest diamonds in the world.

New Jewelers, Tools.
M. Capitaine has devised several new tools for jewelers' use. His boulet coussin comprises in one instrument more than 300 matrices or forms of the usual descriptions mostly em ployed for shaping plates of gold and silver. It replaces the above number of dies in the workshop. The chasse pierre is a portable pincers, having on one part a steel tooth and in the other a cavity of variable dimensions. Its object is to remove delicate gems from their settings without endangering their being accidentally dropped. The same inventor has devised a way of setting precious stones upon concealed springs which allow them to move and appear more spark ling, and has also introduced bronze forms in the shape of truncated busts marked with radiating lines on which necklaces of jewelers can be fitted and the position of the stones or divisions of the work adjusted.

An Egg Within an Egg.
D. L. M. says that a resident near Grater's Ford, Pa., found on March 4, a hen's egg as large as a goose egg. J.t weighed our ounces, and was three and a half inches long and seven inches around the middle or shorter diameter. The shell is very thin, hard and a little cracked. The egg, on being opened, was found to contain a yolk and albumen or white and another perfect egg. The inner egg is two inches long, five inches around the middle, and weighs one and a half ounces.

## WEATHER THRESHOLD

Our engraving illustrates the application of an improved self-adjusting weather threshold to an ordinary door, the object being to prevent the entrance of drafts of cold air and dust, by closivg the space between the bottom of the door and the floor. A portion of Fig. 1 is broken away in order to show the working parts, which are represented in section in Fig. 2.
A is a metal plate secured by screws to the sill, and, be side protecting the latter from water, may serve to hold down an end of the oil cloth or carpet. B is the movable door strip, provided with lugs at either extremity, which enter sockets in small metal plates fastened against the door frame

at C. D is a spring lever pivoted in a recess, as shown, and connecting at its lower end with a rod which enters a pocket, E, formed in the door strip, B. When the strip lies flat upon tho plate, A, which is the case when the door is open, it swings the lever, D, so that its upper end projects inward from the door frame. As the door is shut, its jamb strikes against this projecting extremity, forces it in, and so moves the lever, causing the latter to swing the strip, B, into aninclined position. The strip then fits closely against or, as in dicated in Fig. 2, into a rabbet in the bottom of the door this completely closing the aperture underneath.
The mechanism of this invention is simple and easily reached for repair, while it is probably of a more durable nature than the ordinary weather strip.
Patented through the Scientific American Patent Agency, January 21, 1873. For further information, address the inventor, John W. Kramer, Bloomsburg, Columbia county, Pa.
M. Sortais, in France, has invented an electrical device which is placed in the holds of vessels. In case of a leak or the entrance of too much water into the bilge, a current is established and a communicator is set in operation, signifying the fact to the commander and the officer of the deck.

THE velocity of circular saws at the periphery is from 6,000 to 7,000 feet per minute, or from 7 y to 80 miles per hour.

## RECORDING BAROMETER.

A is a fine balance lever with unequal arms and a regulating weight. $B$ is a barometer tube, which is connecte with one end of the lever. and the lower end of which dip in a trough of mercury, C. To the other extremity, K, of the beam, a pencil is attached. U is a clock, which, when in action, moves the rack, $Z$. This rack is connected with vertical paper covered board, T, which is in contact with the pencil of the lever, and rests on rollers.
The action of the inscrument is thus evident. The motion of the mercury in the barometer causes the lever to move up nd down, and the pencil at the end of the longer arm make trace on the paper, which is gradually being pushed along according to the rate of the clock.


Time divisions are indicated on the paper, and it is recom nended that a small hammer be made to tap the barometer ube occasionally, in order to prevent adhesion of mercury A recent number of the English Mechanic describes th bove, and statesthat it is the invention of Professor Brahns, of Leipsic.

## PIPE TONGS.

This invention is an ingenious form of pipe tongs adapted fit any size of pipe. It is made in two portions-

straight lever, A, and a hooked lever, B-the former passing through a slot in the latter. The back of the straight lever is notched and a serrated fulcrum piece, C , is pivoted in the slotted lever by a pin upon which the lever, B, receives its upport when the tongs are in operation. The fulcrumplece is provided with a spring which retains its serrated edge in proper position to engage the notches in the lever, A. By either desired direction. When the tongs areopen, the lever A, can be moved within the slot and adjusted so that the in A, can be moved within the slot and adjusted so that the in
strument will fit on any size of pipe. The fulcrum piece, C being pivoted, allows the full length of its serrated surface to come in contact with the similar portion of the lever, A so that the parts always have a firm bearing upon each other and be subjected to an equal strain and wear.
To Mr. Andrew B. Lipsey, of West Hoboken, N. J., is due the credit of this device. Patented September 17, 1873.

## A Photo-Improvement.

An improvement in photographic printing, by W. H. Ja coby, Minneapolis, Minn., is as follows : If the printing is to occupy one minute, the sensitive paper is exposed in contact with the negative for forty-five seconds, and the paper is then separated from the negative to a distance of, say, one eighth of an inch, and the exposure continued for fifteen seconds. This produces a sort of double printing, and imparts a soft mezzotint effect to the picture which is very pleasing. The separation of the paper from the negative is done by means of a peculiar construction of the printing frame.
a Winking Sitter.-At a recent meeting of the Boston Photographic Society, Mr. Burnham explained some experiments he had made for the purpose of getting the eyes of at man who winked 364 times in one minute. The feat was accomplished by placing in front of the subject a black screen, with a hole large enough for the tube, and at the same time shutting off almost all of the light, giving (say) thirty seconds' exposure to the subject, and then holding before the lens a black velvet cloth for some thirty seconds. The eyes were perfect, and the experiment was successful.
By means of the spectrosccpe, astronomers have found tha the atmosphere of Uranus is alriost entirely composed of hydrogen gas. M. Protier remarks that if a very small proportion of oxygen also existed there, an electric spark would cause tremendous convulsions by combining the two gases.

## A SUBMARINE OBSERVATORY AND PHOTOGRAPHIC

M. de Toselli has recently invented an apparatus which allows of descent to considerable depths in the sea, in order to examine the natural productions and to take photographs of them, without inconvenience to the observer from press ure of air or of water, or other causes. He calls his machine a taupe marine, or marine mole. It consists of a long case, as shown in the annexed figures, taken from the English Me, chanic, and is divided into four compartments. The cham ber, A, is filled with lead to keep the machine vertical. Into chamber, B, water may be admitted by a stopcock, and can be expelled by means of the hydraulic pump, P. The chamber thus serves to increase or diminish the weight of the machine, so that it may sink or rise in the water as wished. The operator occupies the large chamber, C. The top chamber, F, contains respirable air, and is charged according to the time to be spent in the water. I is a cock by which the air is admitted into the principal chamber. G A is a metalic abductor tube, with stopcock, 0 , meant for expulsion of vitiated air. A caoutchouc tube from the upper extremity leads to a float, $l$, which has a valve allowing the egress of air, and preventing entrance of water.
The mole has a rudder and a screw (wrought by hand), which allow of its being slowly propelled in the required direction. $M$ is a manometer, showing the pressure of the water, and thus the depth reached. N is a manometer, indicating pressure of condensed air at disposal in chamber, F . $R$ is a rope connecting the mole with a vessel. It contains a metallic wire, by which and the telegraphic apparatus, $Q$, communication may be held with the captain of the ship. $U$ is a manhole by which the observer enters. It has a double lid, and can be opened from without or from within. V are mall glass windows of observation. $Z$ is a seat, which may also serve for wardrobe.
The following difficulties are discussed by M. Toselli :-1 Suppose the abduction tube for vitiated air to be injured, so that it were necessary to close the cock, 0 . In this case the apparatus would immediately be raised for repairs, and, if necessary, the stopcock, $\mathbf{Y}$, of the second abductor tube might be opened; this tube having also a valve at its upper end.
2. Suppose the electric wire broken, and it were necessary to communicate with the ship. The mole would be raised till the upper mouth of the speaking tube, I J, was above water, so that the observer might speak through it.

3. Suppose the hydraulic pump deranged so that the mole would not rise. Telegraph orders to draw up.
4. Suppose the pump, the wire, and the rope, to be all in jured. The operator might then set free the weight, $S$ placed under the mole, and connected with it by a screw above.
5. Suppose, as an extraordinary case, that the ship were wrecked. The operator would first detach the rope at B, then rise to the surface, and having ascertained the right di rection, proceed thither. For this purpose the mole is furnished with an artificial eye, $r$. This is a camera obscura, which, with the tube, $W$, enables the observer in the machine to see external objects as ships, rocks, etc. He can turn the tube in any desired direction.
Costus Root.-Dr. John R. Jackson, Curator of the Museums, Kew, states that: Its chief use is by the Mahomme Museums, Kew, states that: Its chief use is by the Mahomme-
dans for burning as incense, but the Chinese also use it as an aphrodisiac. In Cashmere its only use is for preserving the celebrated cashmere shawls from the attacks of moths, pieces of the root being putinto the bales in course of packing. When dry the root is of a dark brown color, very brittle and apparently full of resin, but it does not burn freely. It has a strong but agreeable odor, similar to that of orris root.

## [For the Scientific Ameriean.]

## MANUFACTURE OF COMBS.

Very few persons understand how the combs, which we have in such daily use, are made. As we have recently had an opportunity of visiting a comb factory, we propose to give a slight sketch of the work.
The processes which each comb undergoes are many, though simple. In the first place, the rough horns of cows and oxen are brought in immense quantities to the factory. Each one is then marked for cutting. Some are marked in a circle,

Fig. 1.

others in spirals (Fig. 1), so as to give a long strip, from which the round combs are made. After the marking, a rotating saw cuts them into these shapes, and also longitudinally, in order that they may be opened. The tips of the horns are of no use in making the combs, but they are by no means wasted; all are carefully preserved for making um brella and knife handles. The horns are now boiled for four or five minutes in oil; whale oil is most common for this purpose. This softens the horn, renders it tough and somewhat flexible. A workman stands ready to take them from the oil, and places them, open, between flat bars. These bar are so arranged that a slight fire of charcoal in the center,

Fig. 2.


A, Fig. 2, keeps the horns warm enough to work with. By means of a wheel connected with the bars by the axis, B C, a very great pressure (of 400 tuns) is applied which, in three or four minutes, makes them perfectly flat. All the oil has been squeezed out, and the color changed from an opaque white to the translucent amber of the tortoise combs. As soon as they are taken from this pressure, they are cut into shape. This is easily done. The workman is provided with a variety of iron forms (Fig. 3), and uses the one most in de-
 mand and that will cut to the best advantage. He places the form on the horn, and with a single blow cats it out. Of all kinds, except the fine combs, two are cut at the same time, their teeth interlacing. The material is sometimes of unequal thickness, and in order to remove this difficulty they are
passed under a great pressure
The next process is that of cutting the teeth. This is one of the most curious and ingenious parts of the work. The ordinary dressing combs are heated so as to soften and make them malleable Then they are placed on an iron, E, Fig. 4 , the size and shape of the comb, having ridges, both fine and coarse for the teeth. This is under a ma chine with a sharp knife, D, attached, which, on being started, moves up and down, cutting the fine teeth. It stops of itself, requires to be slightly re-adjusted, and then cuts the coarse teeth. The two combs are
 then torn apart.
Next they are rubbed on a wheel covered with emery or some other rough substance, which takes off some of the superfluous material, but adds no polish, After this they are wasked to cleanse them from the dust. On another wheel they are pointed. They are then placed in hot sand in order more effectually to soften them, and any little irregularities, such as the projection of the teeth too far at the end, are easily remedied by pressing the pliant horn.
The next process is polishing. This is done by rubbing them on wheels covered with emery. In fact the combs are continually going through the hands of workmen who, rub bing them a few times on the emery, add a little each time to the polish, until the last one puts the finishing touch to the whole work. This completes the dressing combs. The fine combs have the teeth cut in a different manner from the others. Each comb is fastened on a machine which moves back and forth against a saw. The machine is so arranged that as each tooth is cut the comb is moved slightly to the left to present a place for the next tooth. When the teeth are all cut, the machine stops and the comb is reversed. The grooves are made by passing the combs under a machine which scoops them out. After all the teeth are cut, the combs are picked out with a pin or needle, and brushed to get rid of any of the horn which still remains between the teeth. A polish is put on, and they are ready for packing.

After the long round combs, which are worn by children, are polished, they are laid on a hot iron. When heated, they are flexible and easily bound around a smooth cylindrical beam, where they remain until cold. When taken from this, they are in shape and ready for market. To some of them, however, a small piece is added, which stands up on the top. The ends, F G, Fig. 5, are bent over and fastened to the comb by small rivets. Colored ribbon is wound around'the
other parts. This is a new style and, to us, not very pretty But it affords variety, and will undoubtedly find ready sal among children.

Fig. 5.


Most of the round combs, and some of the dressing combs are made of rubber instead of horn. This is prepared i Edinburgh, Scotland, and imported.
The high back combs which are very much worn as orna ments, after having the teeth cut, are each shaved by hand a little, and also by a machine. Then they are pointed, washed polished a little, and carried to the engraver, who carve from a pattern. His only tool is hollow, much like a chise (Fig. 6); with this he scoops out the various figures and Fig. 6. curves. The combs are colored black, with ace-
tate or sugar of lead, and, in imitation o tortoise, with lime, li tharge, and potash They are then heated and placed on molds to give them the requisite form. The difference beween the real and imitation tortoiseshell is that the rea has a much richer, more reddish color.
In this work nothing is wasted. The horn dust is of es pecià value as a fertilizer, and is carefully saved for that purpose.
One of the largest comb factories in this country is at Wappinger's Falls, N. Y., Elias Brown \& Co., proprietors. Their product exceeds a hundred dozen in a day.

