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## mproved Brick Kiln.

Scientific men, for the past few years, have devoted themselves anew to a study of the laws of heat; and a philosophy has arisen which effectually disposes of the old notions about caloric and its properties. Among other things, the subject of ventilation has undergone a thorough revolution; it has been found necessary, in order to produce a comparatively uniform temperature throughout a room, to exhaust from the bottom, thas absolutely inverting the old method of providing an inlet fo heated air in the floo and an exit at the ceil ing. Heated air tends in an upward direction, and this is based upon the natural law which causes all fluids to seek a level according to relative weight or specific gravity ; therefore, when we desire to secure an equal temperature everywhere upon the whether it be the whether it be the moderate temperature of a dwelling or the
intense glowing heat intense glowing heat of a burning oven or kiln, we must exhaust from below.
This principle has lately been happily applied, and with com. plete success, to kịlns for the burning of bricks,tiles, and waras of different kinds. And in this direction we take pleasure in referring to the subject of our illustration, "The Hawley Kiln."
Fig. 1 represents a perspective view, showing the left hand anterior chamber in process of burning, while a part of the walls of the right hand chamber, furnace, and floor, is broken away in order to show something of the internal arrange ment. Fig. 2 is a vertical section, with arrows showing the course of the currents during the process of utilization of eat. Fig. 3 is a dimished foundat location of the wells for retaining condensed steam and ducts

leading from the chimney. Fig. 4 represents a portion of the | heat. Fig. 3 is a diminished foundation plan, showing the | In all other kilns adopting this |
| :--- | :--- | :--- |
| location of the wells for retaining condensed steam and ducts | distinct stages to the process, namely, drying and burning. |
| leading from the chimney. Fig. 4 represents a portion of the | The first step is to drive off the moisture (steam, "water | permanent floor of the burning chambers, show ing the construction and mode of support.

(To illustrate the manner of burning the first chamber, refer to Fig. 2 left hand furnace and oven, isolating in imagi nation this part from the rest of the drawing. The course of the arrows, be inning at the ash pits, ginning at the ash pits, hows the direction of he currents during burn ing).
The room, $A$, is filled with green material, and the chimney damper, D pened. The cold air draft to feed the fires in the furnace enters (ihrough openings, K K, seen in Fig. 1) on each side of the ash pit doors, and rise in appropriate vertica flues until it enters th
it passes downward betwo arch over the furnace; thence furnace, and enters the ash pit under the grate bars.
During the progress of burning, the furnace walls become intensely hot, and the incoming fresh air, by contact with these walls, during its transit to the grates becomes so highly heated as to ignite all the smoke and the gases generated
from the fuel (whether wood or coal), thus securing almos perfect combustion.
The products of combustion rise upward in the furnace, B, and enter through the opening (in the direction shown by the arrows) into the burning chamber, A. Haring no avenue of upward escape, the heated air spreads itself in a level
stratum throughout the top of the chamber, displacing and expelling at the same time an equivalent in bulk from the
final process. The experience of every observing brick burn er shows that it requires a much larger expenditure of fuel to burn bricks to the proper degree of hardness after they have been completely dried by means of a slow fire; under such circumstances they say "the heat runs away from them," and they therefore strive to follow as closely as possible the complete the process ; buth a sufficient degree .of heat to complete the process; but as they approach the top courses in the kiln, the heat unavoidably escapes into the sky and fails to do its perfect work; and they therefore are likely to have pale or insufficiently burned insumick to a burned less to a greater or less extent, and no fang will firing will remedy thi difficulty. This same defect is met with in all down draft kilns, when the drying of process is completed before heavy firing is begun, or where they pass the heat from the already dried oven over into a succeed ing one, necessitating much longer firing and, of course a large expenditure of fuel By Hawley's device this defect is over thime During hi prer come. During his pro cess of burning, the incoming heated air generates steam free ly from the green ma terial contained in the oven; this steam gravitates in a level stra tum, is condensed be low (thoroughly satu rating the material),
bot tom of the room into the sub chamber or condensing well, and acts as a sort of automatic damper, which resists or re , situated underneath the floor of the burning oven, from tards the closely following or descending stratum of ignited which it escapes up the chimney flue, controlled by the gas which, at a white heat, is thus caused to expend its force damper, D.
Hawley, by his method of burning, aims at an entirely novel process, which serves to distinguish his invention from all others who have adopted the down draft principle.
In all other kilns adopting this principle, there are two The first step is to drive off the moisture (steam, " wate per prevents the scape of ${ }^{\text {at }}$, at least above the steam point $\left(212^{\circ} \mathrm{Fah}\right.$ ), it does not materially obstruct the natural draft. This action is analogous to the formation of clouds around mountain paks by the condensation of moisture from ascending warm rrents of air
This task of retarding the descending stratum of intense
 heat until after it com pletes the burning pro cess, through and below the lowermost courses in the burning chamler, is effected by providing the sub-chamber or well, C under the floor, $F$, of the oven, in which the dfacending steam is received, condensed, and retained in sufficient quantity to effectually arrest the escape and consequent loss of heat until the pro cess of burning the propleted.
In the burning of material requiring extraorterial requiring extraor-
dinary and prolonged exposure to intense heat (fire brick, etc.), he finds it necessary sometimes to furnish an artificial supply of water in this well, to be generated into steam (damper) and thus check
intense degree of heat is applied to complete the burning process. During the latter stage, the heat passes almost without obstruction, indeed is conducted rapidly through the al ready dried and thoroughly warmed mass of material, and is with green material in order to dry ond oven, previously filled
a longer time the escape of heat up the chimney.
Another and almost equally important feature is his ad mirable method of utilizing the immense amount of surplus heat stored in the material just burned
To illustrate the utilizing process, we again refer to Fig. 2, where we will imagine the process, just above described, as having taken place in chamber, $G$, instead of $A$; therefore,
the right hand chamber is now filled with a glowing mass of hot material. The left hand chamber, $A$, is filled with green material. The damper, D, to chamber, G, is closed, thu closing the outlet from under the floor into the chimney. The damper, D , of the chamber, A , is opened, the dampers con trolling the communication between the ash pits, $I$, of the iurnaces are opened, the direct draft dampers are shut (see K K, Fig. 1), and the dampers at E, for the cold air inlet under the floor of the hot oven, are opened.
By the course of the arrows, it may now be seen, the in ventor takes all his draft in at $E$, and converts the whole in candescent mass contained in the oven, $G$ (equivalent in fifty thousand bricks to three and one half tuns of coal, all in a state of actual combustion), into an enormous furnace, pass ing this torrent of heated air over into the chamber, A, and thus using it at the proper stage for a hot blast, and unde the furnace, $B$, and at the same time cooling rapidly and safely the contents of $G$.

Fiy. 3


By means of the sub-duct, J, connecting all the ash pits, the heated air may be transferred to either of the burning chambers at discretion; or by a prolongation of the sub-duct, J, outward, any desirable amount of heated air may be conveyed to the outside structures for drying or other purposes.
The ovens, being constructed in a group of four, permit continuous operation; cooling one while burning another charging the third, and discharging the fourth, all at the same time. The feature, also, of their double walls separated by a dead air space (to prevent cold air from coming in direct contact with inner and heated walls, thus preventing them from cracking) renders this kiln far more permanent and lasting than if thicker and solid walls were used, and at the same time reduces its cost.

Tiy 1


While the saving of fuel is an item of vast importance to all interested in burning processes, and while, on scientific principles, we think that no other kiln or oven extant pre sents equal advantages in this direction, save, perhaps, the single exception of the celebrated German kiln of Hoffman a scarcely less important feature is that of the greatly im proved average quality of the stock turned out.
In the common grade of bricks, for instance, the genera appreciation in value, by having them uniformly hard (avoid ing " benches," "clinkers," and "salmon" bricks), may b reckoned as at least $\$ 1$ per thousand, while, in the finer grades the difference is of course much greater.
In the Hawley kiln, it is claimed, practical experience has demonstrated that at least fifty per cent may be saved in cos of fuel alone; and this, when added to the greatly improved quality and value of stock, must render it a most useful and important invention.
We have not only seen this kiln in operation on Croton front bricks, at the extensive yards of Cox and Barlow, a Croton Landing, N. Y., but have been shown a certificate from this firm, substantially verifying the claims herein set forth

The invention is protected by three separate patents, dated respectively, September 20, 1870, August 22, 1871, and Apri 2, 1872; also by a reissue dated April 2, 1872. "Application for patents in foreign countries are now pending.
This kiln is equally important and valuable to all manu facturers of tile, terra cotta, pottery, queen's ware, etc. Ad dress, for further information, A. R. Morgan, proprietor of the Hawley kiln, 103 Fulton street, New York.

The Iron Interest.-One hundred and forty thousand operatives are employed in the production of iron in the ore and fuel, 2 ,000 in these are employed in prepalls 42,000 in the rolling mills; 12,500 in blast furnaces ; 3,500 in bloomeries; 800,000 are engaged in manufacturing articles of iron. Thus we have a total of 925,000 men employed in the iron interest. The value of pig iron manufactured last year was $\$ 75,000,000$. The product of the rolling mills and forges was $\$ 63,000,000$, the value of other manufactures was $\$ 762,000,000$, and the entire value of manu factured iron
for the year was $\$ 900,000,000$.

ON THE HEATING OF WATER AND BOILERS..--CURIOUS EXPLOSIVE PHENOMENA.