## A Cure for Girdled Trees.

Since the winter of 1867 and 1868 , there have been none more favorable for field mice, says the New York Tribune than the one just ended. Over a wide range of country the ground was covered with a heavy body of snow in December. This was added to by frequent storms, and it remained during the entire season. In closely planted orchards, the snow was piled in places several feet in thickness for eigh r nine weeks, and afforded just the conditions most propitous for these active pests.
Under such circumstances it will be strange if, on disappearance of nature's blanket, thousands of fruit trees are not ound girdled, especially those standing in or near grass land. Trees from which the bark has been gnawed all around and six to twelve inches in width, are sure to die within a year unless prompt make conction be make be and that below the wound. The prescrip tions which have been published from time to time are as numerous as flies in midsummer, and most of them as unsatisfactory. Where only a third or a half of the circle has been made, leaving a connecting strip then, by covering the bare part with a coating of cow drop pings and yellow clay, the young bark will grow over the mound much sooner than if left exposed. Where there is no such connection, however, the best and most simple method of forming one-and the method that never failsis to insert scions (one, two, or three, as the case may re quire), bridging over the barked part as in the foregoing picture, which is an exact drawing of a pear tree that four years ago was girdled, and (with many others similarly treated) is now in prime condition. The method is simple and rapid, and most any one can do the job without difficuly. Take the scions of last year's growth of wood, from young healthy trees, cut them the right length, bevel each on the same side at both ends. Then, with a budding knife, raake an incision in the bark of the tree abov and below the injured part, and carefully press the made with grafting was and then wind around the nade wo the the row strips of bass matting, which will keep them firmly in place. For trees from which the bark has nly been gnawed half or two thirds the way round, one or two scions will be sufficient; but when there is no connection left, it will be found advisable, particularly on a large sized tree, to put in three scions. The work may be done at any time between the 1st and 10th of April. The figure at the left represents a scion prepared for setting in the way suggested. When we consider the ease with which damage by mice may be remedied in this simple manner, the person ho permits his girdled tr

THE locomotive returns from fifty-one railways, for No vember, 1872, published in the Railroad Gazette, show an average expense of $22 \cdot 13$ cents per mile for each locomotive 2,682 locomotives were employed, and they traveled a tota distance of $6,958,616$ miles.

## IMPROVED WATER FIRE-GRATE

This is an improvement by R. J. Eilis, Liverpool, England and recently published in the Engineer. Our engravin shows two methods of construction, one showing cast iron bars having the water channels formed in them, the other a bent wrought iron tube.
It will be noticed that in each of these arrangements the bars are fixed at one end only, the other end merely resting on a bearer, so that the bars are quite free to expand or con ract. The bearer to which the bars are bolted contains two channels, F G, communicating with the passages through the bars, as shown. The feed water for the boiler is pumped into the channel, F , in the bearer, whence it circulates through the bars, returning to the channel, $G$, from which it passe off to the boiler in a highly heated state. The joints be ween the bars and bearer are made tight by suitable pack ng rings.


It is claimed by Mr. Eilis that this arrangement of bar not only forms an efficient feed water heater, and adds ma terially to the heating surface of the boiler, but that from the bars being kept comparatively cool, trouble from clink ering is avoided. The plan of pumping through the bars insures a good circulation through the latter, and the sys tem of construction admits of the bars being readily removed from the bearer for the purposes of cleaning or renewal if necessary.

## 

## Fire Alarm.

To the Editor of the Scientific American:
Some time ago you published an article in which I described fire alarm, made with strips of sheet zinc and iron soldered ogether, there being the metals which differ most in expans bility. Wood is so little lengthened by heat that it is used for pendulums of clocks; and I havetried a piece of a tube f zinc (the most expansible of metals) such as is used to onduct bell wires, 18 inches long, laid on a piece of wood with one end of the tube fastened to it, At the other end of he tube is a small hole made in the side, into which is in serted a pin or point of the short end of a 6 inch lever moving on a pivot $\frac{8}{8}$ of an inch from the tube, giving the ong end fifteen times the motion; this can be moved suff ciently for a fire alarm by the heat of the breath blown
 through the tube, ihus I made another by adding an additonal lever the tube, with lever fastened to the board at

## , b and c , thus :



This latter will increase the motion 150 times; and in om at a temperature of $65^{\circ}$, the heat of the hands will mo the end of the second lever an inch and a half.

## The Power of Compound Levers

## To the Editor of the Scientific American:

Having noticed, on page 195 of your current volume, ommunication from J. C. C. as to the power of compound evers, I herewith give the equation for the same, togethe ith a solution of his problem
The form of compound lever known in mechanics as a "knee joint" has for its proportion P:W::2R:tan$\frac{1}{\frac{1}{2} a}$ being the angle between the bars. Now J. C. C. desires to know what power would be exerted on the head, A, when he joint is acting at its fullest efficiency, the power arm of he lever, C, being to the weight arm as 8 to 1 . A glance at the proportion for the "knee joint" shows that it matters

not one iota whether J. C. C.'s bars be two inches or two eet long, or whether the value of his lever be 8 or equal to that of Archimedes. The power of the knee joint, when the gle between the bars approximates to $180^{\circ}$, is approxi mately infinite; for, just in the same ratio that the extreme
$\tan \frac{t}{2} \mathrm{a}$ increases, the other extreme, P , diminishes, and when $\frac{1}{2} a=90^{\circ}$, its tangent $=\infty$, hence $P$ is then infinitely small. Conversely, when the bars are together, P must become $\infty$ The following equation gives the value of the lever or joint for all angles: $W=P \frac{1}{2} d \div 2 h$, or $P: W$. :: $2 \mathrm{~h}: \frac{1}{2} d ; h$ being
the hight of the joint from the plane on which it slides, and the hight of the joint from the plane on which it slides, and
$d$ the distance from F to I.
R. D. Williams, Ph. D. d the distance from
Baltimore, Md.

## Construction of Dwellings.

To the Editor of the Scientific American:
In J. H. L.'s communication, printed on page 180 of your current volume, there are a few improvements required to make just such a house as I think he wants. He proposes filling in between the studding flush with the inside and outside, then plastering upon the filling without furring off, as
is usual. His house if so constructed, will be damp upon is usual. His house, if so constructed, will be damp upon the inside; and by this, I mean to say that almost all damp walls are so, not from passage of damp through them, but by condensation of inside moisture; if there be an air space
between the plaster and the wall, his house will be warmer because such space is a nonconductor. Therefore, to follow out his plan in part, I will commence with drain tile, as recommended in an excellent article in the Scientific Amer ican of March 22, entitled "Complete Drainage of Dwelling Houses." After getting the drain in place, I should run up a foundation of stone or well burned brick; on top of foundation I would lay $2 \times 8$ plank all around for sills; place the joist, and secure it from toppling over with strips. Then nail the joist into the sills, and erect the rest of frame, rest ing the foot of the studding upon the sills and against the
joist, to which nail securely. Carry foundation to top of first joist, to which nail securely. Carry foundation to top of first
floor joist. I find that more cold comes in through floors than warm air escapes by absorption or bad joints in walls; therefore I should nail strips, three or four inches from top of joist on each side, and cut in any waste lumber upon which I should spread mortar (concrete would be better) to within an inch of the top of joist; and I would serve the upper floors the same. In laying floors, run the flooring back again, filling in walls; this will form a preventive against fire. Now when the four inches of filling is in place, I would fur off with inch strips and lath before plastering; or I would start in the beginning with six inch studding, making a two inch space of air in place of one, as in the furring mentioned. As for fire, if the brick or stone foundation is carried to top of joist, the flue J. H. L. speaks of is closed at bottom; if the upper floor is carried back to filling in, we have stop number two; then the plate upon top of wall forms the third stop in
flue. And we have as nearly fireproof a house as the genflue. And we have as nearly fireproof a house as the gen-
eral run of brick buildings, if not better. Even in houses with no filling between studding, if the floors are carried back to the sheathing, or pieces cut between studding at this point, the mortar that always falls from the clinch will make an almost air tight joint. But carpenters who take a job of building, competing with perhaps a dozen o hers, cannot be expected to do any little extras, and now-a-days buildings are oftener thrown together than otherwise, built to sell, stylish outside, relying too often on paint and putty to cove bad joints.
Chicago, Ill.

## Relics of the Mound Builders.

To the Editor of the Scientific American :
On page 184 of your current volume, in an article entitled "The Relics of the Mound Builders," occurs the following sentence: "The most peculiar feature about the formation
of the skeleton was that the arm at the shoulder connected of the skeleton was that the arm at the shoulder connected with a short strong bone that was connected firmly with the
sixth joint of the backbone, counting from the head." A sixth joint of the backbone, counting from the head." A
bone reaching from the shoulder to the sixth cervical vertebra is a new feature in human osteology. This excited my curiosity, and I wish to enquire if other skeletons of these mound builders have not been found; and whether this extra bone is common to them all, or whether this is a single example, and ought to be looked upon as a lusus natura? If common to all, then we have some fragmen: ary knowledge of a race of human beings entirely unrelated to the race of Adam, but another and extinct species of the same genus. say another, for the skeleton found in one of the caves o Italy, in immediate juxtaposition with the skeletons of the extinct tiger, cave bear, etc., shows pretty conclusively tha these animals and man existed contemporaneously, probably long before Adam and Eve were created. In saying this do not wish to be understood as denying revelation or any of
the truth contained in the Old Testament the truth contained in the Old Testament. Of course it could not be expected that Moses, from his very limited means of knowledge, most of which was legendary, would attempt to enlighten mankind about the fossil remains of extinct men and animals, of which he could know nothing. Geology shows very conclusively that creation and extinction have
been the natural order of nature, that the conditions favorable been the natural order of nature, that the conditions favorable to a given form of life have ceased, and therefore, that that is the fossil remains belonging to this or that geological age. Fossil remains of many animals and plants exist in latitudes where the living specimens have ceased to exist for an indef inis Italian skeleton and, perhaps, these mound builders also were of species extinct long before our progenitors were created. This being true does not necessarily fix the stigma of untruthfulness $r$ Moses, for he could not be expected to know why the combined researches of science for ages have
but $j$ ast unfolded. Hishistory was in accordance with the but $j$ ast unfolded. His history was in accordance with the
best light he had, and he undoubtedly believed it to be true.
R. K. Slosoon.

## Deep Sea Soundings without a Rope.

## To the Editor of the Scientific American:

The present mode of obtaining deep sea soundings is exit re laborious, and by no means satiffactory. Not only surface of the latter enables any deep oceanic current to carry it away from the perpendicular and so mislead the observer.
Recognizing these difficuities it occurred to me some years since that it might not be impossible to dispense with the rope altogether and to ascertain, at least approximately, the relative depths of various parts of the ocean with infinitely less trouble. By letting a stone fall down a shaft, and careflly noting the interval of time between its movement from the surface and its arrival at the bottom of the shaft, it is
easy to determine the depth of the latter, which is the distance traversed by the falling body. All systematic works on natural philosophy give the rules for estimating the space passed through during each second by a heavy body falling
in air. And it is surely possible to obtain the same informa in air. And it is surely possible to obtain the same informa. tion with respect to heavy bodies falling in water or light bodies rising in it. Now the plan which I have in view for deep sea soundings is based on the same principle as that long used to determine the depth of shafts, namely, by simply noting the time required for the falling body to reach the bottom ; but in the ocean depths we could not readily tell when the weight touched the ground, and therefore a more complicated, but by no means insuperable, problem is there presented. Thus, if a body specifically heavier than sea wa ter is allowed to sink at the surface of the ocean, it will at the end of a certain time, varying with the depth of water strike the solid ground below the latter; and if at that mo ment the specific gravity of the body can be so changed that it becomes and remains lighter than water, it should at once begin to ascend until it again reaches the surface of the sea. Then by simply observing the time required for the descent and ascent of the body, and dividing that time properly according to ascertained laws for the descending and ascending movement of the body, the ocean depth at the spot would be approximately known. The arrangement which I should propose may be outlined in a few words. Have a strong iron cylinder, with a close fitting piston, so contrived that when the latter is at the top of the cylinder, both being placed verically, the apparatus will readily sink in water; but when he cylinder is filled with gas, the piston being at the bottom the cylinder so as to retain the gas and being prevented from compressing the gas by a mechanical contrivance, the apparatus will be lighter than water and consequently ascend
in it. There is no difficulty about the sinking of the appait. There is no difficulty about the sinking of the appa
ratus, and the ingenious devices now in use, for detaching ratus, and the ingenious devices now in use, for detaching
extra weights and causing sand, etc., to adhere to part of the apparatus, might also form part of this arrangement. For changing the specific gravity of the apparatus at the botom of the sea, I would employ a simple contrivance like that of some of the earlier torpedoes, by means of which some gunpowder, placed in or near the top of the cylinder, should be ignited. As soon as the apparatus struck the ground, the resulting gases would force down the piston and fill the whole space of the cylinder so that it should at once become lighter han the surrounding water.
Believing that any plan tending to facilitate the acquisition of more correct information respecting the depth and bed of the ocean is not without some public interest, I submit these ough ideas to the consideration of those more immediately nterested in the subject. It is gratifying to observe that
ivilized governments are now more than ever recognizing civilized governments are now more than ever recognizing
oceanic science as a common field for peaceful international rivalry; and the naval department of the United States, espe cially in connection with the official labors of the late Captain Maury, has already honorably distinguished itself in this great and useful work. Experiments of the kind now would are beyond the means of private individuals, may legitit to be among
New York city.
George Robinson, M. D.
The comet of 1866 and the November Meteors. To the Editor of the Scientific American:
It is now admitted that the comet of 1866 and the meteors of November 14 move in the same orbit, and that the latter re the débris of the former's disintegration. This comet near its ascending node, passes almost exactly through the of its path is due to the disturbing influence of that planet. The date of this change in the cometary orbit is fixed by Leverrier in the year 126 of our era. That the first appulse,
however, of the planet and comet must probaily have occurhowever, of the planet and comet must probaoly have occur-
ed at a more ancient epoch is undoubtedly indicated by the following facts:

1. The meteoric showers observed in the years 931 and 934, as compared with those seen from 1866 to 1870 , show last 9 ivively that the lengthening of the meteor cloud in the lelion passars has been less than that between the first peri the diffusion of meteoric matter in the early part of the tenth century was too great to have been effected in so short a period as 800 years.
2. Dr. Oppobser's period of the comet of 1866 , computed rom four weeks' observations, is $33 \cdot 176$ years, and this is the value which indicates a close approach to Uranus in A. D.
3. This period, it must be admitted, is liable to some 126. This period, it must be admitted, is liable to some
uncertainty. Have we any probable data by which it may uncertainty.
The identity of this comet with that of 1366 was suggested
jecture which subsequent research has strongly confirmed. It is also probable that the comet observed in China on the 29th of September, 1133, (Williams' ' Observations of Comets," p. 65,) was a former return of the same body. The interval petween 1366 and 1866 is equal to 15 mean periods of 33.283 years. With this value of the periodic time and the known secular variation of the node, it is found that the comet and Uranus were in close proximity about the beginning of the year 547 B. C. It is not improbable, therefore, that the former was at that time thrown into its present orbit by the attraction of the latter.
If then, as seems highly probable, the comet of October, 1866, was a former return of that which passed its perihelion in January, 1866, it is easy to find that the same body will make a near approach to the earth about the 16th or 17th of November, 1965, and to Uranus in 1982-3. At one of these epochs the cometary orbit will probably undergo considerable transformation.

Daniel Kirewood.

## The Boller Explosion at Conshohocken, Pa.

To the Editor of the Scientific American:
We notice in your issue of April 5, in your Answers to Correspondents, a communication from W. S. B., who says mined the boiler know the high standing of the Scientific american as well as its proprietors, before the public, we think you do not wish to have us misrepresented or to let errors and falsehood go uncorrected. If we saw what W. S. B. says in some of the sensational newspapers, we would let it go unnoticed; but cannot do so when it appears in your widely circulated but cann
We reply by saying that every word that W. S. B. says in that communication is false and malicious from beginning to end; and we only wonder what inducement or expectations Mr. W. S. B. can have in view in publishing such a string of falsehoods. He cannot find any part of the exploded boiler three sixteenths of an inch in thickness; it is all here yet and can be examined at any time. There were not so many persons killed as he represents, and none of the wounded are crippled for life, all being well and at work. We never carried 125 lbs. pressure on the boilers, but only 85 lbs. and we never exceeded it. There is no boiler here with 18 patches upon it, and never was, or anything near it. He never saw such a boiler here in his life. He never heard the proprietor say last summer, in reply to the engineer's opinion that they were carrying too much pressure (from 100 to 110 lbs.) that it was all nonsense, that those boilers were able to tand 150 lbs. pressure. He never heard such a remark in his life or any thing like it. He has made this story up out of the whole cloth. He says the trouble was that they want d one man to do three men's work, and one man was doing it for less than one gor,d man's wages. How absurd is this statement! A man is not likely to do three men's work for one man's wages, as you well know. The fact is that the engineer in charge of the boiler at the time had the engine to stop and start two or three times on his turn; he had six boilers to attend to, looking after the water only (no firing to do), beside oiling; this was about all he had to do whilst running, for which we paid him twenty-two dollars per week; about seven dollars per week more than engineers get here or running at blast furnaces where they run seven turns per week, and about six dollars per week more than most engi neers get for running in rolling mills. We paid him extra because we thought he was a superior man, and we pay more to engineers than any one else in same business (to one we pay twenty-six dollars); and they have been here for over ten
years. In many places engineers have double or treble the years. In many places engineers have double or treble the
number of boilers to look after that we have here; so that it number of boilers to look after that we have here; so that it
does not look as if one had to do the work of three men. We have the reputation of paying a good price for everything we get, labor not excepted; our men make as good wages and are paid as promptly as any in the country.
We wish to state to you, as it may benefit others as well as ourselves, that we had the boiler spoken of by W. S. B. (as taken out from the side of the exploded one) and the one which, he says, has 18 patches upon it, tested with hy draulic pressure, and it was taken out for that purpose. It was tested by Mr. Farren, one of the Hartford Boiler Insur nce Company's inspectors, to 175 lbs ., with ice cold water without showing any signs of strain or leaking a drop, o weating at a seam or rivet. This test, Mr. Farren says, (ac ording to experiments made at Morris, Tasker \& Co.'s works
with boiler tubes, etc., who say that one pound of cold water with boiler tubes, etc., who say that one pound of cold water
pressure is equal to two of steam) is equal to 350 lbs . of pressure is equal to two of steam) is equal to 350 lbs . of
steam pressure; we do not, however, assert this as a fact. It steam pressure; we do not, however, assert this as a fact. It
is no doubt much more severe than steam pressure; and under the steam boiler laws of Philadelphia, they allow steam one third less than the cold water test to which they subject them to be carried. This would have given us the privilege to carry 117 lbs. steam on this boiler; W. S. B. says there are worse boilers working in the mill today than this, carrying from 60 to 125 lbs. steam. This is false also; we have not worked any in this mill since February 3, not being ready yet to start. But what boilers we have at this mill have been all inspected by the Hartford Boiler Insurance Company, and they have no hesitation in giving us a policy of insurance to rum them at their risk. We presume they ought to know something about boilers.
Mr. W. S. B. has the advantage of us, as heis unknown to us; and as we do not know where to look for him, and he knows us, we extend to him through you a polite invitation
to visit us, as it would give us much pleasure to talk the matter over personally with him. He might give us some valuable information, perhaps. We will state one thing
more: The Hartford Boiler Insurance Company's inspector say they do not care for the age of a boiler, that they only look for the quality of the iron, thickness of sheets, diame ter, and workmanship, and that they often find old boiler better than some new ones.
Conshohocken, Pa.

## thg government submarine works at hell

 GATEWe should advise people of a nervous temperament, who contemplate visiting the excavations at Hell Gate, to refrain from entering the wooden shanty, in which a laboratory for the making and filling of the nitro-glycerin cartridges has been extemporized. Not that there is any positive dan ger-for 16,000 pounds of the material have been handled and used without an accident-but the sight of gallons of liquid destruction surrounding one, and the knowledge that should it explode utter annihilation would be the result, is alculated to send a disagreeable tremor even through th trongest organizations.
The nitro-glycerin destined for use at Hallett's Point i ransported from the place of its manufacture and stored several hundred pounds at a time, in a small arched con crete building, erected on a reef known as Flood Rock, situ ated in the middle of the river. From here it is carried to

## THE NITRO-GLYCERIN LABORATORy

which is located at some distance from the other buildings. The floor of this shop is covered with a thick layer of dry plaster of Paris, which serves to absorb, and render harm less, any drops that may fall upon it. Within the apart ment an equable temperature of from $65^{\circ}$ to $70^{\circ}$ is main tained throughout the year; steam pipes, carefully guarded, affording the necessary heat in winter, and a chest of ice serving to lower the warmth in summer. The thermomete is in fact the principal sufeguard, for if in cold weather the nitro-glycerin allowed to fall below the above mentioned temperature, it is liable not to explode when fired, while i on warm days it should become heated to excess, sponta neous combustion is apt to ensue.

## the cartridge

are made of heavy manilla paper and vary in size, according to the amount of explosive they are to contain. A sheet of paper of suitable size is first wound over a roller, for half its length, then the other half of the leaf is covered with thick glue, when the whole is tightly rolled around the form. One end is folded and closed, and the case is slipped off the cylinder and covered with a waterproof mixture of Stockholm tar, resin and tallow, great care being taken that every portion inside and out receives a complete coat. This dried, the cartridge is filled with nitro-glycerin, the workman having several quarts of the explosive in rubber vessels on the aable before him, and apparently handling and pouring it with as much coolness as if it were water. The case filled, the electric fuse is inserted. This is either one of the patented fuses or an arrangement of fulminating powder at the end of the wires. Chlorate of potash is principally employed, as it is some fifty per cent cheaper than either fulminate of mercury or of ccpper. The upper end of the case is then twisted arcund the wires and covered with a thick mass

## use.

The principal point to be guarded against in making these cartridges is that they shall be impervious to leakage. This is plainly evident from the fact that, should such not be the case, a portion of the dangerous liquid might escape and
spread through fissures in the rock after the charge had spread through fissures in the rock after the charge had been inserted in the hole. Not sharing in the gengral explosion, the presence of the nitro-glycerin in the cracks would not be known until struck by a drill bit, when of course a terrible disaster would result.
The number of cartridges made in the laboratory depends upon the requirements of the works; it ranges from 100 to 250 per day. About 1,000 pounds of nitro-glycerin are used monthly.

## EFFECTS OF NITRO-GLYCERIN

Did we seek a word to express the effects of this power ful explosive, we should fix upon "pulverizing," for such is indeed the case. One hundred pounds of nitro-glycerin placed upon the surface of granite rock fairly reduces the stone to powder. Its action under water was well shown
in the recent blasting of a reef near Hell Gate. The rock in the recent blasting of a reef near Hell Gate. The rock
was entirely submerged, of considerable length and of pewas entirely submerged, of considerable length and of pe-
culiar shape, its upper portion forming an overhang. The first trial was made with a cartridge containing 12 pounds of nitro-glycerin, placed under the projecting ledge. It is supposed that a passing steamer generated a current which carried the charge some fifty feet away from the reef, for when it was exploded, a colurnn of water hundreds of feet high was thrown into the air, while the surface was covered with dead fishes. The rock was untouched. On making the second attempt, several cartridges were firmly secured in proper position and fired. This time the water was raised that the reef had disappeared, leaving the bottor at a uniform level.

## NITRO-GLYCERIN COMPARED WITH OTHER EXPLOSIVES.

Nitro-glycerin is some thirteen times more powerful than gunpowder, and consequently, from its greater force, it accomplishes different results. In using powder in the Hell Gate blasts, the rock was split off in masses often weighing several tuns each, which required a large amount of hard labor with heavy sledges to reduce to a portable condition.
With nitro-glycerin the latter work is no longer necessary,as
it is rarely that a fragment exceeds one hundred pounds in weight. Dynamite and dualin are considered as uncertain
in effect and explosion, and consequently of greater dange than the pure nitro-glycerin. For small holes varying from 1 to $1 \frac{1}{4}$ inches in diameter, dynamite, we were informed, had been used to good advantage but for larger blasts, of 2 inches and over, nitro-glycerin is the superior. Lithofracteur ha

## HOW THE WORK IS TO BE CARRIED OUT.

As we said in our previous article, it is the present inten tion to extend the headings until all shall reach a poin above which 32 feet of water exists. After the seven gal leries are completed,the floor of the entire excavation will be lowered some fifteen feet in order to give the roof a clea all of abput forty feet. It does not appear to be the de sign to follow out the original idea of cutting chambers in the supporting pillars in which to place the nitro-glycerin though the exact method of arranging the exploding charges is not as yet definitely determined. The opinion among the officers of the work is that the piers will be cut entirely away, and the roof supported by heavy wooden crib work The nitro-glycerin will then either be placed at suitable points in barrels, or else will be contained in tubing, laid close to the roof throughout the entire chamber, the whole arranged with electric fuses being connected with a battery. arranged with electric fuses being connected with a battery
The water will then be allowed to enter the main shaft, com pletely fill the excavations and thus act as a tamping. Th iitrofglycerin is designed to act upon the roof, shattering it to fragments which, falling to the floor, will at once leave a sufficient depth of water. By this means the slow and ex pensive process of subsequent dredging is hoped to be voided.
Tremendous as che explosion will be, the water tamping, it :s considered, will effectually pwevent all danger to adjoining buildings, though in all probability a very near approach to an earthquake will occur in the neighborhood. When this final "blow up" will take place it is difficult to state. Congress has been by no means lavish in appropriating funds to carry on the work. About $\$ 600,000$ we are informed, is necessary for its completion, but the progress toward the lat ter is dependent upon the rate at which the necessary mone ter is depend
is doled out.

## other great excavations and cuttings.

No better proof of the excellence of the plans of Genera Newton can be afforded than the complete success of similar operations undertaken to remove the obstructions in the arbor of Valetta, on the island of Malta. The same genera design of work was copied and the result was a complete removal of the dangerous reefs. It may be acceptable, in conluding our notice of the Hell Gate excavation, to glance in brief review over other and similar works both completed and in progress, and in the same connection, to remark the performances of the drill which, in our previous article we demonstrated to be of such practical value. In

## the hoosac tunnel,

less than 8.000 feet remains to be cut. This will be done efore November, 1873, and it is stated that cars will be reguarly running through the great bore before March, $18{ }^{7} 4$. The contractors for the work, the Messrs. Shanly, state that by using the Burleigh drill a gain of 33 per cent over hand labor was obtained, which will enable them to complete the tunnel in five years less time. It is only necessary to compute the loss (which would accrue if the capital invested in defraying the cost of the enterprise $\$ 10,000,000$ were allowed to lie idle as it would do, if the tunnel could not be used or five years longer) to show, that by the use of the drill above mentioned, not only a saving of time, but a large savng of money has been effected. The cost per yard of the Hoosac tunnel, although the rock is harder, has been less than that of the Mont Cenis tunnel, where the Sommellie drill was employed.

## THE ST. GOTHARD TUNNEL

piercing Mont St. Gothard in Switzerland, is to be thirteen miles in length. As the Hoosac bore is $4 \frac{8}{4}$ miles, and that through Mont Cenis 79 miles, the above mentioned great cutting will be longer than both together. The Burleigh drill, we learn, is to be used throughout the entire work. The

## NESQUEHONING TUNNEL,

at Mauch Chunk, Pa., was completed in less than two years by the Burleigh drill, when it was plainly proved would hand labor had been employed, at least five year through have been required: 1,000 feet of the cutting was try. In headings where 15 feet hardest known in the coun an excellent rate of advance by hand labor, the machine an excellent rate of advance by hand labor, the machine
above mentioned accomplished from 80 to 90 feet in a similar pe:iod without difficulty.