A large proportion of all the explosions that occur are produced by a continuous increase of pressure without the means of escape.
Of these, many are caused by a defective state of the safety valves. Any cause that shall obstruct or prevent their free action will cause a rapid increase of steam pressure. Such bstruction may occur as a result of unequal expansion in he metal of which the valve is composed, or in the steam ipe which supplies steam to it. Says the Evening Mail: Some of the most violent explosions
traceable to this easily preventible cause.

## traceable to this easily preventible cause.

The accumulation of scale or sediment upon the bottom of the boiler will eventually weaken it. Another method by which the strength of the boiler may be diminished is found in the negligence of the engineer when he permits the water to become too low in the boiler.
All these causes are simple enough. No one will pretend that explosions resulting from them can in any sense be called accidental. Defective construction, negligent management, remiss attention, the whole catalogue of agencies by which man's negligence is put to test or his sense of dange dulled are antecedents of that class of explosions which we refer to the increase of pressure.
But we have another class referable to causes distinct from those which we have stated. They are those which we name explosions due to unequal expansion. Thus many cylindrical boilers, having the feed water introduced on the bottom, are broken by the cooling and contraction of the iron. A difference of temperature of two hundred degrees or more may thus occur in the same plate; so that its differ ent portions are subjected to an enormous strain. An ex plosion may occur from an unequal expansion without the presence of a single particle of water in the boiler. In one remarkable case, a man was clearing an empty boiler from scale and sediment, and finding these adhering too firmly to the inner surface of the boiler to be easily removed, conceived the plan of loosening them by the application of heat. He therefore lighted a fire of pine shavings at either end of one of the principal flues. This caused an irresistible expansion of the flue. The shell of the boiler was not able to resist the enormous force thus developed, and a violent explosion was the result. The head of the empty boiler was blown off in the most sudden and violent manner, and driven through the wall of the building that contained it.
A third cause of explosions is found in what we may cal "repulsion of the water." There may be no sign of trouble in the condition of the water in the boiler. The tempera-
ture of the boiler may not be elevated, at least in any way that subsequent examination would disclose. There may be no indication of weakness in the boiler.
Any of our readers who have seen a drop of water fall upon the smooth surface of a heated flat iron have noticed that it does not touch or wet the heated metal, but rolls about its surface like a marble on the floor. This it will continue to do for some time without evaporating. The lit tle globe of water is surrounded by a thin film of vapor, which protects it from the action of the heat, and prevents it from touching the metal.
This phenomenon is known as the " spheroidal state" o water. The same state may be produced within a steam boiler, at least in a portion of the water that it contains. When the fires under a certain part of the boiler are especially intense, they may so violently heat the metal above them as to drive away from it, in spite of the pressure which force whe water down, that part of the water which is directly above the heated iron. A thin film of vapor is now inter-
posed between the metal and the water. The iron thus separated from the good conductor with which it has been in contact, and covered only by the comparatively poor conductor, vapor, will rapidly increase in temperature until it becomes red hot, or perhaps even white hot. All is now ready for an explosion. Let any force produce contact again between water and the iron, and an enormous liberation of
steam must instantly follow. This force may be supplied by the admission of more water into the boiler, or, as in the case of a locomotive engine, by any sudden jolt or violent itself. Whatever the cause, the result is the same. Hot water and red hot iron are brought into sudden contact; and nothing can withstand the explosive force thus produced When the water once strikes violently, the soundest iron may e broken and the strongest workmanship be destroyed.
Mr Robinson made numerous experiments in which h produced these explosions by repulsion. In these cases owever, he guarded against dangerous results by employing safety plugs composed of weak metal, which broke at the
first explosion of steam. In these cases, says he, "there were no indications whatever of trouble in the boiler till the plugs broke."
In Paterson, New Jersey, an explosion of this character occurred in the case of a locomotive engine just finished. But a moment before the crash, the safety valves indicated a very moderate pressure. In an instant, a considerable portion of a three story workshop was blown down; four men The last re those due to what is called overheating of the water. Water by long boiling loses the air'which it contains in solution. The result of this deprivation is, little by little, to raise its boiling point. A French experimenter, M. Denny, temperature of $275^{\circ}$ Fahrenheit before it vaporized. By his careful treatment, the water had been freed from the air it
contained. In consequence, its particles adhered mor closely to each other than those of water in its ordinary condition, and it resisted vaporization. But when the heat grew oo great as to overcome this cohesive force, the water vapor zel with a sudden explosion. An open pan of boiling water which had been thus freed of its air, has exploded with fata esults. As one class of explosions already described have ccurred without any water in the boiler, so the present explosions may occur without any boiler. Either water or metal alone may thus fatally explode upon the application of heat. In the cases now under consideration, the water gradually freed from its contained air by heat long maintained at or near its boiling point, trembles just upon the brink of a sndden explosion. When more heat is added, or when the pressure is reduced by starting the engines, the udden vaporization will occur, and the whole mass of wate contained in the boiler will flash at once into steam. The esulting explosion is often of the most terrific character. Such is the nature of explosions in which the shells of boilers have been shattered when the steam pressure and the fires are low. It is pleasant to know that they may be pre vented by the use of safety plugs, so constructed as to be broken by a very low pressure. The gradual escape of the overheated water is thus provided for; and the temperature of the fire will be reduced without any dangerous agitation of the water.
Explosions caused by repulsion may be prevented by so constructing boilers that the circulation of water within them shall be perfect. The American Academy of Arts and Sciences lately presented the Rumford medals to an engineer of Philadelphia, Mr. Joseph Harrison, for the invention of a boiler in which this danger is guarded against. The Committee of Award stated that in this boiler a violent or destructive explosion is almost impossible. . Mr. Norman Wiard has also devised a boiler in which the same result is Wiard ha
It is of importance to remember that in no case will ny contrivance, or patent, or invention take the place of human intelligence and watchfulness in preventing acci cents. No patent has yet been discovered which will take the place of the human brain. An engineer whose wits aro about him will prevent a bad boiler from bursting, when a careless one would destroy the strongest boiler in use. And when the public, through the courts, insist that boilers shal not burst, ample means will be found to prevent boilers from bursting.

## CARPETS AND KNITTED MANUFACTURES OF AMSTERDAM, NEW YORK.

Amsterdam lies in the Mohawk Valley, about thirty-three miles from Albany, on the line of the New York Central Railroad. From the hights above the valley, the Chuctan anda Creek rushes at right angles through the town into the Mohawk river, and furnishes ample water power to the nu merous mills built along its course. A bale of wool ought to be, if it is not, the emblem of the town of Amsterdam, for it is in the production of woolen manufactures that the ma ority of the mills are engaged.
I should think it would be difficult, says a correspondent of the New York Times, to find in the State of New York village, of the same size as Amsterdam, which displays more manufacturing enterprise; for, although the manufacture of knitted goods forms by far the largest single branch of its business, knitting is not the only business carried on in the placs. There is a large boot and shoe factory, a linseed oil factory; the seed crushing mill of Kellogg and Miller, which can turn out 2,000 gallons of oil a day; the paper mill of Stuart and Carmichael, for making paper four strand ; Shuler's teel carriage spring factory; MacElwain's turbine water steel carriage spring factory; MacElwain
wheel works; and other smaller factories.
Wool knitting by machinery, as it is now carried on in Amsterdain, is a very different thing to what it was ten or twelve years ago. - Invention has done marvels for it; and moreover, it passed through a very troublous childhood. In act, it was for some time doubtful whether the babe woul ever be reared. Fortune and circumstances seemed to com
ine against it. It was in the year 1857 that Adam W. Cline bine against it. It was in the year 1857 that Adam W. Cline, in conjunction with John Maxwell, built a small knitting factory about a mile and a half from the in 1859 thei manufactory was destroyed by fire. Fire is the one great an tagonist that proprietors of knitting factories have to contend against. They cannot buy wool suitable to their purposes which is not apt to have small stones in it; and as the wool is passed through the "picker" which separates it, a spark is often struck from one of these little stones, and the flimsy mass is in a blaze in a moment, and of course soon commu icates the fire to the inflammable material piled about in all irections. Nothing daunted, however, by his misfortune in 1859, Mr. Kline built another knitting factory in the fol wing year. For some years business prospered, but just as Mr. Kline was beginning to feel himself firmly established his factory was again destroyed by fire in 1866. In the mean time, other factories had sprung up, four new ones have since
been built, and in 1868 Mr. Kline rebuilt his factory, and been built, and in 1868 Mr. Kline rebuilt his factory, and on, Harlan P. Kline.
A short time ago, a lady wrote to the New York Times ask ing in what branches of manufacture in the State, girls and women are employed. She should visit Amsterdam, and see the number of females employed there. In the knitting mills, nearly all the employees are girls; while at Mr. Stephen Sanford's carpet manufactory, in the upper part of the village, out of a labor force of 700 hands, the bulk of the are women and girls.
The knitting machine is a circular parcel of needles, some-
thing like elongated crochet needles, in and out of which the strand of wool is passed by machinery which knits it into stitches as it goes along.
The leading knitting factory is that of William K. Greene's Sons. They employ 200 hundred hands, on thirteen sets of machines. Their average daily production is about 200 dozen of shirts and drawers, of different sizes. The business of Schuyler, Blood, \& Co., is nearly one half that amount. Among the older firms, there are A. W. Kline \& Co., McDonald, Kline, \& Co., John M. Clark, McFarlan \& Marcellus, and the American Hosiery Mills, where they make a coarse grade of knitted stockings and socks. The two new mills in the village are owned by De Forrest \& Wanner and Phillips, Dent \& Lowden.