## Spring Dangers

Doctor Hall, in his Journal of Health for April, says: March, April, and May are more fruitful of sickness and death than the other months of the year; not so many die as in July, August, and September, but there is more disease, arising mainly from sudden changes of the weather, injudicious changes in clothing, and errors in eating. The causes of sickness and death are avoidable; hence, we are he authors of our own sufferings, which are irrationally attributed too often to the "mysterious dispensations of Provi-
dence." The difference to the reader between attention to and neglect of some of the following suggestions may be vigorous health or a shroud before midsummer.
In March there is a searching rawness and dampness in
the atmosphere which chills the blood in such a way as to lay the foundation for a multitude of colds, fevers,and inflam mations. In April the atmosphere is not so much saturated
with dampness, but the fires are early put out, and the winter clothing is too soon laid aside, in whole or in part. In the beautiful May, the mornings and evenings are damp and chilly; the warmth of midday tempts many to lay aside the warmer clothing, and this lighter clothing, together with the absence of fires, makes a difference sometimes of twenty thirty, or even forty degrees. But, in addition to these here is another cause of disease, almost universal, prevail ng through all the three months. No one thinks of build ng as fierce fires in the spring time as in midwinter becaus here is not the same necessity for artificial heat, the exter nal air is not nearly so cold, but we kindle as great an interna heat, which is excessive, and that is fever, and fever is fol lowed with cold within twenty-four hours as certainly as a pendulum, carried to the right, if let go will swing to as a pendulum, carried to the right, if let go will swing to
the left; one is the re-action of the other, a fixed law of the left; one is the re-action of the other, a fixed law of
our being. If the system were kept in an equable condition our being. If the system were kept in an equable condition
of warmth within and without, we would have neither evers nor colds, chills nor inflammations
We eat for two reasons; to sustain and to warm. A arge portion of our meats and butter and bread is composed of the warming principle, carbon, the province of which is o produce animal heat; hence, if we eat as much in the spring as in the winter, there is inevitably too much interna ire, and that is fever. In the spring everybody gets weake because the weather is warmer, and yet we eat with the winter's appetite until Nature begins to take it away; then we begin to think that something is the matter, that we ar oing to get sick; but, instead of being content to diminish he quantity and quality of our food in proportion to the di inishing appetite, we begin to stimulate that appetite by "tonics" and "bitters," meaning thereby whiskey in dis guise, for it is scarcely possible to find a tonic or a bitter or n appetizer of which alcohol is not a large constituent; i hey do whet the appetite, they are injurious just in propor portion as they do it; it is fighting against Nature; for while she is endeavoring to moderate our desire for eating we are trying to increase it ; she aims to diminish the amoun fuel to supply the internal furnace; we try to increase it. In fact she goes further and absolutely changes the appe ite. In February we revel on pork and fat and sweets and buckwheat cakes and corn bread, which are almost wholly "carbon ;" we all know them to be " heating;" and as spring comes on, we relish " greens" and spinage,the early vegeta bles and fruits and berries, which we all know to be "cool ing" with their delicious acidities. How we delight in cab ages and turnip tops, and other green things which ar aten with vinegar, and turn away from pastries and pud ings and doughnuts, and other forms of fats and sweets If, in the spring, we eat with the appetite of winter, goad ourselves to it with tonics, the inevitable result in all cases, infallibly, is that there is too much internal heat meaning fever, followed by biliousness with its long cata logue of "ails," ending in dysenteries, diarrhæas and insuf erable debilities.
Families make a great mistake, especially in the country, in early dispensing with fires. Where there are children there should be a good blazing fire on the hearth, at least in one room in the house, all day, until the first of May, and during May until after breakfast, to be kindled up at sun down. The instinct of the children will drive them to that room, and when they cease to gather around that fire, morn ings and evenings, then, and not till then, ought fires to ease for the summer

## changing clothing

Health and sometimes life itself is often lost by laying side winter clothing too early. Laying flannels aside in the spring is a most pernicious practice. They are as neces sary in July as in January. We can better do withou woolens next the skin in midwinter than in midsummer We do not get overheated in winter; we do in summer and the most frequent exciting cause of coughs, colds, and consumption is a rapid falling of the temperature of the body. All are familiar with the fact that a sudden checking of perspiration is always dangerous; very little exercise causes us to perspire in summer, and a very slight draft of air checks the perspiration; hence, eminent French physicians have stated, after a long series of observa tions, that colds taken in summer excite the most incurable forms of consumption. White woolen flannel is a most effi cient guard against these sudden changes, because it keep cient guard against these sudden changes, because it keeps
the heat of the body in, while it repels the excessive heat the heat of the body in, while it repels the excessive heat
from without; it conveys the water of perspiration to it from without; it conveys the water of perspiration to its
outside, while the surface next the skin is drier. We all known that silk, cotton, and linen next the skin get satura ted with water, and if, for an instant, the slightest draft of air gets between the skin and the material, there is a char nel-like chill when that material touches the skin.
The rule should be to wear white woolen flannel next the skin all the year round; thick in winter, a little thinner in April, a gauze material on the first day of July; on the first of October resume what was laid aside in July on the first of December put on the thickest, extending to ankles and wrists.
These rules of change are especially necessary to all old people, to all invalids and young children; day laborers and all out-door workers would be incalculably benefited by the same observances.

The velocity of light is 192,000 miles per second, neariy. The velocity of frictional or static electricity over a copper wire is 288,000 miles per second. The velocity of sound in water is 4,900 feet per second.

LUNATIC ASYLUM, WINDSOR, ENGLAND. The fine architectural design, presented herewith, is from the proposed plan for a very extensive lunatic asylum, to be erected at St. Ann's Heath, Virginia Water, Windsor, En-
gland. The material for construction is brick with stone gland. The material for construction is brick with stone
decorations, though the latter will be few, the object being to give the edifice a thoroughly brick expression. Portions which cannot be executed in brick will be produced from
gether in one solid or hollow homogeneous weldless wheel, gether in one solid or hollow homogeneous weldless wheel, and tenacity, free from the defects and liability to breakage of those in ordinary use. The wheel is afterwards annealed, f required.
For wheels of a similar construction to those at present in and placed in the casting box, and then the naitably heated
and

Arikial Formation or Organic Substances. By Dr. Henry E. Armstrong, F.C.S., Professor of Chemis ry, London Institution: From marsh gas or methane, by series of operations similar to those whereby ethane is con verted into ethylic alcohol, an alcohol is obtained which proves to be identical with methylic alcohol. or wood spirit, one of the main products of the destructive distilla tion of wood. These alcohols serve as the starting points for the wood. These alcohols serve as the starting points for the
preparation of other hydrocarbons and alcohol wi bearing relations to each other similar to those which obtain between me thane and ethane, and between methylic and ethylic alcohols. Many of the alcohols, as prepared artificially are identical with the alcohols which are ob tained, together with ordinary alcohol by fermenting sacch, by substances, or which exist in the form compound torm of the ethereal oils ex tracted from variou plants.
A long series of pro ducts is obtained by the oxidation of alco hol. This is first de prived of a portion o A its hydrogen and con verted into aldehyde which latter is then converted by direct as sumption of oxyge
into an acid: ethyli into an acid: ethylic Fai alcohol, yielding ac tic acid, the acid of vinegar. The other terms of the series of
alcohols to which alcohols to which or dinary alcohol be寻 longs are acted upo thus a series of alde hydes and acids is obtained. Many of thes acidsare identical with those which enter into the composition of the natural fats. The al 요 dehydes are extremely alterable compound 4 and readily undergo 변 taneously in spo 고 ing converted into bodies of more com plex composition. Formic aldehyde, the 은 aldehyde of methylic alcohol, is probably formed in plants from the carbon and oxygen of the carbonic acid of the atmosphere (whence, as is well
known, plants derive known, plants derive their carbon), and the hydrogen from water. One of the simplest transformations of formic aldehyde is its conversion into sugar; this conversion, however, has not yet been effected artificially, although formic aldehyde has been converted into a substance closely resembling the natural sugars. The aldehydes combine di aldehydes combine rectly with ancts readi ly perth ly part with the ele ments of water, and are converted into al iron, of the necessary thickness, cut into suitable lengths to $\left\lvert\, \begin{aligned} & \text { kaloids, one of which, that obtained from butyric aldehyde, }\end{aligned}\right.$ form the arms or spokes, are arranged around, and retained is identical in nearly all respects with conine, the poisonous in their position by molding in the ordinary manner. Molten alkaloid of hemlock.
steel, iron, or metal, is then poured in or otherwise intro- A variety of interesting derivatives is also obtained from duced, until they become united into and form one solid ho- the acids of the acetic series, such as glycocine, leucine, gly mogeneous weldless steel or metal wheel. These wheels collic and lactic acids, all of which are substances found in are said to be peculiarly free from jarring and concussion, as various mineral fluids.-Iron
well as more economical than ordinary wheels, and they' are not so liable to sudden expansion or contraction. The ab sence of complicated tyre fastenings is another very advantageous feature

Determining the Value of Aniline Colors.-The Chronique de l'Industrie describes a new method, the principle of which consists in the fixing of the coloring matter to be tested on a plate of glass, by means of collo dion. The thin film thus obtained is compared with another of the typical coloring material prepared in the same manner.

## SULKY PLOW.

This invention combines a number of useful and ingenious devices by which the plow may be elevated or depressed to furrow at any depth, and the land wheel raised or lowered in connection therewith by simply touching a lever, the actuating power being supplied by the advance of the machine. Other mechanism is provided, through which the plow may be adjusted by hand without altering the position of either frame or wheels.
Fig. 1 gives a general perspective view of the apparatus, and Fig. 2, to which we shall first refer, shows the appliances governing the plow. The frame of the machine is clearly indicated in Fig. 1, and a ly indicated in Fig. 1, and a porg. 2, at A. B is the plow Fig. 2, at A. B is the plow
beam, the draft upon which is beam, the draft upon which is
sustained by rods, C, secured sustained by rods, C, secured
to the rear end and also to the to the rear end and also to the
main frame. There are four main frame. There are four
of these rods, of which the inner two extend directly forward while the outer ones are inclined outward so as to serve as braces. To either side of each end of the beam, B, are secured straps, D and E, which pass up between the two parts of the frame-one portion of which is removed in our enwhich is removed in our en-
graving. In the upper ends of graving. In the upper ends of these straps are formed holes,
by means of which the straps by means of which the straps are pivoted to the arms of bent
levers, $F$ ande $G$. The object levers, $F$ and. G. • The object
of the several holes is to enaof the several holes is to ena-
ble the plow to be conveniently ble the plow to be conveniently

adjusted to work at any desired depth. By referring to Fig. 1, it will be noticed that these bent levers have each two rearwardly projecting and one upwardly projecting arms. The former are connected, as $\mid$ This wheel being held immovable-the machine meanwhile | upwardly projecting arms. The former are connected, as |  |
| :--- | :--- | :--- |
| above stated, to the straps; the latter enter the slotted ends | This wheel being held immovable一the machine meanwhile |
| advancing-the small wheel, $Q$, must necessarily roll around |  | of a rod, H . The pivot pin of the vertical arm of the lever, it, and thus bring the crank arm, $\mathbf{N}$, to a horizontal posiG, works in a short slot in the rear extremity of the bar, H, tion. To retain the arm thus, a catch, T, pivoted at its upper in order that the forward end of the plow beam, B, may begin its upward or downward movement in advance of the rear end, to cause the plow to leave or enter the ground more more readily. The lever, G, is simply pivoted at its angle to a suitable support; the lever, F , however, is secured to a cross bar, I, which works in bearings on the frame of the machine. To this bar, and near its end toward the plowed land side of the implement, is attached a lever, J, which is provided, as shown, with a handle placed within easy reach of the driver. By this means it is clear that the plow can be raised or lowered at will without calling into play the devices below described. Referring now to Fig. 1, the arm of the lever, J , is seen passing through the slot of a connecting link, $K$, and is supplied with a pin which enters a short slot in said link; so that which enters a short slot in said link; so that

the lever and link may be locked together, and the lever and link may be locked together, and
the former operated by the movement of the the former operated by the movement of the
latter. A notch in the link allows of the delatter. A notch in the link allows of the de-
taching of the two portions whenever it is detaching of the two portions whenever it is de-
sired to raise or lower the plow by hand, as above described. The link, K, is prolonged by an arm which is secured to the axle, $L$, and which works in bearings attached to the frame. This is not shown in Fig. 1, being necessarily obscured by other portions. $M$ is the furrow wheel which revolves upon a journal on the axle. To the opposite end of the latter is secured a crank arm, $\mathbf{N}$, at the end of which is a spindle, $O$, on which the land wheel, $P$, rotates. To the hub of this wheel is attached a small gear

wheel, $Q$, the teeth of which engage with those of a larger wheel, $R$, that revolves upon a journal on the extremity of the axle outside the crank arm. $S$ is a lever pivoted to the frame and provided with a handle convenient to the driver.

The lever is made with an outward bend, and an offset or foot which, engaging with the teeth of the wheel, R, serves to hold the latter stationary.
When the crank arm, N , is in a vertical position, as shown, the land wheel, P , will be raised, while the other wheel runs in the furrow; and when the arm is turned horizontal, the former wheel will be lowered so that both wheels will be on a level. To secure the latter effect, the driver pushes the lever, S, forward so that its offset catches the gear wheel, R.


SACHSE'S SULKY PLOW

## HE TANITE COMPANY'S SHAPER AND SHARPENER.

The annexed engraving represents a machine especially designed for use in wood working establishments. It is arranged to run six wheels between journals and one overhung wheel, the latter being especially intended for sharpening or gumming saws. The rest shown in front of the wheel can be adjusted on a line parallel with the arbor on either side of the table. It can also be supported across the trough in the bed of be supported across the trough in the bed of the table, thus allowing it to come between end of the machine outside of the overhung wheel has finished surfaces, and can be easily set so as to allow the grinding of a bevel at any desired angle. The arbor is of steel, one inch in diameterbetweenbearings, arranged to carry wheels from one fourth to one and a half inches face, movable collars being supplied for this purpose. Wheels as large as eight inches in diameter can be used if desired. The water or oil trough being cast into the bed of the table is not liable to injury from rust or misplacement, and can be emptied by removing a plug, the handle of which is shown underneath the table. The base of the machine is four feet by two feet six inches, and the distance to the center of the arbor is bat about three feet. The apparatus stands very firmly and is well and strongly braced. The countershaft is here shown underneath the table, as it is usually preferred, but it can easily be
ngers above. While especially designed for
E TANITE COMPANY'S SHAPER AND SHARPENER.
extremity and supporting a weight is made at its upper end with a projection which is rounded off above but square be ow. When the crank arm turns forward the inwardly exwhich is thus shoved aside, but is immediately carried back by the weight, thus locking the crank arm in place, and permitting the disengagement of the lever, $S$. On the lower part of the last mentioned portion is a stop, $U$, which tates part of the against the reark parm, N to a return the crank arm, $\mathbf{N}$, to a vertical position, and raise the land wheel-by moving the upper end of the lever, S , to the rear, this stop pushes forward the catch, $T$, and releases the arm when the weight of the frame, etc., lowers the opposite end of the machine-and the arm becomes upright. The crank arm and lever or link, K , being both rigidly connected to the axle, as the former moves to raise or lower the wheel, through the medium of the link, the plow beam and plow are also raised or lowered at the same time. A suitable stop is provided which prevents the crank arm from being carried backwards beyond a vertical position.
The other portions of the device need no especial reference. The mechanism is not complicated and appears of a strong and durable nature, while the advantages offered as detailed above will, we do not doubt, favorably commend the machine to the notice of agriculturists.
Patented through the Scientific American Patent Agency, March 11, 1873. For any further particulars required, address the inventor, Mr. Louis Sachse, Monmouth, Polk county, Oregon. [See advertisement on another page.]
placed on hangers above. While especially designed for shaping and sharpening molding bits, cutters, saws, and othvariety of purposes by workers on metal. For further particulars address the Tanite Co., Stroudsburg, Pa.

## POSTAGE STAMP AFFIXER.

The convenience of the device represented in our engrav-

ing will, we think, be at once recognized by all who have ever had occasion to affix the postage stamps to large quantities of mail matter. It consists of an ordinary spring hand press.
er, as shown, beneath which is a small box in which the stamps are placed, pasted sides up. Within this receptacle is a plate supported by a fixed standard, which passes through an aperture in the bottom. When the box is pushed down to the presser, the stamps do not follow its motion.
The letter is first moistened at the place on which the stamp is to be stuck, by pushing it between the roller and dampened sponge. Then it is laid above the box and the presser is brought down upon it. The case is thus forced downwards, and the letter carried in contact with the uppermost stamp, which adheres to the wetted surface. A coiled spring on the standard raises the box back to its place
This ingenious invention was patented through the Scientific American Patent Agency, January 21, 1873, by Mr. E. B. Morgan, of Paterson, N. J.

## PATENT OFFICE DECISIONS

Legartr, Commissioner:
An amen bment should not recelved whtch introduces into the applica-
tion a featum ent $t$ described in the specifcation as originally fled, and which
 To claim a propuctionas "a new article of manufacture " does not entitle
It to a more favorable consideration
 his right by a patent for employing the fabric in a way which did not require
invention.



## DECISIONS OF THE COURTS.

United States Circuit Court---District of New Jersey










## $\begin{array}{lll}\text { e } \\ \text { er } \\ \text { e } & \text { at } \\ \text { fu }\end{array}$

Report on the Hydraulic Lime of Teil, its Fabrication and Use in Construction of Marine Work, Canals,
Aqueducts, Sewers. etc. By Leonard F. Beckwith, Civil Aqueducts, Sewers. etc. By Leonard F. Beckwith, Civil
Engineer, etc. New York: D. Van Nostrand, 23 Murray Engineer, etc. New Y
and 27 Warren
Streets.
The work now before us is an elaborate and exhaustive account of the banks of the Rhone, in the department of Ardeche, France. The question of the value of hydraulic cements, especially in the preparation of artifictal stone, is now one of very great importance ; and the material treated of in this report is well known in the United States market
Manual of Chemical Analysis, as applied to the Exami-
nation of Medicinal Chemicals; a Guide for the Determi nation of Medicinal Chemicals; a Guide for the Determi
nation of their Identity and Quality, and for the Detection of Impurities and Adulterations. By Frederick Hoffmann, Ph. D. New York : Appleton \& Company, 549 \&
551 Broadway.
in this hook Dr Hoff

In this book, Dr. Hoffmann has given a most valuable ald to the practica and scientific pharmaceutist. As he states in his preface, the preparation of
drugs and materia medica generally has passed out of the hands of the retallers and compounders of prescriptions : and the value of a knowledge of tests and reagents becomes doubly apparent when we conslder how va-
rious are the modes of manipulation in use by manufacturing chemists, to qualities and effects of chemicals may be altered. Dr. Hoffmann's book especially directed to these points, and is compendious and complete.
a Dictionary of Science, comprising Astronomy, Chem istry, Dynamics, Electricity, Heat, Hydrodynamics, Hy Pneumatics, Sound and Statics. Preceded by an Essay on the History of the Physical Sciences. Edited by G. F Rod well, F.R. A. S., F.C.S. With numerous illustrations.
Philadelphia: J. B. Lippincott \& Co. This work is a valuable compendium of sclentific knowledge, which has,
during the last few years, made such unexampled strides. Among the contributors are Professors Bottomley, Crookes, Guthrie, Proctor, Tomlinson,
Wormell, and Rod well, the work betng edtted and supervised by the last Wormell, and Rodwell, the work betng edited and supervised by the last
named sclentist, who has also contributed the Introductory essay, the artinamed sclentist, who has also contributed
cles which may be fncluded under the peneric title of "Heat," and many others. As an authoritative text boos forthe scis.
Expression: Its Anatomy and Philosophy. By Sir Charles Bell, K.H. With Notes and Illustrations. Price
$\$ 1.50$. New York : S. R. Wells, 389 Broadway. has more deeply studied the subject of expression in art and nature than
Charles Bell; and his writings are not only valuable for the student and the
A Treatise on the Strength of Bridges and Roofs,
with Practical Applications and Examples, for the Use of with Practical Applications and Examples, for the Use of
Engineers and Students. By Samuel H. Shreve, A. M., C. E. New York: D. Van Nostrand, 23 Murray Stree
and 27 Warren Street. and 27 Warren Street.
There is no branch of engineering sclence which is of greater value and
nterest to the public than bridge-bullding ; and American engineers are justly proud of the many structures which carry our rallroads over difficult places. The ingenulty and fertiilty of resource which American engineers
have employed in these works have elicted the applause of the profession have employed in these works have elicited the applause of the profession
in older countries, and have ponted out the American timber bridge as a model of originality and economical construction. The book now before
us, which we have not hitherto been able to review at any length, is a complete and detalled treatise on the practice of the best engineers, as shown in the most exemplary specimens of this department of clvil engineering,
The explanations of the theoretical part of the subject and the calculatione


## NEW BOOKS AND PUBLICATIONS

The Romance of Astronomy. By R. Kalley Miller, M. A., Fellow and Assistant Tutor of St. Peter's College, Cambridge, England
This is a most entertaining and pleasing little volume, the contents of
which were originally prepared for dellvery in lectures, and were subse Which were originally prepared for dellvery in lectures, and were subse rently published in the Light Blue, a Cambridge University magazine. The
 terest with which they are read: and in this book will be found the most attractive of these facts and phenomena, exhbited in a pleasing and grace phene etent.

Improved Car Coupling.
Melvin c. Doubleday, Sharon, , t. -The invention consists in an improvement in car couplings. The drawhead consists of an upper plate and a lower plate connected at the outer end by a bumper plate, from which plate The coupling link consists of two bars conined in a reversible box. This
box fits between the plates of the drawhead, and is attached thereto by a
central pin upon which the box turns. The bars forming the coupling link are placed in the box with their coupling ends projecting from the box and through the bumper plate of the drawhead. To allow the box to be reversed,
or turned end for end, with the bars thus arranged, the bumper plate is slot. ed. Springs confined in the box serve to force the coupling bars together. ed. Springs conined in the box serve to force the coupling bars together.
In one coupling the bars project and form the coupling link; ;n the other
the box is reversed, the coupling bars belng turned inward, while the other end of the box receives the link and coupling pin. When the two couplings
come together, the ends of the bars enter the spring jaw as they snap around come together, the ends of the bars enter the spring jaw as they snap around
the coupling pin. This jaw prevents the ends of the bars from spreading, and makes the coupling secure. The jaw slides on a rod upon which is a spiral spring. The advantage of making the coupling box reversible is that
any two cars may be coupled together. For uncoupling the cars, the pin is
withdrawn while any two cars may be coupled together. For
withdrawn, while they couple automatically
Daniel Read, New York city.-This invention Pouch. a combined tobacco pouch and wallet ; and it consists in the combined to bacco pouch and wallet, composed of the pouch, made of rubier or other suitable waterproof material, and provided with a metallic frame,
pockets of a wallet arranged upon one or both sides of said pouch.
Improved Machine for Upsetting Tires.
Charles J. Peterson, Brevard Station, N. C.-The object of this invention is to provide means for lessening the diameter of a wheel tire without cut-
ting the tire. The tire to be upset 1 s bent Inward on the machine, and then
fastened by the keys between serrated jaws ; and while hot the bent portion fastened by the keys between serraced Jaws; and while hot the bent portton is hammered down flat to the bed plate, thus upsetting it. The tire is after
ward dressed upon the anvil and applied to the wheel. The bend in the
tire before operating with the machise may be more or less according to the amount of upsetting required.
Improved Mosquito Net Frame. this invention is to supply a portable mosquito net fram.-The object of be placed in position for use, adjusted to any desired hight, and, after use,
be readily folded and stored away. The device conslsts of a top piece, composed of two parts hinged together, which may be folded and opened. It supports four diagonal arms, which are laterally movable
therein, which again have pivoted to their ends four legs, adjustable to any therein, which again have pivoted to their ends four legs, adjustable to any
desired hight by tubes and spring arrangement. A string connects the ends of the ar
storage.
Improved Gir Saddle Tree.
John Bauer, Newark, N. J., assignor to Chas. M. Theberath and Jacob H.
Theberath, of same place.-The invention consists in interposing between Theberath, of same place.-The invention consists in interposing between
the skirt and jockey of a saddle a one-piece metallic plate with penden pins. These pins, passing through the flap at an obilique angle, hold the a gaged machine or otherwise to punch the skirt at the places where the a gaged machine or otherwise to punch the skirt at the places where the flap. The upper leather or jockey covers a plate and is held in place by the
fastening of the top plece or saddle scat and also by the turret fastening. fastening of the top piece or saddle scat and also by the turret fastening.
By the use of this the flap can be properly applied by unskilled persons, and By the use of this the flap can be properly appl.
a perfect finish will be insured without effort.

Improved Dress Elevator.
Moris Fox, New York city.-This invention relates to a new attachmen the dress can be raised to clear it of mud or rain water during bad weathe or during passage over muddy streets or roads, and subsequently lowere at will.
Engraving and Carving Machine.
Thomas w. Minter, 132 Nassau Street, New York city.-This invention
relates to improvements on a carving and engraving machine for which relates to improvements on a act hat and engraving machine for which
leters: atent of the United States have been recently granted to the same inventor. The present invention consists, principally, in simplifying the
supports for the article under operation, and for the pattern, and the mean for adjusting the same. The holders are fitted into a slotted tilting frame po that they can be adjusted any desired distance apart, and combined with a single longitudinal screw that hangs in the tilting frame, for turning them on their axes in equal degree. The invention also consists in connecting
the swivel frame of the cutting tool, by rods, with a crank of the feeling pin; so that when one is ting tool and pin holding beam longitudinally as well as vertically adjustable on and with its holder, so that it can be set to all kinds and sizes
of work. of work

Improved Whip Socket.
John W. Coe and Daniel Merritt, Williamsburgh, N. Y.-The invention re lates to whip holders which have on the same standard a pair of clasping
jaws above and a basket below. The standard has a shoulder and a screw thread formed upon its lower end to adapt it to be screwed into the timber
of the carriage frame. Its upper part has a shoulder formed upon it, and of the carriage frame. Its upper part has a shoulder formed upon it, and
has a screw thread formed upon its upper end, to which are attached spring jaws which curve outward and inward to form a recess to receive and hold
the whip. A basket is provided to receive the butt of the whip, which is made in the form of the inver.ed frustum of a hollow cone. In placin the whip in the socket the butt of the whip is placed in the basket and the
whip is then pressed into the space or opening between the jaws, which presses a movable jaw back and allows the whip to pass into the recess becessary is to draw it out

## Improved Knitting Machine.

Edouard Tallbouis and Ambroise Renevey, St. Just-en-Chaussé, France,
assignors to Joseph Freeman, Windsor Locks, Conn.sists in the improvement of knitting machines. There are two systems, which comprise knittirg mechanisms, which, working together, prodace plain ribbed work of the ordinary sort; ; but each may be worked separately
to produce plain work, or elther the vertical or horizontal needles may be worked alone; and one set may be making plain work while the other set is making fancy work. The mode of working the two sets of needles to gether for plain ribbed work is similar to the mode of operation in other
knitting frames having vertical and horizontal needles, and need not be described; but for working each set separately to produce a separate fabric on each, a separate thread is supplied to each set, the one for the vertical
needles being fed through one guide where the horizontal needles will be forced back before they take the thread, thus throwing the horizontal neeand form the stitches. But at the next feeder the horizontal needles will
take the thread while the vertical take the thread while the vertical needles will be prevented from werkin so as to throw off their stitches, so that said needles cannot rise high
enough for the loops to pass below the latches, and they will be prevented from taking the thread supplied to the horizontal needles by reason of the said thread being fed through an eye which is so far in advance that their
hooks pass below a comb before the thread comes within their range. But at this feeder the said horizontal needles will, in this case, be forced back Ward further than when they are working in connection with the vertical
needles, in order to draw in thread enough to form the ettiches. This is not necessary when the two sets of needles are working together, because the vertical needles govern the length of the stitches. The separate fabrics
can be instantly merged in one by suitable appliances. In this manner double fabric of any length or shape may be made. By other arrangement several changes in the order of working the neediles may be eff ected. Double
ribbed work on the vertical needles and plain ribbed work on the horizon. tal needles may be made at the same time. If, in these operations, threads of
different colors be used at the diferent feeders-say a black different colors be used at the diferent feeders-say a black one on one
feeder and a white one on the other-the result will be a black surface on
one side of the work and a white one on the other: but, if the work be
side wbich shows a black surface and a black interior will be seen from that side which shows a white surface. These double ribbed stitches can
either be continued all the time or bealternated trom time to time by plas either be continued all the time or be alternated trom time to time by plain
or other work, at will. With the threads of different colors, both vertical and horizontal stripes can be varied at pleasure. The same kinds of work can be produced on both sets of needles, at the same time making the work
allke on both sides, whereby it will be reversible at pleasure, or one se allke on both sides, whereby it will be reversible at pleasure, or one set
may make different kinds of work, while other kinds are made by the other set. In addition to this capacity of the horizontal needles for per-
forming work of the same kind that the vertical needles do, they can make forming work of the same kind that the vertical needies do, they can make
stripes, squares, and many other useful combinations of different stitches