## how carpets are made.

Mr. Stephen Sanford's carpet manufactory is supposed to be the most extensive one in the United States under one sole proprietorship and management. The average produc ion of the factory is one thousand yards of carpet a day
one but the very commonest wool is suitable for carpe manufacture. The finer wools have not sufficient toughness
and fiber to enable them to resist the rough wear which a and fiber to enable

The wool is first of all thoroughly washed, and is then thrown, completely saturated and dripping, into the hydrau lic extractor, a large receptacle, something like a huge caul dron, which revolves very rapidly. A few seconds after the extractor is started, the wool and the cauldron alike are lost to sight from the rapidity of revoiution. I asked the operative who had charge of it how many revolutions the extract or made in a minute. He replied, "Three thousand, Sir." Such a momentum appears almost incredible. The extractor is about four feet across; therefore, a given spot on it would travel a distance of twelve feet 3,000 times in one minute, or at the rate of 410 miles an hour. In a few minutes, what wa dripping wool is taken out so nearly dry that there is only a slight feeling of dampness to the touch. The wool is then taken upstairs to the drying room, where it is laid out in layers on extensive sheets of wire netting. A powerfulblast of hot air is forced into the room, and an undercurrent downward through the wool. By this means, the wool is quickly dried and is ready for combing, drawing and carding. The spinning of the wool seemed to me an endless businoss. A first, the strands are as thick as your finger; but they are spun again and again, each time into a smaller strand, till they have been reduced to the required finenass. The wool is then wound from the bobbins into skeins, and is sent away to the color house to be dyed. The brighter colors of the dyed skeins have a very gaudy appearance. But this gaudiness is lost in the careful harmonizing of colors in the pro cess of weaving. It has of been a mystery to me how they weave such beautiful and many colored patterns in car pets; but putting the machinery on one side, it is a ver simple operation to watch. The pattern is punched on a se ries of plates of thick card board, certain holes correspond ened together like the photographic plates in a revolving ened together like the photographic plates in a revolving
stereoscope. The cardboard pattern presses against the pins stereoscope. The cardboard pattern presses against the pins
which govern the many cords forming the web and the woof; which govern the many cords forming the web and the woof;
and, of course, where there are holes the pins pass through and, of course, where there are holes the pins pass
the card board, and so allow certain of the cords to take a the card board, and so allow certain of the cords
different position as the shuttle flies backward and forward The weaver stands before his loom with as many shuttles on either side of him as he has colors to weave. The shuttles are placed one below the other; and by raising or depressing them with a lever, the right shuttle is brought into play When the weaving of the carpet is completed, it is carefully gone over by experienced hands, and all lost and faultly stitches are put in with a common carpet needle. But the carpet is covered all over with short woolen bristles. To remove these, it is passed through the dresser, a machine very similar in its operation to the mowing machine; for as the carpet passes through the dresser, the bristles are all re-
moved by a series of knives, arranged like those of a mower.

## ON cotron seeds.

by foratio x. Frassen
Since small hullers have been introduced on many of the plantations, the planters are enabled to hull their own seeds These are thrown into the top of the hullers, and first come
in contact with knives, which cut the hull; then they are in contact with knives, which cut the hull; then .they are passed through sieves, by which process the kernel and hull
are separated. The kernel is divided into two portions; the are separated. The kernel is divided into two portions; the
first is that part which has been broken or cut by the knives; this is ground to make the meal used for feeding, and constitutes one third of the whole weight of the kernel. The remaining two thirds come out whole, and are sold for other purposes. This meal has been found to be as rich, in flesh and fat producers as linseed meal, for stock, and supersedes the use of it in the cotton growing States. The hulls are piled in heaps until they arrive at the right state of decomposition to be used as a fertilizer, for which they are well adapted, being rich in the phosphates and lime, characteristic of substances used for this purpose. The seeds contain a fixed oil to the amount of about thirty-seven per cent of the weight of the kernel, most of which is obtained by expression. At the factory on Long Island, which the writer visited, the seeds are bought with the hulls on, although the whole kernel is generally brought directly from the planter. These are first thrown into a gin, which separates some more of the
lint. This is packed in bundles and sold for ordinary cotton batting. From this, they are conveyed to the hullers and undergo the decorticating process. The kernel is then carried dergo the decorticating process. The kernel is the to to a box which feeds two large iron rollers,
converting it into meal; the meal is put into a large vessel heated by steam to render the oil more fluid, and then is put between iron plates which are forced together by hydraulic pressure, which presses out nearly all the oil and some mu cilage. About eight par cent of oil is left, which cannot be emoved except by solvents. This oil, as then obtained, is of handsome dark wine color and sweet taste. This then un dergoes the purifying and bleaching process, which is kept a secret by the manufacturers
The purified oil is either a golden yellow or white color An oil is also produced, by chilling the purified oil and ex pressing, to obtain a variety almost free from stearine, called by the manufacturers " winter oil," from the fact that cold ill not thicken it
This oil is used extensively in the arts, chiefly to adulter ate and substitute higher priced oils. Cheap paints are round in it, and it is used to a certain extent to adulterate inseed oil. But being a non-drying oil, only a small per centage could be used.
It is also used for adulterating sperm oil for burning, and for mixing with lard oil. The most practical way to detect these is to heat the suspected oil with distilled water ; sepa rate the water and add a solution of subacetate of lead. I it contained cotton seed oil, a white precipitate will be formed account of the presence of mucilage, which is alway ound in this oil. If the sperm or lard oil is pure, it would e indicated by the absence of any milkiness.
It is also used to adulterate olive oil, and chemistry has found no practical mode by which they can be definitely dis inguished apart.
A soap has been made of the residue left after refining. It is of a more or less dark brown color and disacgreeable smell It is used in the laundry, and sells at from three to seven cents pound, according to quality. It was also attempted to make soap from the white oil. This, when first manufactured is of a handsome white color, but after standing some length of time it becomes dark and finally almost black. It is not made $n \rightarrow$ w.
It is used to the amount of ten per cent in making fancy soaps, to give them a good lather, for which the oil is said to be the best known; but even in this small amount, the dor of the rancid oil can be detected.
The hulls are used for fuel in the factory, and the greater part of the cake meal was sent to Europe, the farmers of this untry, at that time, not being generally acquainted with its properties. It sold for about thirty dollars a tun.
A few years ago, the oil was noticed in the journals in con nection with preparations of pharmacy, to be substituted for oils in liniments and ointments, for which it is adapted by its properties as an emollient; but nothing definite was arrived at. Being cheaper tban even the commonest grades of olive oil, and resemb ing it so much in its behavior, it is peculiarly fited fcr the preparations of the pharmacopœia in which the olive oil is used. Mixed with aqua ammoniæ in the officinal quantities for "Liniment. Ammoniæ," it makes` a product which has all the essential properties that are indicated by he olive oil, and has the advantage of not forming so thick a mixture, thereby making it more convenient. In the "Lin ment. Camphoræ," it s.
Lead plaster made with the cotton seed oil has been sub tituted with advantage for the officinal, and has been used to mix with it to the amount of fifty per cent by some manu. facturers of the plaster. This, made with the cotton seed oil alone, forms a handsome, light colored plaster, apparently qual in all respects to the English, with the exception that it does not become hard enough to keep its shape, in the usual form of selling it. But when mixed with olive oil in qual proportions, this difficulty is entirely overcome.
The cost of the plaster made with the cotton seed oil, using the best English litharge, is twenty cents per pound. This difference in the cost, combined with the practicability of sing it, will recommend it to the more careful examination of druggists who deal extensively in this preparation.-Amer ican Journal of Pharmacy.

## origin of Microscopic Living Forms

In a recent lecture before the Scientific School of Yale College, Professor W. H. Brewer said: "The most reliable observers are overwhelmingly of the belief that all life is from antecedent life, or, in the words of the old Latin aphor ism, omne vivum ex vivo. And each good investigation re duces
The facts of the case may be stated as follows: 1. The old view of organic and inorganic compounds in chemistry has een broken down. 2. All allow that beings do arise where he germs cannot be distinguished by the best microscopes yet made. that what were once supposed to be several species are now nown to be often cnly phases of the same thing. 4. Al though it is highly improbable that all forms of living beings re derived from one original, yet many of the so called present species appear to have been produced from earlie imilar species. The whole question must be regarded as et among those that are unsolved, and should be approached n a candid and scientific spirit. I believe, said the lecturer that it will ultimately be shown that all life is derived from antecedent life, and that the beginning rests with the Creator.