Improved Machine for Making Plow Irons
James M. McGinty and Thomas Nolan, Moulton, Texas.-This invention
has for its object to furnish an improved machine for forming plow bars To the driving shaft is attached a segmental cog wheel, the cogs and blan space being so arranged that the bar or plate to be cut will be fed forward
the required distance, and then allowed to be stationary while the dies are operating. The teeth of the segmental gear wheel mesh into the teeth of a operating. Mhe eeth of a second shaft that revolves in bearings in the
gear whend attach ey suitable means is connected with the feed rollers. A
frame, and which by the bar or plate from which the plow bars are to be cut is fed forward by the rollers, it passes along a table between guides, which keep the said bar
or plate in proper position to be operated upon by the dies. The lower or stationary die is secured to the table. The upper or movawle die
sildes up and down, in ways attached to the frame. The dies are so formed as to form two plow bars at each operation. Each die is provided with two punches to form the holes in the plow bar, and with holes to receive the
punches of the other die, and which extend out to carry off the plugs. The which are so arranged that they cannot raise the plow bar abour bars, an of the table, so that it may be pushed from the machine by the bar as it is
fed forward by the rollers. The plow bar is held while the upper punches are withdrawn by stops, which, when the upper die descends, enter a notch in it. When the die descends the first time after a bar is fed into the ma-
ckine, it forms the whole of one plow bar and all the second one but separating it from the bar. The second time the (ie descends it cuts of the second plow bar, wholly forms the third, and forms the fourth all but cutting if from the bar, and so on until the baris cut up.
Improved Cooking Vessel.
William Y. Thomson, Oyster Bay, N. Y.-This invention has for its objec to furnish an improved cooking vessel or bofler. Upon the inner surface of
an ordinary cooking boiler, near its upper edge, Is formed a flange for the
cover to rest upon. To the inner surface of the boiler, upon its opposite sides, are formed projections at such a distance above the flange as to af ford space between them for the cover. In the forward part of the cover is
formed a number of small holes, through which the liquid contents of the oiler may flow out When the said boiler is tilted. The perforated part o
he cover is covered with a flap, the edge of which is so tormed as to fit the cover is covered with a flap, the edge of which is so formed as to fit
against the inner surface of the boller, to prevent the escape of steam ormed notches corresponding in position with stops upon the boiler, so that by turning back the flap and turning the cover around that edge of the
cover may be raised, allowing the cover to be detached. In the cover is over may be ralsed, allowing the cover to be detached. In the cover
cormed a hole of sufficient size to allow a fork to be inserted through it to try" the contents of the boller, whether they be fully cooked. 'The ord ary bail is pivoted to the boller in the ordinary manner. Upon one sid
of the lower part of the boller are cast two lugs at a little distance apar Which lugs project outward, and incline toward each other. The ends of
small bail, which are bent outward, are passed through holes in the lugs small bail, which are bent out ward, are passed through holes in the lugs.
By this construction, when no weight is upon the bail, the elasticity of the ill in an upright position. When welght is thrown upon theballin til ing the boiler, the elasticity of the wire that forms the bail allows it to ork in the lugs as readily as if they were straight.

Improved Bottle Washer
York city.-This Invęption has $f$
William Dtck, New York city.-This invephtion has fortts object to furntis
improved device for washing bottles, lamp chimneys, an improved device for washing bottles, lamp chlmneys, globes, etc. A
hollow cylinder, the lower end of which is flanged, is attached to a base o
suffcient weight to anchor the device in a pan of water. In the bottom o he cylinder are formed openings, which are closed with valves opening up ward. A piston fits into the cyilinder and has a hole formed in its center
and is attached to the lower end of a tube, which passes up through the water from the article being washed, and guide it back into the pan the ube has holes formed in its upper part to allow the air to pass in and out reely. The lower end of another tube revolves upon a pivot attached t he bottom of the cylinder. Upon the lower larger part of this tube ia
ormed a screw thread of steep pitch, which fits into a screw thread upon he piston, so that the tube may be revolved by the up-and-down move
ment of the said piston. The upper part of the tube is made smaller and passes up through a hole in the pan. The brush is formed upon the upper end of the tube. In using the device the bottle or other article to be washed is held over the brush, and the first tube and piston are moved up and
down by means of the handle, formed upon the pan, revolving the brush. As the piston is raised a vacuum is formed in the lower part of the cylinder and the atmospheric pressure forces the water in, opening the valve and
flling the lower part of said cylinderr. As the piston is forced downward, ne valves are closed, and the water is forced up through the second tube, hile the sald surface is being rubbed by the brush

Improved Apparatus for Rendering Tallow, etc. Pevide means for "rendering" tallow and grease, and cooking and drying The fertllizing antmal matters left after the tallow or grease has been sepaand it consists mainly in the means of connecting the tank or inner cham ber for containing the substance to be rendered, etc., with an annular
team space surrounding the same, whereby the surplus steam from the steam space surrounding the same, whereby the surplus steam from the abling t
pipe.

## Improved Washing Machine

Cyrus Watson, Wh'te Cloud, Kansas.-This Invention has for its object to clothes are washed by passing them back and forth between a pair of roll ers connected with the box or tub. The bottom of the tub inclines down-
ward from the center toward each end. The lower roller, which is made nooth, and its journals revolve in bearings in blocks, the lower ends of hich are notched, to rest upon the angle of the bottom. The blocks are connected and held in positions by cross bars. The upper edges of the
cross bars overlap the sides of the lower roller to prevent the clothes from working in beneath it. The upper parts of the blocks are slotted verticalhat the said roller may move up and down to adjust itself to the varying oller is corrugated or fluted, and its journals project, and to one of the sattached the crank by which the machine is operated. Vertical connect ing rods are placed in vertical grooves in the sides of the box, and upon pper roller. Upon the lower ends of the rods are formed cross heads to

Improved Apparatus for Cooling Liduids, etc.
Heinrich Meidinger, Carlsruhe, Germany.-This device is based on the ract that a concentrated solution of salt will, in contact with the prope excess of salt is added, the temperature will always be constant--that is, $3^{\circ}-$ as long as any ice is left undissolved, because the excess of salt will
preserve the solution always in its highest concentration. This apparatus worked in the following manner: A cylinder is filled with a certain lution is poured over it. Then a ring sieve is filled with coarse salt and
hung into the cylinder: last, a conical vessel is put through the central
pening of the ring sieve and pressed into the floating ice, when the latter
Theodore Improved Life-Preserving Float
rseshoe theme sanuky of rome res a horseshoe in form, and is made of wood, in two sections, the inner sides of
which are grooved, with the groove filled with cork to make the frame
 three inches in thickness, with a circular orifice therefn to recelve the
welght of the person using it . ${ }^{\prime}$ Through the opening is a safety belt at der the to the frame, whichis buekled around the chest of the person, under the arms or around the waist. Loops are provided, by ineans of which
other personsin the water may hold on to the frame and support them selves. In the frame are slots in which are rotating paddles or propellers. shes. ft is revolved by means of the levers, which the person in the frame
seizes, the shaft being rotated, when he pulls on the levers, by means of

Process and Apparatus for Making Carbonate of Soda.
Ernest Solvay, Brussels, Belgium. - This invention consists : In forcing car Ernest Solvay, Brussels, Belgium.-This invention consists : In forcing car-
bonic actd gas, obtained from any conventent source, through a high column generally several times as large as its greatest width, and so make the liquo descend and the gas ascend $m$ :Inly in a vertical direction, by which means ery active reaction is obtained, and a complete prevention of the heating of the liquid: The use of a single vessel of considerable hight in proportio
its width, called the "absorber," for treating the solution of nd ammonia by carbontc actd: The use of plates pefforated of sal and ammonia by carbonic acid: The use of plates pe:forated with smal
holes and provided with teeth round their circumference in the sald absorber, in order to divide the gas as often as practicable: The pecullar
form of calotte or globular segment given to these plates: The use of form of calotte or globular segment given to these plates: The use of
plates provided with one or a few large holes in the said absorber to prevent me mixing of the liquor at the bottom and top of the sald absorber: Feed iquor in the upper half of the absorber in a fit state to retain the ammonia carried off by the gas from the lower half of the absorber: The use of racuum filter for separating the bicarbonate from the liquid: The drying
of the bicarbonate and its conversion into mono-carbonate of soda with the of the bicarbonate and its conversion into mono-carbonate of soda with the
same fllter by passing a current of air or other gas through it: The drying with proper openings, and which to provided with shaft arms and scrave Which cause the drying substance to move from the top to the bottom of the ylinder: The use of hollow shelves heated internally in the sald drying pparatus: The drying apparatus, consisting of a hood provided with a cen quid from which tre b thus obtained, by which muriatic acid or chlorine is obtained, and the mag,
nesia, as well as allthe salt which has not been converted into bicarbonate.

Improved Apparatus for Protecting Grain and Seed. Jean Methodios Joannides, of Mark Lane, London, Eng land.-This inve
Hon has for its object to prevent the mildew and rotting of seed or grain of all kinds, and other things, during the period of being stered on boar ships, or in other places; and this by an apparatus so arranged that fresh
air is conducted iuto and about the mass of seed or grain thus stored. The pparatus consists of a perpendicular cylinder of suitable material, wit ranching from the perpendicular cylinder. The sald cylindere, both endicular and horizontal, are perforated with small holes for the circula tion of the air, but so as not to allow of the grain, seeds, or other things arge ones for the return of the conflined air and to keep up the circulation. The apparatus thus formed is placed in the compartment of the ship, o chamber. The perpendicular cylinder, projecting as attached to it a funnel-mouthed ventilator fitted with sponges chem cally prepared for purifying the air hefore its admission into the cylinder
Thus fresh air is introduced down the perpendicular into the horizontal hus fresh air is introauced down the perpendicular into the horizont

Improved Cartridge Made of Fusible Metals, etc William Henry Tooth, Brixton, England.-This invention has for its objec
furnish metallic cartridges which can be expelled from fire arms with the projectiles without leaving any residue behind to foul the barrels. The in vention consists in constructing the cartridges and projectiles or bullet ither of one piece, or they may be made of two or more pleces joined toge her, and and powder purposes metamic hles and powder atal or compound is used which is not corrose of the compositions of lead and tin, and any other metalic substance which wil fuse or melt at a comparatively low temperature, whereby the destruction of the cartridge is completely effected; or for a cartridge which is itsel ployed, with the addition of bismuth, such cartridge to be filled with pow

Cigar Bunching Machine.
Henry b. Bu ter, 10 Barclay Strect, New York city.-This invention ha base frame of the machine is a light casting, and fis designed to be secure a table or bench. Upon the forward end of the frame is formed a raise projection in which is formed a T groove to serve as a guide for the tongue
or guide bar of the table or top frame and cause it to move back and forth in a straight line. Upon the rear end of the base frame are formed two up wardly projecting lugs, in the upper ends of which are formed screw ho:e to receive the screws, which serve as centers to the ends of the roller. The
top frame moves back and forth between the arms of the base frame, and In its stde bars are formed longltudinal slots, through which the rolle
 oving back and forth. The fraine is gulded, as it moves back and forth, b ts sides to fit into the $T$ groove of the by the tongue, and has grooves in
At the rear edge of th platform is formed a trough or recess, Into which the proper amount of fillang for a cigar is packed. In the end parts of the recess are formed holes to
allow the dust that may enter said recess to escape. Upon the forward edge of the platform are cast hooks, upon which the bunch is received. The for ward end of an apron or strip of cloth, or other sultable material, passe
down through a slot in the forward edge of the platform, and is attached to down through a slot in the forward edge of the platform, and is attached to
rod of such a size and length that it cannot be drawn through the sal rod of such a size and length that it cannot be drawn through the sal
alot, and which is held up against the under side of the platform by an duastable spring. The other end of the apron or strip passes over th turn and is attached to a rod, to enable it to be lengthened and shortene turning the rod in one or the other direction to wind said cloth from or
pon it. In using the machine, the frame is pushed fully forward, and th lack of the cooth is pressed down into the recess. The binder is then lal pon the cloth upon the platform, with one end or corner extending down
into the recess. The proper amount of filling to form the bunch is the placed in the recess and the frame is drawn back. This rolls the bunch ove and over in the blght or fold of the clowh, winds the binder around it, and brings it into proper condition
hand in the ordinary manner.