Some microscopists use instruments which magnify 5,000 or even 10,000 diameters. But notwithstanding the power of the instruments used, it should not astonish us if we canot even then see the original germs. For let us make simple calculation. Some of the great trees of California
are over 300 feet high and 30 feet in diameter. Such a tree
is estimated to contain 250,000 feet of lumber exclusive of the branches, or $36,000,000$ of cubic inche. 3 . The cubical con tents of a seed of one of these trees may be put at from $\frac{1}{1000}$ to $\frac{1}{2000}$ of a cubic inch, and its length at from $\frac{3}{10}$ to $\frac{2}{10}$ of rom 10 . In one of these trees, then, we have a living being 10,000 to 15,000 times as large as the largent dion of the seed-not the germ however-and from 50,00 to 7,00 million times its cubical contents. And if we may suppose uppose that the relation between orms and their germs is at all analagous, it is not unreasonble to consider that they exist, though we may not be able to see them.
But have these questions no practical bearing? Are they merely curious and interesting speculations? It is indeed a subject of immense practical importance. Diseases of both man and animals are caused by microscopic organisms. As samples of these may be mentioned, the itch, a disease known as favers, and all the phases of ring-worm. So also certain diseases of vegetables, such as rust, mildew, and blight of crops, the grape disease, and the potato rot. In all these cases, the animals are known to reproduce from other:. There re also numerous other contagious and epidemic diseases which seem to be of like character, although their causes are not so well known. Such are small pox, kine pox, and sheep pox Extensive experiments, made on these diseases, go to show that the infecting material is minute particles, and the prob lem becomes to destroy them. It is also but a step from these contagious diseases to epidemic and malarious ones uch as cholera and the plague, although the cause is here more obscure. That treatment of these diseases, however as been most successful which regards them as caused by
iving organisms. Some malarious diseases cold, as the yellow fever by a frost diseases are checked by cold, as the yellow fever by a frost. The silk worm disease may also be placed in this category. The subject may be summed up as follows: 1 . We know that some diseases are caused by minute organisms. 2. That others apparently are so. 3. That of those that are certainly so caused, the organ isms are not spontaneously evolved. Beyond this, we are still in the dark, but every year brings a solution to some new case, and they all point the same way, namely, that these great scourges are caused by minute organisms not spontaneously generated. If so, the remedy is simply to keep the seeds or spores away from the body, but if they are spontaneously generated, there is no hope of extirpating hem, and unless a specific is found the race must continual ly suffer.

## Bone Felon Arrested by Congelation

Dr. James B. Walker, of St. Louis, Mo., says, in the Medical Archives: Not long since I was consulted by a young lady who was suffering from an incipient felon. The distinguish ing characteristics of the painful affection were already man-ifest-pain, throbbing, some tumefaction, and the nervous excitement, indicated plainly what was in advance, unles the inflammation was arrested; and the command was: Arres it at all hazards.
The starting point had been two days previous to her applition for treatment. I could think of nothing offering such a prospect of success as cold, as low as the freezing point. Ad ding equal parts of snow and salt in a tumbler, I placed the fin ger, it being the middle one, in the freezing mixture. For few seconds, there was an increase of the sensibility of th part, and it was with difficulty I could persuade her to hold her finger in the mixture. By degrees the pain subsided nd, at the end of two minutes, perfect insensibility had fol lowed. I removed the finger, and after a few minutes the sensibility returned, and with it came the pain, throbbing etc. The application was renewed, and the pain again ceased and insensibility ensued. This was repeated as often as the pain returned, and in about two hours, alternating the appli ion and removal, there was no return of the painful sensa tions, and the difflculty entirely ceased and there was no felon. The induration remained several days, and the skin radually exfoliated.

Manufacture of Horseshoes by Machinery.
Our young and promising contemporary, the Chronique de l'Industrie, prints a communication from the pen of M. A Verhaeren on the above subject. He gives it as his opinion that the most remarkable factory of the kind is that of MM Mansoy et Cie., who supply the horseshoes used by the Om nibus Company and the Cab Company of Paris, and who, du ring the siege, furnished all the shoes required for the cav alry. The machinery employed by MM. Mansoy is described as very simple-a rolling mill, a shaping machine, two steam hammers, and two punching machines, with, of course, dies for each size of shoe made; the value of all this is said not to exceed $\$ 6,000$. The hammers require 15 horse steam power, and a 6 horse engine suffices for all the rest; but, it is added, a 15 hoiss engine would probably answer all pur poses. With the above machines, the company turns ou 000 shoes a day with six laborers and three apprentices nd the space occupied by the factory is about four hundred quare meters. The production is constant; when workin only during the day, the fires are covered up at night, bu when working night and day there is, of course, a considera ble economy of fuel and working expenses. The engine re worked with the lost heat of the plate furnace, as in roll ing mills.

The Odors of Plants.-It may be laid down, as a gener principle, that a larger proportion of white flowers are ragrant than those of any other color; yellow come next and lastly blue; after which, ad the may be reckoned violet, green, orange, brown, and black.


## Muller's Rope Railway.

The use of rope railways as a means for transporting heavy freights, mining products especially, has within the past five years become quite extensive. In England, Scotland, and on the continent, many miles of these railways are now in successful operation, and contracts for the erection of lines thereof, several hundred miles in extent, are now out. In Colorado, they are now in use to a considerable extent, and many new lines are being projected.

Among the especial advantages of the rope railway as a means of locomotion are its economy of first cost, the quickness with which it can be set up, and the cheapness of its operation. It consists of traveling ropes suspended on poles, the ropes taking the place both of the rails and the locomotive of the common railroad. On the rope railway, the burden to be carried is attached to the traveling rope, the movement of which is not affected by the form or grade of the surface of the ground. In this respect, it resembles a telegraph line, and works just as well whether it passes over the roughest chasms or the smoothest levels.
The improvement illustraied in our engraving is the invention of Mr. Hermann Müller, an Austrian engineer, and has lately been patented in this country. The distinctive features of the improvement consist in peculiar devices whereby the ordinary mining cars with their loads are transferred with facility from the usual ground railway tracks to and from the rope railway.' This will be readily understood by a glance at our picture. It will be observed that, at each end of the rope railway, there is a drum of considerable size over which the traveling ropes pass. The ground tracks are arranged
to run in connection with the upper and lower surfaces of to run in connection with the upper and lower surfaces of the drums, and it is only necessary to push the cars, into contact with the ropes at either drum, in order to connect them with the ropes and effect the transport of the cars in either direction. Our sketch is not purely a fanciful one, for these railways are used in places far rougher and more inaccessible than the scene here represented.
This invention has for some time been in practical operation at Sigl's great machine establishment in Vienna (Austria) where it passes from the roof of one of the buildings over the fortification walls, ditch, and streets to a neighbor ing piece of ground pertaining to the concern. Its operation gives great satisfaction. The invention is particularly adapt ed for large manufacturing works, also for coal and min ing purposes. It costs comparatively little for erection, and may be used in long or short sections. Further information concerning the expense of erection, plans, etc., will be fur-
nished by S. S. Townsend, No. 31 Liberty street, New York nished by S. S. Townsend, No. 31
sole agent for the United States.

Mr. H. Teague of of London, sug
gests the form of gests the form of
valve shown in valve shown in $\mathbf{o u r}$ engraving,
which is stated to which is stated to be very effective and to operate without noise. I will be observed
that an opeuing that an opening equal to one third of its area is made in the ordinary clack valve, and over this opening another valve is hinged. The $t$ wo valves are thus arranged in opposite directions. This is a very simple and excellent invention.

## Green Corn Fodder.

A correspondent of the Country Gentleman says: "Having three cows, and not having the grass for them, I concluded three cows, and not having the grass for them, I concluded
to soil them with sowed corn entirely. I commenced about to soil them with sowed corn entirely. I commenced about
the first of June, and have fed them bountifully ever since, the first of June, and have fed them bountifully ever since,
wth the aid of 18 or 20 heads of small loose cabbage apiece with the aid of 18 or 20 heads of small loose cabbage apiece
Now for the result; The cow, that would have given on grass Now for the result; The cow, that would have given on grass
20 quarts per day, now gives only 12 quarts; No. 2 , instead of 14 quarts per day; now only 8 ; No. 3 , a heifer that did give in the past winter, on dried stalks and feed, 6 quarts per day now only 2 quarts. The three cows are perceptibly decreas ing in milk every day, and I fear, by the time cool weathe setsin, there will be more milk taken from the corn than from the cows. They have a shady, cool yard to run in during the day, and are stabled at night. I was always under the impression that sowed corn was a great supplier of milk. But I have come to the conclusion, so far as these cows show, that sowed corn fed alone and continually is not as valuable as we think. But grass and sowed corn fed together are al that we can ask."

## Submarine Telegraph Cables.

A cable of the very best construction, containing four con ductors, was manufactured and recently laid between Lowes toft, on the coast of Suffolk, Eng., and Emden, on the Hanoverian coast, for the German Union Telegraph Company, by the Telegraph Construction and Maintenance Company, and is now in perfect working order.
The conductors are of stranded copper, of excellent con ductivity, weighing 107 lbs . per nautical mile, and insulated with three coatings of Willoughby Smith's improved gutta percha to the weight of 140 lbs. per mile, so that each insulated conductor weighs in the aggregate $24^{17} \mathrm{lbs}$. per mile. The insulation, it is hardly necessary to state, is excellent.
The several "cores" or insulated conductors were wormed and served in the ordinary manner, and then sheathed with 12 No. 3 B. B. galvanized iron wires for the main cable, and with 12 No. 000 B. B. galvanized iron wires for the shore
ends. Each type of cable was further protect
ings of tarred yarn and bituminous compound. ings of tarred yarn and bituminous compound. The length and weight of the cable necessitated its being laid in two sections, but the whole was successfully accom plished. The end landed on the coast of Suffolk, at Lowestoft, adds some additional importance to that place from a submarine telegraph aspect. This makes the fourth cable landed there. The others are the Lowestoft and Zandvoort north and south cables, and the Lowestoft and Nordeney (Reuter's), the property of the Post Office; this additional cable makes up a total of sixteen wires starting from that point for continental traffic. How strangely the traffic has grown since 1853, when one wire alone stretched across the North Sea. And now, in addition to the cables mentioned there are other existing cables northward, which swell the number.
A cable well manufactured and laid on such good ground may be expected to last many years-take, for instance, Reu ter's cable, separated by but a short distance from the Ger man Union cable; how well that has lasted through these years! And, indeed, it would be vain to attempt to define the life of such a cable, when we have already the Dover cable still in existence and still working, of the ripe age of twenty two years.

## [For the scientifie American.] FRICTIONAL GEARING. <br> Ye. s. wiokliv

Since the introduction of friction as a means of transmitting motion, it has often been desirable to apply the principle to bevel gearing. Frequently, however, this has been unsuccessful. The failures have resulted either from the want of a correct knowledge of the principles of bevel gearing, or from imperfect workmanship in the application of hose principles.
When correctly and substantially built and accurately put up, bevel and miter friction pulleys, within certain limits, operate just as well as in the other form. True, we cannot in these, as in the cylindrical pulleys, extend the face $a d l i$ bitum without greatly increasing the diameter; and for this reason, when great power is to be transmitted, it is not con venient to use this form of gearing. But in all fast motions, where not more than ten horse power is to be transmitted, the bevel friction is one of the best means of connecting at an angle. It may be adapted to almost any change of speed and set to any angle, either right, obtuse, or acute, and has the same advantages in operation as the other form of friction. And when it is required to reverse the motion at pleasure, it is most conveniently done by setting two bevel pul. leys upon one shaft, facing toward each other, and placing one, upon another shaft, between them so that it may be one, upon another shaft, betwee
brought into contact with either.
In building this gearing, the iron cone, or pulley, is made imilar to a bevel pinion, except as to the teeth, instead of which there is a smoothly turned face. The same care should be bestowed upon the accuracy of finish and balance that irequired in the other form of friction pulley; but the pulley may be made somewhat lighter in the rim, as the conical form gives additional strength. In making the wooden dri-ver-the iron pulley being furnished-the first point is to determine the exact diameter and bevel, for upon the correctness

To obtain these cimensions, place a square across the smaller end of the finished iron pulley, and set a bevel to it, as shown in diagram A. This will give the correct bevel for the face of the driver.


Next, upon any plane suriace of sutficient size, draw the lines, A B and A C, making the length of the line, A B, just equal to the larger diameter of the iron pulley, and the angle at A a right angle. Then, with the square and bevel, or with a movable T square adjusted to the bevel, draw the lines B and AD. The distance, A C, is the diameter required the driver, and the other dimensions are easily obtained. at acute angles, draw the lines as in the annexed diagram marked B.
First, draw the line, A B, to represent the driving shaft.

Then, at a right angle, draw the line A C, making its length equal to half the diameter of the driving pulley. Next, at the angle at which the shafts are to be set, draw the line $\mathbf{C}$ D; and at a right angle from this line, draw the line CE, making its length equal to half the required diameter of the other pulley. From the point, E, parallel to C D, draw the line E F, which will represent the other shaft. Now, from the point of a section of this rnd the line A B, draw the line G C, which will give the bevels for both pulleys.
If not above two and a half feet in diameter, the driver of the bevel pulleys may be built upon a "hub flange"-a disk of iron of about two thirds the diameter of the pulley, with a hub projecting from one side. The hub should extend half an inch beyond the thickness of the wood to receive an an nular disk of smaller diameter, through which the whole may be securely bolted together.
Upon the flange, around the hub, the pulley should be bilt. The first two or three inches, to form the back, should be of hard wood put on radially. For the balance, use soft maple. It is, in the present state of our knowledge, the only wood that can be recommended for this form of friction gear. It should be laid on this, as upon all friction drivers, with the grain running tangentially as nearly as possible. And each subsequent course should be madesmaller, so as to form the bevel. The layers are put together with glue or white lead, and carefully and thoroughly nailed. The builder should be careful to make the joints perfect, and to put the wood snugly around the hub.
When the wood is built up to sufficient thickness, the other flange should be put on, and the whole bolted together and turned to the exact diameter and bevel required, and the pulley should be balanced with the utmost care
For a larger bevel driver, it is best to use an iron center with arms, and a flanged rim something like a car wheel. The diameter of the rim or cylinder should be a few inches less than the smaller diameter of the face of the pulley, and that of the flange something less than the larger diameter. Upon this wheel, the wooden rim is built as directed upon the hub flange, except that the bolts must be put in as the work progresses, so that subsequent layers will cover the heads; and the pulley is finished without the smaller flange. The diagram, marked C, shows a cross section of this pulley, which will be understood without further explanation. In setting up this gearing, it is of the utmost importance that the countershafts line exactly to the centers of the main or line shafts, and at the precise angle for which the pulleys were fitted; and that they are substantially set, so as not to get out of line.
This gearing isthrown on and off, connected and separated, by moving the countershafts endwise in their bearings. This may be done by allowing the end of the shaft to extend through beyond the outer bearing far enough to receive ar

extra box, one end of which is closed and Babbittel to receive the end pressure. This box is set up by a lever to which it is pivoted. And by having the end of the shaft grooved where it is embraced by this box, it will be drawn back where the lever is released. In light work, it is as well to make.the outer bearing do the whole by making it both an end and side bearing, and having the box movable in a line with the shaft.
The pressure required, to hold these pulleys up to the work, is not great, and is easily applied by finishing the end of the shaft, and using a flat bearing of anti-friction metal, the full size of the shaft. Sometimes a steel point, like a lathe center, is set against the end of the shaft to receive the pressure, but this is a very bad arrangement. It makes the bearing surface too small, and is one of the worst forms of bearing to keep supplied with oil. A flat bearing of wood, especially of hard maple, is very much better than wood,
this.
Wh
When there is considerable difference in the sizes of bevel pulleys working together, the end pressure is most upon the shaft carrying the larger, but this may frequently be neutralized, upon lines having several of these drivers, by setting them with their faces reversed.
A point that should never be lost sight of, in constructing setting levers for all friction work, is to make them adjustatle so that the pressure may be easily increased if required. ble so that the pressure may be easily increased if required.
This is sometimes done by a ratchet with several notches, into This is sometimes done by a ratchet with several notchen,
any one of which the lever may be drawn; but it is generally better to have but one catch, and to make the adjustment elsewhere. This may be done by connecting the lever, to the part to be moved, by a rod having adjusting nuts, or by mak-
ing the fulcrum adjustable by bolt or set screw.
These adjustments should be made by the person having charge of the machinery, not by the operator of each machine. They should be kept tight enough to do the work required, but more than this is a waste of power, and a useless strain upon the machinery.
It may seem unnecessary to give the diagrams of lines for the dimensions of bevel gearing, as these are well understond. But it must be remembered that we have no work on millwrighting, at present, that gives information on this point of any scientific or practical value, and that our millwrights are not all familiar with the construction of this gearing. Our mills, though súperior, are built without rulen or uniformity of construction.
by dr. ADOLPH оtt.
Portland cements are those artificial hydraulic mortars which are burned so that vitrification has partially taken place, and which, in this condition, contain no free lime and have a specific gravity above 3 . The name originated with Joseph Aspdin in Leeds (England), in 1824. The solidified cement, having an appearance and quality equal to those of
Portland stone, of which the finest edifices of the English Portland stone, of which the finest edifices of the English
metropolis are built, he gave to his product the name of metropolis are built, he gave to his product the name of
Portland cement. When we learn that this stone is classed among the most valued building materials of England, the said designation might be considered too assuming, but it will be shown that its qualities are not overrated-in fact that the name must be considered as very appropriate.
The Portland cement presents itself as a sharp, crystalline powder, of a color varying from light to dark gray and of a bluish or greenish tint. Chemically, it is essentially a combination of lime, silica, alumina, and oxide of iron. When mixed with water to a stiff paste, it soon solidifies into a stone of an agreeable bright gray stone color, which in its stone of an agreeable bright gray stone power of resistance best quality attains a hardness and power of restore equal to that of the most valued formations. Such stone, according to Major-Genthe oldest formations. Such stone, according to eral Gillmore, acquires during the first two years fully nine eral Gillmore, acquires during the first two years fully nine tenths of the strength and hardness which it finally attains
in the course of time. Both the tensile and crushing strength in the course of time. Both the tensile and crushing strength
vary, of course, according to the quality of the cement; but they are generally the greater the denser the mortar. The tensile strength per square inch of blocks seven days old was found by Mr. Grant to be 236 pounds for English cement powder weighing 103 pounds per U. S. bushel, while it was 406 pounds for cement weighing 126 pounds, thus showing a difference of 170 pounds per square inch. The strength of Boulogne cement for blocks, fifteen months old, was found to be by Gillmore 496 pounds. At the age of one month, according to this authority, the tensile strength of pure Portland cement is equal to about two thirds of what it attains during the first two years. With regard to the c-ushing strength of the cement, it does not reach its maximum limit within a period of two or perhaps three years. The crushing weight of English Portland cement was found by Grant to be, per square inch, 3,806 pounds for blocks three months old, 5,388 pounds at the are of six months, and 5,973 pound at the age of nine months.