## Improved Lamp.

Frank A. Flanegin, Fagundus City, Pa.-Tne collars of glass lamps ar cement. Collars thus fastened are very apt to get loose, and are conse quently rendered useless until repalred, This invention relates to an im. rocure the same to lampa, and the improvement consists in the arrangemen a tubular screw and its attached springs with a lamp gollar

## Improved Saw Set Ill.-The invention consis

John W. Leslie, Cairo, Ill.-The invention consists in the mode of faston
ing a saw set to a handle. The saw set attachment, which consists of Ing a saw set to a handle. The saw set attachment, which consists of a
short, narrow, but strong plate of metal is firmly attached to the ferrule so angles to the handle, sultable for bending the teeth sidewise by the handle

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S. C. M. asks how to whiten the red of N. H. H. asks how to put a polish on steel A. C. T. says: Please give me a method of
making japan of superior quality. C.F. D. asks: What can $I$ put on a copper
xhaust steam pipe to make paint stick? J. H. asks: How can I make the best paste G. L. F. asks: What color should a mill J. H. says: Please inform me what will
nake ink used for ruling machines dry faster than alcoW. L. asks what is the quickest way to
eason elm hube which are bored through Irrat and then ounded up in this lathe.
E. B. C. wants recipes for making red and
lue stenciling in k for marking unplaned wood. " 1 pre er allquid to dry Ink."
W . G . asks: Is there any way that mica
ised as windows in anthractec coal stoves, can be kep W. E. says. W. T. B. tells us that he drives
4\% feet millstone with a 2 inch belt. Will he tell us
T. N. asks: What can I mix with wood char

G. W. S. says: Can you inform me what
preparation is used for the bright yellow lacquer on Hass castings, such as gas $\ddagger$ tutures, and how 1 tis made
E. F.L. asks: How can a varnish, made from resin dissolved in bolling water by mean, of carbonat
S. says: The $V$ of a railroad terminates in
solid limestone in the foot of the ness is about 15 feet. I Propose to bank up the cut with are worthless, and set them on fre. Would that tessen
and the la bor of deepening the cut and to what depth would
the stone probably be burnt
 scends vertically and draws a welght of 6 ibs. L ap a plane
whose Inclination is 450 . How far will the firsbody deWhose Inclination 18 $45^{\circ}$. How far will the frisbbody de-
scend in ten seconds?
[We would 1 ike a solution of this problem, releating to accelerating forrees, from any reader
who may have more celsure than we have to devote to Who may have more lelisure th

E. W. H. says: I should like to have the opinions of omeme
of your readers on the following problem, as it may ellict some or-
Iginal dideas.
$A$ Is supposed to be without weight
and in a state of rest in space. and in a state of rest in space,
uninfuuneco oy any external orces,
Requirec the motion timparted $b$, Required the motion imparted by
given force, P, applied at any polnt
as A sumposing there be no resist. as A, supposing there be no resist
ance of the art. [This is n neat prob.
Iem tin the highermethemat lem In the highermathematics which
we suspect will be respectfully con we suspect will be respectfully con-
siderea by our readers, and of which we shall be peaesed to see a conclise
solution. - ED. E. B. C. asks: Will iron, that has been W. E. says: I wish to run a stone with a est of the mill without the stone. How can I Idscon-
den M. M. H. asks: How can I preserve or kee neat, such as beef and mutton, sweet and good for tabl nse, for a week, durlng the summer months? I have a
large tee chest,but $I$ ind that the meat sometimes sours.

## 

Owing to the illness of one of our editors, the replies
to several of our correspondents relating to chemical
G. McK. says: Of what metals and in what
proportions does the enclosed specimen consist ?

 determinning the number of pound a person can hold on
$t ;$ if so, how? How hould l proceed to charge a Leyde ar, or a tumbler of water? Answer: A simple method of constructing an electric gage is to connect one end
of a a ilk thread with the tron wire core of the coll, and have the other end wrapped around a small shaft (a
darning neede will do) with a pointer, a fine cambric neede, soldered at one end so as to indicate, on a grad nated disk, as the tron core is withdrawn; any gage you
may use is to be understood as relatitve, that is, it is not ike pounds pressure, supported by steam. Your ma.
hine has not quite sufflclent power to charge a jar sat. sfactorily; connect the outside coating of the jar, with one end of the secondary coll, and bring the other
o within an elghth of an inch of the brass knob.
W. C. V. says: I wish to prepare a battery Will common sheet copper, such as can be had at til
 olution soaks through the porous cup.
E. B. asks: : Is there any such thing as
watch that will tell the distance you walli'

Answer | waten |
| :--- |
| Yes. |
| 8.15. |

H. . ays: I hand you a specimen of a pecu
lar sand found in Iowa. It lies on i kind of pata and it mixed with ht. What t 8 it and can it be used beneficially as an artiliclal manure ; and if so, on what class of solls Answer: It is calcareous tufa, deposited
We do not thlnk it would beneft the soll.
 steam to drive it properly, which $I$ think ts twice to much, as I have run more than double the amount on
machinery with the same boller, but a dafferent en gine. The boller is 52 Inches diameter 824 feet long,
with two 18 inch flues. Engine and boller are in good order. If we work at a lighter pressure, the steam soon
runs down. We have no trouble to make steam with saw dust. The engine is only elght feet from boiler, con-
nected by a three nich pppe, but tit works more water in cyllider than Ilike. There is a plain slide valve, and
 on, and see if there is no serious leak past elther. Tak
off valve chest bonnet ; see if valve has a litte ead oil off valve chest bonnet; see if valve has a little lead on
steam side, cuts off at about two thirds and does not
 and exhaust passages are not choked by faults in the nul examination of that, and the application an ar ator to the engine would be very certatin to detect the
analt 1 tin
H. D. N. asks our price for replying to
uestion relating to the use of belting. We reply tha the subscription price of the Scirentific Americas ig
hree dollars per year, in advance. We make no othe charge, and we belileve that we meet with some suceess
in oureffort to give our subscribers more than an equiv-
 whioh will be foundint the editorial columns of this 1 ssue. $\underset{\text { smail boat to be worked with a serew by hand ; and my }}{\text { P. }}$
 manyblades it should have; and if folt would make any difference if the wheel would project below the botom of the boat. The dimensions of the boat are to be as
follows: Length of keel 18 feet, beam $2 \nless$ feet, depth of follows: Length of keel 18 feet, beam $2 \%$ feet, depth or
hold 14, feet. Answer: Make the serew as large as pos.
 jections to so placing the screw as to project above the
waterthan below the keel. The great objection to the atter plan is the liability to take the ground. We shoul
appose a screw of 2 feet dilameter and 2 feet ptch .ith elther three or four blades would answer, and could be
put tn.
J. H. H. asks: What is the relative propor gine? 2. . have been informed that there e 18 no way of er
fectually belng that the live steam cylinder gives off enough stean to drive the condensing cylinder from 12 to 20 revolution
 oy has passed that the governor begtns to act t and then probably, is the time when the engine requires all the steam it can get. I clalm that, by a different arrange
of valves, a compound engine can be made to gover of valves, a compound engine can be made to gover
instantly. I have consulted a mechanical engineer on omething in of position of the component parts of a machine is pat result Whanto raccomplish it, in order tomakeit patentable? Commo ense would seem to suggest that, if by smp turning Itherto useless thing upside down, it could be made of prcfit thereby discoverer of that fact was ent thed to prcit thereby. Answer: The propnrtions vary in ever
ndividual case. If desirous of obtaining designs, consult some able mechanical engineer who has had some opportunities to learn the proper proportions. A com mon proportion glves the high pressure cyliinder not fa
from one haif the diameter of the larger. 2 . We should consider your ideas correct, but can form no idea of th
value of the proposed device without seeing it. Th
D. H. P. asks: Can sheets of metal, eithe or over, and of a thickness of from 0001 to 003 of an inc ired in making such a deposit, and what ill be the probable cost if copper is employed? Could such a sheet of metal be deposited on paper so as to ad
here firmly? Answers : 1. Yes. 2. Ten cells of Dan ell's battery, to plate the surface and thickness men Honed, would require about two hours. The cost would epend mainly on quantity; no pricecoula be mentione without a prellinary trial. 3. By rubbing plumbago tor, and then plating it with copper, we have no doubt
but that the metal will adhere as firmly as you majneed Will not gold or silver leaf paper answer your purpose N. C. sends three samples of rock said to
rich in silver and cinnabar. Are they of any value? Answer: The specimens received show no signs of either nswer: The spe
silver or cinnabar.
L. P. asks: 1. Is the strength of wood impagon axle draw more is dried by steam? 2. Does a large wers: 1. Wood consists of carbon, oxygen and hydro sen, the latter gases being in the proper proportion t
form water. When in its ordinary state, wood also con tains some uncomblned moisture which is removed by
drying or seasoning. If the process is carried on, wheth $r$ by steam or otherwise, at a temperature which is no uch above $212^{\circ}$ Fahr., the drying takes place wthout njury to the wood. If the temperature is carried much osing all its water of combinat, the wood is charred eft. If this occurs, even partially, the strength of th the draft, provided that the bearing surface does no become too small to allow of proper lubrication, thus
S. P. S. asks: What is the largest diame ter of thedrivers in use on the English locomotive en-
fnes, and also that of the American? Answer: The gines, and also that of the American ? Answer : The
diameter of the largest drivers generally used in Eng
T. G. G. asks: Could an engine be construct and use the same steam twice, once in each cylinder?
For instance, let the piston rod run through one cylinder into the other. Then let the steam in at the front en of rear cylinder, and let it pass out through a pipe to rea nd of front cyllinder, so as to get power twice from same steam before it passes out. As the steam enters
the back end of rear cyllinder, let it pass through a plpe
to front end of front cylinder, etc. Answer: Our corto front end of front cylinder, etc. Answer: Our cor-
respondent describes a "compound engine." With cyl per pound of coal consumed, than with one alone. If
he second cylinder be made larger than the first, as $T$ . G. will ind them proportioned on nearly every steam r now bullt for ocean navigation, expansion will occu engines is too extensive to be treated of here. Our cor esponden $t$ should know that Nature never gives any
hing without recelving an equivalent. The same powe annot be obtained twice from the same steam unde ny conditions.
W. S. D. asks: How can I remove plaster of Paris after it has set hard in metal sockets withou
niuring them? Answer: Calcine the plasterby puttin
S. E. M. says: 1. I would like some advice negard to a steam blower. We have a 25 horse booller
for steam heating, etc. The boller sets about 10 fee rom the chimney, and a 16 inch pipe connects the boile nd chimney. I put a spiral coil of $3 /$ inch pipe, with rease the draft; but it does no good. This coll of nch pipe enters the smoke pipe near the top of th oo any good? 2 Could I use a hydraulic press for mak ing fuid extracts from roots and barks? 8. Do you think It good practice to test a steam boiler by flling it full o water and starting a light fire? I propose to test our should not be done. Answers: We should expect jet to work better in the chimney. A jet is never as
eflcient as a blower. 2. We should not expect a press o work as satisfactorily as the usual method of steeping xtract the juices very completely. 3. Bollers ar sometimes tested as proposed. We should prefer heat ng the water to the boiling point nearly and then using
the pump. Water heated under a pressure of 1001 bs pe he pump. Water heated under a pressure of 1001 lbs .pe its ordinary bolling point. Should rupture occur, scald lig hot water and as much steam as this excess of tem-
perature would suffice to form-that is, about one eightb perature would suffce to form-that is, about one eight
he total weight of water in the boiler-would be set ossibly, no little damage
F. S. A. says : I send herewith specimens of
frmations found in the boflers of the steamship R. R. Cuyler. The tubes were covered with these crystals
Can you tell me of what they are composed? The vesse as been in South American waters off the Pacific coast. nswer: The specimenis an unusually large crystal (con of lime, and was derived from the wafer, which must of lime, and was derived from
J. C. H. asks: What is the proper name of
an acid that willeatitself out ot flasass boties? Answer: n acla that will eatitself outof glas
Hydrofluoric accid will dissolve glass
W. F. P. sends a specimen of mineral and sks what it is and the value. Answer: It it
quartzand hornblende: of no use in the arts.
R. M. S. asks in regard to the construction "stralght."
J. M. C. says: If 1 should set a hydraulic
am 100 feet from and 10 feet below the level of my spring, how much of that water can I raise perpendicu
larly 30 feet above the ram? Answer: Probably abou ten per cent.
$\underset{\text { Sng p.cckies in abs brass settle renders them injurious to }}{\text { S. }}$ health, and will a brass faccet ina vinegar barrel Injure the vinegar: Yes; in both cases acetate of copper is
formed. This 18 a volent poison and many cases are on record of tis singurious effects. The manufacturers of the best plckles made bonl them tn oak tanks by means of a platinum worm. This is not practicable of course
in a sinall way, but they may be cooked in porcelain lined
S. P. S. S. says to R., who asked how to dissolve
bones to be used as a fertulizer: If you have but a few to dissolve, the best way is to pack them in wood ashes In a hogseead and let hem stay there for a about a year,
keeping them moist. At the end of this time they wril
all have dig these may be returned with the next lot. They may alo be burnea, but this 1 e extremely wasteful. After burn. ing they should be treated with two thirds of thet
weight of sulphuric acld, in order to convert them superphosphate. It costs about ten dollaras a tun to
grind them while green, and requires the ald of power grin machiner
ful
mat
S. P. S. replies to S., who asked how to
make a red stain that will give, when burnished, a bright make ared stain that will give, when burnished, a brigh
clear color: Make a strong decoction of logwood and on wood.
A. O. says in reply to M. $\mathrm{M} . \mathrm{E}$. P.,., who asked
what are the best materfals for soldering Iron and steel, and how are they used: $:$ For largeand heavy pleces of fron and steel, copper or brass is used. The surfaces to be
united are first cleaned off by flling: then they are bound ogether with steel, and upon the joint a thin strip o sheet copper or brass is lata, or, if necossary, fasten to it with a wirre. The part to be eoldered is now covered
with a paste of clay, free from sand, to the thickness of with a paste of clay, free from sand, to the thickness of
one inch, the coating belng applied to the width of hand on each side of the piece. It is then laid near hand on each sile of the piece. It is then 1ald near a
fre, so that the clay may dry slowly. The part to obe
soldered is then held before the blast, and heatea to a solderere is is then heled bebore the blast, and heatec to a
white heat, whereby the clay vitrifies. It tron 18 soldered white heat, whereby the clay vitrifies. If ifon is soldered
to iron, the piece must be cuoled off in water. In sol-
 cool slowly. The semi-vitriffed clay is then knocked off, and the surface is cleaned in a proper manner. By fol-
lowing the hints given, it will be found that a durable
 er method is recommended, thereforere, for steel. Artyclecs of fron and steel of medium size are best united are cleanly filled and spread over with the solder and borax,
when the soldering seam is heated. Hard brass solde Is prepared by melting in a cruclbie eight parts of brass and adding one part of previously heated $z$ inc. The crufew minutes, then emptied into a a pall of cold water the water belng strongly agitated with a broom. Thus the metal is obtained in small grains or granules. Soft
brase solder 18 obtained by melting together $81 \times$ parts of brass
prass one of zinc and one of tin the granulation carried out as Indicated above. Small articles are best soldered with hard or soft silver solder. The former 18 obtained by mixing equal parts of fine silver and
soft brass. In fusing, the mass is covered with borsoft brass. In fusing, the mass is covered with bor-
ax, and, when cold, the metal is beaten out to $a$ thin sheet, of which a suffciently large and previously annealed piece is placed with borax upon the seams to be united, and heated. Softsilversolder difers teenth of tin, which is added to it during fusion. Very fine articles of iron and steel are soldered with gold, namely, either with pure gold or hard gold solder. The parts silver, and three copper. Fine steel wire can also b soldered with tin, but the work is not very durable. Hard and soft brass solder are used for uniting copper and brass to iron and stee
$\underset{f \text { limestone could be successfuly }}{\text { A. O. Says. in }}$. duction of steam in a furnace suitably constructed for
he purpose: Limestone is a carbonate of lime and will not slake unless burned. As burnt lime commands a ready sale, to produce steam from such lime would a powder, when saw dust will do as well. Besides, you could only produce steam of A. O. says, in reply to I. C. B. who asked if
drinking water, standing in a pail, should be covered, to prevent absorption of noxiousgases in a room: The absorption of gases by water, unless they are conveyed hence no precaution need be taken to prevent it. If containing carbonic acid or oxygen, it will be deprived
of it and become stale in an open vessel. The cause of it and become stale in an open vessel. The cause
why water gets spoiled if not running is attributable to organic matter gathering in it.
$\underset{\text { coffee produce leather soup," etc: It is about as true }}{\text { A. O. . }}$ A. H. sends a mineral specimen and asks
what kind of stone it is. Answer: The mineral you $\underset{\text { askswhat it is. Answer: Iron pyrites or fools, gold. }}{\text { W. B }}$ of no value.
G. W. asks: Is there any thing that will re-
move lime scales from boilers? I have used many remedies with but little success. The so-called "disincrusting compositions" oftered for sale do not help me in the
least. Can you suggest anything that will clean my least. Can you suggest anything that will clean my
bollers? I am now using pure water. Answer: Scale once deposited can usually be best reraoved by mechan-
ical means. To prevent deposition, the lime salt must ical means. To prevent deposition, the lime salt must
usually be precipitated before the solution reaches the usually be precipitated before the solution reaches
boller. Heating to the boillng point will cause deposition of the carbonate. Chloride of barium will throw down the sulphate. Look through our back numbers
and select for yourself from the many recipes and
methods discussed and described therein.
E. G. A. asks: What horse power can I get
from a well protected 2 2ht inch pipe, 75 feet from the bollers, with 40 1bse. of steam? Answer: Judging from orr experience, we should suppose that the loss of press
ure tu such a pipe would not be more than a pound oo
.
 powr.
W. J. K. says: I have about 300 lbs of this Ineral, and ask you what it is, and is it valuable. An
wer: The mineral you send is is ron pyrttes. of no spec ${ }^{2 a l}$ value,
W. F. C. says: $I$ am building a sawmill with Ifeet nead,penstock 3 feet $x 4$ nchehes clear, feed by trunk ibs. Shall $I$ attach it to the shaft of the water whee Which is a flutter wheel with two feet buckets, or use a have my own views. The ttream 18 gemall and Id depend on wheel that would answera better purpose? some think balanae deadens the quickness of the mill. Will 1 l take more power to run with balance than wthout
Answer: We should balance the crank by a welght oul the opposite side equal to its own, in order to avoit jerking at each center; with a crank thus balanced an extra balance wheel would be of no use. A balanc Fheel may aliso be used with a a crank (or pitman pin)
ne side, with the opposite stide loaded equal to the weighto whe pitman pin. It 1 sal ways better to balance
weigh of the crank, especially in a quick motion. As a principle, balance whee 18 always run at the expense of power
which 18 stored up th the motion of the wheel Winch 18 stored up in the motion or the wheel and mor periodical force i s refífired, such as for punching, shear ing, cutting off stoks of cord wood with a circular saw te. There are many turbine water wheels, some ad tritised in the scrientrific AMRRICAN, that are bette
than the old fashioned futter wheel; we would advise sendlng for the circulars of various makers.
F. A. S. asks in your last number how to My answer is: Shoot it through with a pistol or rifie
There are reacuent examples of this mode of on ting glaes to be been am
way New York.-0.D.
A. M. says: " I am running a circular saw Inches in diameter, with cast steel mandrel $3 \%$ inches in
diameter, runnin dameter, running in seif ollling Babbitt-1Ined boxes
The box next to the saw runs hot in spite of all efforts
 the mandrel (the onl will cause the paper to stick to the
ournals) let the joint in the paper come on the journals) ; let the joint in the paper come on the side pouring off; lay the mandrel in, and let it remain unti he Journal and box are both warm, but not bo as to oure
or scorch the
aper. The mandrel should then be take outorra the paper. The mander should then ne take
out, and the ofled paper stuck around it. Pour the met are pound the outside of the paper after the lower boxe paper, and put on the upper box, boltingit down. After
and the upper box 1s poured, take tit offand take off the paper
which will leave the journal of the mandrel free to ruil witho will leave the Journa1 or the mandrofng to r wecout healng. As the Journals wear down so as th
become too loose, take out a layer of paper from be ween them.