Cement unmixed with other material finds but a very limited application, firstly because it would be too expensive, and secondly for the fact because, though mixed with inert materials, it is yet sufficiently strong for most practical purposes. Portland cement, with three times its quantity of sand, becomes in a few months superior to mortar more reduced in no small degree.
For foundations, flooring, houses, constructions in the sea etc., chips or small stones, gravel, broken bricks, burned clay, cinders, etc., are generally used in combination with sand. Such a mixture is then termed béton or concrete (from concresco.) The substitution of common lime for a portion of the cement results always in a sacrifice of strength in proportion to the extent of the adulteration; however, when mixed with a small quantity of lime milk, it loses propor tionately but little of its solidity, while it can be worked much better and surer, as the setting is greatly retarded by such an admixture.
With regard to the durability and healthfulness of con structions of Portland cement, European experience, extend ing over a period of more than forty years, has established the fact that they, will resist climatic influences and changes equally well as the very best building stones. Porthate ment stone, if properly said of brick and sandstone. Since warmth and moisture are peculiarly favorable to vegetable growth, these building materials are more liable to disinte gration than other materials with less absorptive power The resistance to frost is absolute, even in those buildings the roofs of which are terraced in this material. Being non bsorben it will not appear strange that houses asilt with it are from eight to ten degrees warmer in winte built with it are from erick.
Concerning the cost, 100 cubic feet of superior wall can be built, according to close estimation, for $\$ 17$. This is consid erably less than half the cost of construction of brick and mortar. Lintels, sills, caps, and arches can all be made at
the same time and with only a slight increase of expense. the same time and with only a slight increase of expense inches being required.
By the addition of proper colors, the brown stone of New York city is imitated so accurately in Portland cement ston that the eye can scarcely detect the difference. With regard to the proportion in cost of these two stones, it may be stated that the price list of one of the compaies in this city shows that the rates for ashlars, caps, corner blocks, keys, tc., range from one half to one third those usually paid in this market for blocks of cut brown stone of corresponding shapes.
For such stone, as well as for ornamental work, only fine ashed sand is used as admixture for the cement
The cost of artificial stone being so much smaller for plain work, it is evident that the difference must be much greate for ornamental work, for the cost of producing the most laborate designs, the molds being once made, is but little nore than that of the simplest blocks. When we consider that in the ornamentation of our public and private edifices
there is no limit except that of design, and that duplicates of
celebrated statuary can be furnished with ease, the invention of Portland cement is to sculpture and architectu
what photography is to the arts of drawing and painting.

## HUMAN HAIR AND ITS SUGSTITUTES.

Formerly, as ladies grew in years and their hair became hin, a false "switch" was procured, and combined with the growing hair to repair the ravages of time. Great care was taken to conceal the fact that false hair was worn, and it
was only to her most intimate lady friends that the fact was whispered even.
But now all this is changed. Nineteen twentieths of all the women in the country who make any pretense to dress wear false hair or some artificial equivalent, and the lady who, no matter how luxuriant her tresses, should presume to appearin society without supplementing their natural growth with "rats," "mice," "switches," "bands," or some othe specimen of the wigmaker's handiwork, would find herself so hopelessly in the minority and so laughed at by all, from her dressing maid to her most intimate friend, that resistance
would be impossible, and surrender at discretion imperative. where the hair comes from.
The hair which adorns the heads of our belles and matrons comes mainly from the heads of the peasant women of France, Germany, and Italy. The hair buyer, supplied with sundry stores best calculated to captivate the rural eye, travels from village to village, seeking out those whose travels from village to village, seeking out those whose Paris market, the great center of the hair trade, and drives the best bargain he can in obtaining it. Sometimes the price is paid in money, but more generally in finery of various kinds, such as ribbons, cheap laces, trinkets, etc., a trade in which the buyer realizes a handsome profit both ways, and the seller parts with the adornment which Nature has provided for almost worthless ornaments which she will soon tire of and throw aside.
Having completed his purchases, the buyer takes or sends the hair he has collected to the broker, who buys $\mathrm{i} t$ at a price which pays the buyer well for his trouble. It next goes into the hands of the merchant, under whose supervision it is cleaned with meal, sorted as to length and color, and put up in packages weighing from one to four cunces, each con sisting of hairs of uniform length and color, but not all the product of any one head.

HOW HAIR IS RUINED
Strange as it may seem, the hair which grows upon the heads of our fashionable ladies has no commercial value Through much crimping, curling, and dosing with various hair "invigorators," "restorers," pomades, etc., it not only becomes variegated in color, but hard and brittle, rendering deed, it is found that the more people "take care" of their hair, the noore they injure it, while those European peasant hair, the hore they injure it, while those European peasants
who let Nature take its course, and seldom even comb their who let Nature take its course, and seldom even
hair, produce the finest and most delicate article.

## its value.

In the shape in which the buyer brings it in from the country, this hair is worth about $\$ 20$ per pound, in gold After it has been sorted, the different lots vary in value ac cording to length and shade, from $\$ 1.50$ to $\$ 100$ per ounce Indeed, it is almost impossible to set a limit to the outside price of choice lots of long hair of desirable shades, for so
dificult are they to obtain, and so urgentis the demand from parties with whom money is a secondary consideration alto gether, that the fortunate holders can set their own price and e sure of a customer. "A switch of very light gray hair," said a dealer, "thirty-six inches long and weighing five ounces, is worth $\$ 1,000$, and can rarely be found at that price.

## substitutes.

In a country like ours, where fashion is a law to the poo as well as to the rich, it has been necessary to provide some
cheap substitute for human hair, in order that factory and cheap substitute for human hair, in order that factory and
hop girls, and others of slender means, may vie with thei wealthier sisters in the adornment (?) of their heads.
For this purpose, several substances are in use. The firs material applied to this purpose "was jute, which, after pass ing through several processes, is reduced to a long and glossy fiber which, in general effect, closely resembles hair, and which, owing to its comparative cheapness, rapidly came possible shades, and was ēagerly bought in the shape of "switches," " waterfalls," etc.

ITS INJURy to the skin.
In the process of adapting jute to this use, nicotin, the essential principle of tobacco, and corrosive sublimate, a most ceedingly brittle and breaks as easily as spun glass. The small particles find their way through the hair to the scalp and, their edges being ragged from the combing process, ac ike so many poisoned barbs, which, entering the pores an being held in place, introduce the poison beneath this shin and dea buran that the jute contained animal that bored into the skin and Jaid their eggs beneath it. The most careful examination has failed to discover any vestige of animal life in jute, but the little barbs we have spoken of have been distinctly seen protruding from the pores of the
scalp, and the sores they produce give every evidence of be ing the result of mercurial poison.

LINEN and COT'TON.
A more recent and harmless substitute for human hair is ound in fine cotton and linen thread, dyed to the proper
shade and sized to give it the requisite gloss, and then made up into the various forms in which it can be used. Switches of this materíal are sold at retail for about one dollar each, a price at which a very handsome profit is probably realized by the dealer.
silk as a substitute.
Probably the best substitute for human hair yet introduced is silk fiber. Its fineness and strength render it peculiarly suitable, while its brilliant luster adds to its resemblance to the real article. It is used both alone and in connection witi real hair, especially in those cases where a switch just sprinkled with gray is required. To produce this effect, dark hair and gray silk fiber are taken in usequal proportions, varying according to the shade desired, and woven together, the result being with difficulty distinguished from a combination of real hair, yet costing, owing to the immense price of long gray hair, a moderate sum comparatively. Bands and braids are also made of silk, the exposed portion only being of this material, and the filling of jute or "combings."

> the extent of the trade.

Formerly hair work was sold only in a few of the leading hair dressing establishments. Now large and expensive stores are devoted to its sale in the large cities, nearly every dealer in fancy articles keeps some of the grades of so called "hair goods," and in every country store neat card board boxes, containing switches, chignons, and other head gear, are offered for sale. So long as fashion holds its present course, every woman in the land nearly is a customer, and thus a to allous bulk of business is done, paying handsone profts tremely large, but competition has reduced this materially. But the volume of business has increased in a like ratio, and But the volume of business has increased in a like ratio, and
the sale of hair and hair work continues to be exceedingly profitable.-Commercial Bulletin.

## Perkins, Steam Gun

It is now more than thirty-five years since Jacob Perkins, an American, exhibited his steam gun in London, where it attracted great attention. It was shown in operation at the Adelaide Gallery, and the inventor, writing home at the time, thus describes its working, together with a curious electrical phenomenon that took place on one occasion:
"The Adelaide Gallery, of which you have frequently heard, continues to attract attention. When I first proposed the estâblishment of such an exhibition as that which is made there, its success was a subject of much doubt. It is now, however, firmly established. Its average number of visitants is 300 per day, each paying one shilling for admit tance; on some occasions there have been 1,000 ; and the vis itors are of the most respectable class. My steam gun show ers its balls every hour from 12 to 4 o'clock. The gallery opposite to this gun is 150 feet long, and it is frequently filled three or four deep, with intelligent spectators; and although it has been thus in use for three years, it still continues to be the lion of the day. Foreigners who visit the gallery not unfrequently avow that the object of their journey from the continent was to see this gun. On a recent occasion, just be fore the last volley was discharged, the atmosphere became suddenly very dark, and many were waiting to see the last shower of balls; the steam was somewhat higher than com mon, the gun had been recently lengthened, and from the concurrence of these circumstances the velocity of the balls was much increased, and a very remarkable effect was pro duced. When the balls came into contact with the cast iron arget, a very brilliant group of stars was seen on the plate each about the size of a marigold, and somewhat resembling in in appearance; light was seen also at the mouth of the gun, and the leaden balls were completely pulverized What could have produced these effects? Was it not the re sult of the development of electricity by the friction, or from some uninvestigated cause?"

## L Lost Art--Glass Cloth

More than thirty years ago, M. Bonnel, of Lille, France discovered a method of weaving cloth, out of spun glas threads, which was described as perfectly flexible and ap plicable to a variety of purposes, more especially the orna mentation of the walls of apartments. This fabric, the ma cribed in the papers of 1837 as present
This cloth of glass is estremely beautiful; and, from the manner in which it reflects the light, it surpasses in bril iancy everything that has ever been attempted with silk, even when combined with gold and silver. Some specimens of this new manufacture have been exhibited in the Passage de l'Opera in Paris; and the Queen of the French was so much pleased with them, that she ordered a golden medal to be sent to the inventor. The following passage is extracted from a French paper: "When we figure to ourselves an
apartment decorated with cloth of glass and resplendent apartment decorated with cloth of glass and resplenden
with lights, we must be convinced that it will equal in bril with lights, we must be convinced that it will equal in bril liancy all that it is possible for the imagination to conceive it will realise, in a word, the wonders of the enchanted pal aces of the Arabian tales. The lights flashing from the pol ished surface of the glass, to which any color or shade may pe given, will make the room have the appearance of com posed of garnets, sapphires, topazes, rubies, emeralds, amethysts, etc., or, in short, of all these precious stones united and combined in a thousand ways, and formed into stars, roettes, bouquets, garlands, festoons, and graceful undula tions, varied almost to infinity."

Study contentment. In these days of inordinate greed ad self indulgence, keep down the accursed spirit of grasp-

## belting and pulleys.

The following interesting particulars of experiments on the capabilities of belting are by Mr. D. Hussey, published in the proceedings of the New England Cotton Manufacturers' Association of the United States:-
Beitrict.-A leather strap or belt an inch wide will sustain 1,000 lbs., before breaking. Eight per cent of the breaking weight, or 801b. to the inch, or about 400 ft . to the horse power, is a tension that will not materially injure the leather, for a long period, by overstraining or stretching. This is used for single belts-main drivers only. A double belt will give one third more equally well.
Ordinarily, counter belts, where the centers are not more than 12 ft . apart, will require $1,000 \mathrm{ft}$. to horse power per minute, and card and loom belts from $2,000 \mathrm{ft}$. to $3,000 \mathrm{ft}$. to horse power per minuts. When at the Nashau Co.'s mills, I ran a 20 in . single belt $7,200 \mathrm{ft}$. per minute, from a 14 ft . diameter to a 4 ft . diameter pulley, which ran successfully on the 14 ft . diameter, but the centrifugal force on the 4 ft . diameter puiley caused it to jump or fly from the surface and run a little uneven, owing to the uneven weight and thickness of the leather.
I think it would have run well on a 6 ft . diameter pulley When it was running $6,000 \mathrm{ft}$. per minute, it ran very satis factorily indeed. From this experiment, I have come to the conclusion that $6,000 \mathrm{ft}$. is as fast as a belt should run when the pulley is not over 4 ft . diameter. Taking this as a basis of calculation, a 10 ft . pulley may run a belt $10,000 \mathrm{ft}$. per minute with safety. It is, however, seldom in practice that we should use such quick speed. Some three weeks since I commenced running a single belt $5,400 \mathrm{ft}$. per minute, the smaller pulley being about 4 ft . diameter, which gives ex cellent satisfaction. I know of no definite rule for running belting; everything depends upon surrounding circumstances, A horizontal belt, running on not less than a 7 ft . diameter pulley, 50 ft . from center to center, and working side at bnttom, will run well with 400 ft . to a horse power, the slack being taken up by its own weight. The same bedt, at an angle of $45^{\circ}$, will require $5,000 \mathrm{ft}$. to the horse power, and with a vertical belt it will be almost impossible to run it any length of time without a binder (which of all things in a mill). I will now mention one law of belting that
dread in may not be known to you all-that is, the hug or adhesion is as the square of the number of degrees which it covers on the pulley, or, in other words, a belt that covers two thirds of he circumference of a pulley, requires four times th power to make it slip as it does when it covers one third of the same pulley.
Belts, like gears, have a pitch line, or a circumference of uniform motion. This circumference is within the thick ness of the belt, and must be considered, if pulleys differ much in diameter antl you must get a required speed.
Owing to the slip, elasticity and thickness of the belt, the circumference of the driven seldom runs as fast as the river. With two pulleys of equal diameters, one may be made to run twice as fast as the other without slipping, you use an elastic belt of india rubber.
I simply mention this to show the effect of elasticity in belts. As the power of a belt is as its velocity, it is well to run it as fast as possible, to avoid lateral pressure and con equently friction of the shaft.
Pulleys.-One of the greatest objections to the fast run ning of shafting and belts is the want of pulleys properly constructed. My experience leads me to the conclusion that t is not safe to run a cast iron pulley, 4 ft . diameter, 400 revolutions per minute, owing to the unequal shrinkage of
castings in cooling and other imperfections. Running slow, he centrifugal force has but little effect; but as the centri fugal force is as the square of the velocity, it is not so easily vercome in rapid motions.
If you make the rim of the pulley thicker, the centrifugal force increases with the thickness, and consequently nothing is gained by the extra iron. I have, therefore, substituted for the rim, built mast force of material is as the specific gravity, and the specific gravity of cast iron is thirteen times that of pine, hence the entrifugal force must be thirteen times greater; but th tensile strength of cast iron is only two to one of that of pine, therefore the rim of a pulley made of white pine felloes will sustain from four to six times the centrifugal force of a rim made of cast iron, that is, the same diameter
with white pine felloes will run more than double the velocity without being torn asunder. It is less likely to be broken by jar or blow, and is less than half the weight and of course takes less power to run it. I have run a pulley made in this way, 16 ft . diameter, 4 ft . wide, 90 revoutions per minute for 18 months. I have just started anther, 17 ft . diameter, 62 in . wide, 100 revolutions per minute driving on to one made the same way, 4 ft . diameter and running 425 revolutions per minute. Both of these are working well. I am fully convinced that, with quick shafting, wood must take the place of cast iron for the rims of pulleys 3 ft . diameter and above.
No. 2 section of Lawrence Manufacturing Co. has been running with gears, shafting, pulleys and belts, conforming號 he same amount of power as it formerly required for 19,000 the same
spindles.

IT cannot be too deeply impressed upon the mind that ap plication is the price to be paid for mental acquisitions, and that it is as absurd to expect them without it as it is to hope for a harvest where we have not sown the seed.

The Chili Saltpeter Deposits of Peru. In travelling eastward through Peru, from the sea to the Cordilleras, e crossed, the third of which, the Pampa of Tamarugal, and the fifth, Serrania Alta, or the inner chain, (Upper Peru, or Bolivia) are explored for saltpeter. The treeless Pampa, a plain somewhat depressed in the center, has a very scanty vegetation, and the only thing which grows there is a single variety of lucerne grass (mendicago); the cultivation of even this is attended with difficulty, on account of the large proportion of common salt, borax and saltpeter in the soil. It serves in part for the support of the beasts of burden used for transporting to the coast the salts and metallic minerals found here. In the south of the Pampa is a large deposit of borax, pieces of which weigh on an average from 100 to 200 grammes; soda saltpeter is found on the borders of Pampa and Serrania, but too far distant from the sea. On the western slope of the Cordilleras, salt is only found in small quantities; but in Upper Peru, where frequent rains wash it together into great lakes, there are large quantities of it. The saltpeter mines consist of different strata. The surface of the ground is composed of silicates, sandstone and pieces of lime. At a depth of from 8 to 10 inches, very regu ar prisms are usually found, which sparkle with a mass of very small microscopic crystals; the strata below this, which is of rocky hardness, consists principally of common salt, with a little chloride of potassium and soda saltpeter, mixed with earth and pieces of silicates and carbonates, and has a hickness of 20 to 25 inches. Beneath this crust is the pure soda saltpeter, in more or less perfect crystals, from 20 to 40 inches long, and 3 to 7 feet in diameter. Guano is seldom ound there, and only in small quantities; and it always occurs just below a stratum of salt. It is not in a powder, like that rom the Chincha Islands, but adheres together, and is of a brown color, containing the bones and remains of birds and insects, and has an ammoniacal smell.
The chloride of sodium and lime present furnish mineral constituents required for the formation of the saltpeter. Ac cording to Thiercelin, the guano furnishes the nitrogen but since the guano is always found below the salt crust Kœnig is compelled to refer the nitrogen wo some other ni rogenous organic bodies, from whose decomposition am monia is formed, and this in turn is converted by the action of the air and organic bases into nitric acid. Besides the three substances named, all the conditions favorable to the ormation of saltpeter are found in that neighborhood, name ly, a pure dry atmosphere, absence of rain to wash away the altpeter when formed, and the regular night fogs. The atter, leaving the salt undissolved, dissolve the saltpeter and filter it through this stratum, under which it crystal izes.
The search for saltpeter is conducted thus: The workman recognizes its presence by certain undulatory elevations of he ground, and numerous lumps of lime and disintegrated ndstone. He bores a hole some 12 to 18 inches in diameter, lowest layer is reached, the hole is widened to about three feet, filled with charcoal and sulphur and fired. The explosion breaks and tears up the ground for twice that distance around and then properly begins the bringing up of saltpeter. The rude article varies considerably in compactness, color an quality and is named accoräingly. The so called sulphuret, which owes its name to its mode of manufacture, is the purest. The porous, earthy and the congealed are different in quality If the raw product contains less than 50 per cent, the mine is abandoned as not worth working; a yield of 70 to 80 per ent is exceptionally good. The raw material is transported on pack animals or wagons to the factory, where it is refined in two different ways. One method is to break it up in pieces and put it in an iron kettle half full of. water, which is then heated over fire for an hour, the insoluble matter re moved and a fresh quantity of raw material added until the olution is saturated. The clear solution is run off into crys allizing vessels, the crystals collected when formed and llowed to dry in the sacks in which it is shipped. In the acond method, steam heat is employed ; the crude material is put in perforated iron, baskets and suspended in boiling water, and the process repeated until the liquor is saturated The saltpeter prepared in this way contains less than one per ent of common salt, while that obtained by the forme method contains upward of two per cent. Large quantitie f iodine are annually reclaimed from the mother liquors of the saltpeter works of South America.