W. T. says, in reply to our
rrespondent G. M. page 187 of the current tolume o cannot get his engine room wate gage (Which is at a considerable dise
tance from his boller, the conne tance from his bobin, the connee-
tions beting made by tortuous pipes) or indicate correctly, as the wat
vill not rise to the level of the wate in the bollers, and is, moreover, in constant agitation owing to con other obstructions, which he found it diffleult, if not impossible, to over come: Make your engine room gage
something like the simple one illus. trated in the engraving one illus and I think you will not more trouble by the gage failing to
tndicate correctiv,from the agitation of the water. [A very good and very
generally used arrangement.-ED.]
S. T. O. says, in reply to W. W. W., who willaffect the central hole : I would say that it will, and learned it 15 years ago. We used to force our whee after wards shrink the tyre on; but we never could re-
move them with any amount of force applied, untll we move them with any amount of foree applied, untll we
had removed the tyre, then the two men would rem the wheel in the same press easilly; these were our hear
 ow this can be done with any thickness of hub?
W. R. J. says that $G$. T. T. P., can make a Gom shellac, 4 oz. white turpentine, $\neq 2$ oz. gum campho 2 2 ze vermina strring uttl
W. R. J. Says that
his process for tinning cast iron, as he may ne mothing new nquiry ateany hard ware store. Tin has long been used
ind ide of cast tron tea kettles and boilers,
L. W. E. says that T. W. M. can make tracnoth sides of the paper with the preparation.
G. H. says: I Intice your remarks on a col-
lapse of a copper still at Phelps, N. Y. $A$ somewhat simIlar case happened some two yrars since at an apple
distillery. The owner, in llling his still, neglected to distllery. The owner, in illing his still, neglected to
open a vent provided for the purpose at the tol of the open a vent provided for the purpose al
still; the result was a collapsed kettle.

COMMUNICATIONS RECEIVED
The Editor of the Scientific American acknowledges, with much pleasure, the re ipt of original papers and contributions on the following subjects
On the Use of the Thermo Pile in the De ermination of the Phrenological Character the Cranium. By G. D
On the Bursting of Cylindrical Boilers. By C.

On Sailing Faster than the Wind. By A.B. On Quartz Mining in California. By G. P On Scientific Hanging. By J. D. H.

On the Power of Compound Levers. By R. D. W.

On the Computation of Logarithms. By G. W McC.

On the Comet of 1866 and the Novembe Meteors. By D. K.
On a Plan for Perpetual Motion. By J. L. C On a Recent Display of Zodiacal Light in Louisiana, and on the Flight of Birds, and on Boiler Strains. By J. B.
On the Intellectual Enjoyments of Science By J. S.
On the Effect of Light on Combustion. By E. B.

On Boiler Strains. By J. C
iso enquiries from the following
W. \& K.-T. C.-G. S.-R. F.-G. M. G.-
H. D. S.-W. T. K.-W. N. G.-S. H. S.-
S. L. B.-H. C. K.-H. L.-G. W. L.-E. H -F. A. S.-J. A. S.-A. H.-T. S.-J. C. R
-W. D. G.-O. J. P.-H. L. M.-E. H. S.-
W. A.M.-W. J.-H. B.-C. S.M.-J. P. D
-C. Z. M.-T. R. H.-J. C. J
Correspondents who write toask the address of certain lso those having goods for sale, or who want to find artners, should send with their communications a he head of " Business and the cost of publication unde the head of "Business an
[OFFICIAL.]

## Index of Inventions

## FOR WHICH

Letters Patent of the United State were granted for the week ending

March 18, 1873
and each bearing that date
[Those marked (r) are retssued patents.]

## Alarm, burglar, W. H. McP Ash sifter, C. S. Collins.

 Auger, earth, H. C. Stouffer Balloon advertiser, E. L. B. Moodie Basket, R. B. Wheeler, (r).Bed bottom, B. C. Vanduze Bed bottom, B. C. Vanduzen
Bee hive, Newman \& Brown Bee hive, Newman \& Brown....
Bee hives, moth trap for, L. Gate Boiler furnace, J. Westerman...
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Bridge, S. B. B. Nowlan...
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Canal boats, snubbing, T. W. Edgar Candlestck, A.E. Rogers Canteen, hospital, H. Beck
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Churn power, W. A. Lewis
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Pans wiring metal w. Fogleson Pans, wiring metal, W. Foglesong
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now, melting, J. Muila now, melting, J. Muilaly
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Snow, melting, J. Mallaly...
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Table leaf suppo Table leaf supporter, W. Jefts....
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37,040 <br>
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136,937 <br>
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\end{tabular}

Trowel, S. F. Streeter
Type, cas 4 Ing, A. C. Converse................
Valve, balanced, H. Fitzsimmons.
Valve, safety, G. J. Rains...
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Vessels, raising sunken, R. W. Hallett
Vessels, buoying, etc., J. W. Cooper
Vessels, buoying, etc., J.
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Washing machine, c. Cole.
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Windmill, Long \& Mc
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APPLICATIONS FOR EXTENSIONS.
Applications have been duly filed, and are now pending,
for the cxtension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned
24,446.-Straw Cutter.-R. Daniels. June 4.
$24,456 .-$ Heating Buildinas by Steam.-S.F.Gold.June 4 24,484.-Paper Polp.-J. B. Palser, G. Howland. June 4.
24.495.-HARvester.-W. \&. T. Schnebly
 4,571.-Finishing Broshes.-T. Mitchell. June 11.

EXTENSIONS GRANTED
23,291.-Bale Band.-G.Brodie.
23,509.-Evvelope.-S. E. Pette
DESIGNS PATENTED.
6,493.-BELL.-O. F. Fogelstrand, Kensington, Conn.
6,993 to 6,50 .-FLoor Clotrs.-C. T. \& v. E. Meyer,
Lyon's Farms, N. J.
6,506.-BEER MVG.-J. E. Miller, Pittsburgh, Pa.
6,508.-BASEET.-S. I. Russell, Chicago, Ill.
6,509 to 6,511.-ORGAN CASEs.-S.Hayward, Boston, Mass.
TRADE MARKS REGISTERED.
1,166 \& 1,167.-Tobaccos.-L. Bremer's Sons,Philadelphia.
1,16s.-FiLss.-Crocker Cutter Tooth Flle Co., Norwich,
Conn.
1,169 \& 1,170.-SIRUP.-Fairbanks \& Gllman,New Orleans,
${ }_{\text {1,771.-Cover Balsam. -F. W. Kinsman, Augusta, Me. }}^{\text {La }}$ $1,172 \& 1,173 .-$ Toвacco.-Robinson Manufacturing C $c$
1,174\& 1,175 . - Hose. - Boston Elastic Fabric Co.,Mass.
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On each Trade-Mark
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On application for Reissue On application for Extension of Patent On granting the Extension
On fling a Disclaimer.
On an application for Design ( ( $3 /$ y years
..... 830

## TALOE OP PATEMPS

And How to Obtain Them.
Practical Hints to Inventors

He
ROBABLY no investment of a small sum of money briugs a greater return than the expense incurred in obtaining a patent even
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Ings, Petition, Oath, ard full Specification. Various offlcial rules and formalitites must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the ald of persons expe-
rienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the partles consulted are honorable men, the inventor may safely conflide his ideas to them;
they will advise whether the improvement is probably they will advise whether the improvement is probably patentable, and will give him all the directions needful
to protect his rights.
How Can I Best Secure My Invention? This is an inquiry which one inventor naturally asks ents. His answer generally is as follows, and correct: Construct a neat model, not over a foot in any dimen. sion-smaller if possible-and send by express, prepaid, desoription of its operation and mertta. On recelp
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model, make as good a pen and ink sketch of the immodel, make as good a pen and ink sketch of the im provement as possible and send by mail. An answer as
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made at the Patent Offlce; such a measure often saves made at the Patent Offlce; such a measure often saves

To Make an Application for a Patent The applicant for a patent should furnish a model of his Invention if susceptible of one, although sometime tcal production, he must furnish samples of the ingredients of which his composition consists. These should besecurely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a di way to remit money is by a dratt or postal order, on New York, payable to the orderof MONN \& Co. Persons who live in remote parts of the country can usually pur-
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The pate
rnment fee $\$ 20$ ), be taken out elther for five years (go ernment fee $\$$ yen or for ten years (government fee $\$ 40$ )
or for fifteen y yars (government fee $\$ 60$ ). The five and en year patents.may be extended to the term of ifteen
years. The formalities for extension are simple and not

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