## xylol as a Remedy for small pox

Xylol, called also xylene and dimethyl benzole, is one of he coal tar products analogous to benzole and toluol. It was first found by Cahours, among the oils which are sepa ated from crude wood spirit by the action of water, hence its $\mathrm{H}_{10}$. The | $\mathrm{H}_{10}$. |
| :--- |
| $\mathrm{H}_{10}$. |
| Xy |

Xylol has been accurately investigated by Dr. Hugo Mul er, who prepared it from coal naphtha, by fractional distilla tion until a distilate was obtained having the specific gravi ty of 866 , and a boiling point of $140^{\circ} \mathrm{C}$. This distilate i mixed with sulphuric acid, which dissolves the xylol, and
forms xylol sulphuric acid; this acid is decomposed by dry forms xylol sulphuric acid; this acid is decomposed by dry
distilation, and the xylol thus obtained is further purified It is colorless, has a faint olor somewhat like benzole, but different in boilling point and specific gravity.
Xylol appears likely to become of great importance, if its pplication in cases of small pox is really followed by such good results as lave been reported from Berlin. It should be given in the early stiges, whenever the physician has rea son to anticipate small pox. Ten to fifteen drops a day ma
be used as a safeguard in addition to vaccination. It is presumed to destroy the poiscn in the blood. Raspberry sirup covers the taste and forms an eligible method for adminis tering it, particularly to children. The dose is three to five drops for children, ten to fifteen drops ior adults, every hour to every three hours. A teaspoonful at a time has been taken without injurious effects. It is necessary to proceed with caution, as its specific action is not closely defined and must be made the subject of research.-Journal of Applicd Chemistry.

## Willinsen's Machines for Cleaning and Finish

 ing Carpets.Mr. John Wilkinson Jr., a carpet manufacturer of Leeds, England, has recently patented, through the Scientific American Patent Agency, improvements in the process of and machingry for cleaning and finishing carpet fabrics. The in vention relates to that class of carpet fabrics in which the pattern is produced by printing after the fabric is made. It is well known that the colors used for printing these fabrics are mixed with earthy and vegetable matters so as to make them of a proper consistence for printing from blocks or rollers.
When the printing has been completed (and the colors have been fixed by steaming the fabric), the earthy and other matters are usually removed by washing the carpet in water. It has been found that, when dark colors are used in the printing operation, this washing process is very liable to (and, in fact, almost invariably does) injure the brilliancy of the lighter colors, and also discolors the white ground
The object of Mr. Wilkinson's invention is to dispense with the washing, and to remove the earthy matters from the fabric by a totally different process. To this end, when the fabric has been printed and steamed in the usual way it is taken to a drying room and thoroughly dried, so 'as to render the earthy and other matters brittle and easily de tachable from the textile fibers of the fabric by means of friction.
The mechanical appliances, found most convenient for the purpose of detaching the earthy matters from the fibers, consist principally of a series of blunt knife edges or scrapers which may be secured either in a reciprocating frame or frames, so that they may be dragged to and fro in contact with the printed surface of the fabric, to break up the earthy and other matters and detach them from the fibers as the fabric is being carried slowly through the machine or these knife edges or scrapers may be adapted to the peri pheries of cylinders or rollers, which may be made to rotate at a suitable speed, and scrape the fabric 'as it is being drawn forward by drawing rollers or other equivalent appliance or devices. This latter is the arrangement of mechanism preferred.

## Very Good Compost

A gentleman residing at La Grange, Ga., wrote to us, some time since, that the following mixture had been used upon

| Nitrate of soda. . | 40 lbs . |
| :---: | :---: |
| Sulphate of ammonia. | 60 " |
| Muriate of potash. | 20 " |
| Bone dust. | 200 " |
| Gypsum | 200 " |
| Salt. | 50 " |
| Soil or muck | 1,430 " |

This mixture embraces quite all the great esse food, but we think it is too much attenuated. The proportions might be doubled (leaving out half the soil) with ad vantage, as it would not be so heavy to handle, We would, owever,'suggest an improvement in the proportions em ployed : instead of 60 lbs . of sulphate of ammonia, it had
better le, for cotton, 100 lbs ; and good, true superphosphate might take the place of the bone dust with advantage. The otton plant needs the active influence of phosphoric acid to push it forward vigorously. If the planters will combin together and purchase these commercial articles, good and true, at the lowest wholesale rates, and make this compost hey wiil save the tens of thousands of dollars thrown away pon the factitious mixtures sold so freely in the South.Boston Journal of Chemistry.

We mentioned some months ago that a member of the Odontological Society had succeeded in replanting teeth which had been extracted in consequence of disease. To the rocess by which this was accomplished, he gave the name of Reimplantation. Another member of the same Society has now had the operation tried on himself, and with success. The tooth, which had for some time been painfully affected by changes of temperature, was carefully pulled out, to pre rent straining or tearing of the gum; the dental canal was leansed, the decayed part was scraped from the crown, and stopping applied in the usual way, and then the tooth was re placed in its socket. The operation lasted about half an hour: for three or four hours there was a dull aching pain which, however, entirely ceased before noon of the following
day, though some tenderness remained. This in turn disap day, though some tenderness remained. This in turn disap peared; and by the end of a fortnight, the replanted tooth o do. Fros and that per sons who object to an artificial tooth may with proper care retain the teeth which Nature gave them.

Refined nickel is worth $\$ 3$ a pound. The ore is found in Pennsyivania and Missouri. The Pennsylvania mines fur profitable,

## Improved Baling Press

The peculiarities of this press are that an auxiliary fo lower is hinged to one side of the part of the press int which the loose material is filled, which, inclosing rapidly compresses the material to a certain extent, when, being sup ported in a manner described below, more powerful pressure is applied to the opposite follower, by which means the bale is consolidated as much a desired.
A, in the engraving, is the principal follow er, and B the auxiliary follower, piroted to the case at C. This follower is thrown open on ts pivots by means of the lever, D, and i forced down by means of the windlass an rope, E. When thus closed, it is fastened by a pivoted section, $F$, of the side of the case actuated by the lever, $G$, and rope, which sec tion swings down and engages the edge of the follower. When the press is thus closed, horse or other power is applied to the lever, H which, through a system of shafting and gear ing, actuates the screw, J, forcing up the prin cipal follower and finishing the compression of the bale.
This construction will facilitate the com pression of hay, cotton, wool, and other loose and bulky substances which, in ordinary press es, require nearly as muchtime to reduce them in volume sufficiently to apply great powe advantageously as to complete the compres sion. The improvement has the further ad vantage that it does not make the press bulky or unwieldy, and adds little to the cost of man ufacture.
Application pending through the Scientific American Patent Agency. Address, for fur ther particulars, John Myers' Sons, Washing ton, N. C.
mproved Hot Air Furnace
Our engraving represents a hot air furnace, which, through the extent of heating surface secured in its construction, ob viates the necessity of overheating the plates in cold weather in order to obtain the requisite heat in the apartments to be warmed, thus preventing the burning of the organic mat ter, floating in the air and so far vitiating the latter. This is a common fault of hot air furnaces, and may often be de tected in the faint oppressive smell imparted to the air which has been overheated. Provision is also made in this furnace for more perfect combustion than is usually obtained in apparatus of this kind. By a pe culiar automatic device, the heat is made self regulating, as will appear in the following description.

Cold air enters at A, passes up through the annular space between the outer shell, B, and fire box, C , and, circulating through the heat ing tubes, D , is led from the top of the fur nace, wherever desired, through suitable pipe or flues. The gases of combustion, rising from the fire box, are reverberated in the gas de flector, E , consisting of a double cylinder, the inner one being closed at the top, and having inner perforated $\mathbf{F}$ to w the tube, F , to complete the combustion of the gases. Thence the heated gases pass up int the cylinder, G, which is closed at the to but has an opening in the side, shown at $H$, whence the gases issue and circulate about the outer surfaces of the heating tubes, final ly passing out into the smoke pipe on the op posite side of the furnace from that. shown.
A prominent feature of the furnace is the damper regulator. I is the draft tube, admit ting air to the fire box through the opening, $J$ this opening being controlled by the valve, $K$ automatically operated by the expanding rods, L and M , the rocking bar, N , and the levers $O$ and $P$. The rod, $L$, has one end permanent ly fixed at Q. The other end is pivoted to the rock bar, $N$. As it expands by the action of heat, it raises the end of the rock bar to which it is pivoted and depresses the opposite end This moves the bar, $M$, downward, this rod also expanding by heat so that the combined movemen the levers, $O$ and $P$, and increased by the lat ter so as to close the valve, $K$, more or less, ac cording as the heat increases. By means of the sliding rod, $R$, the lower end of the rod, M , is moved nearer to or farther from the fulcrum of the lever, 0 , to regulate the degree of opening or closing of the valve, K .
The tube, $F$ is supplied with a damper, S , by which the in flow of air to the gas deflector is regulated.
In burning wood, the gas deflector, E , performs another office from that above described. Besides completing the combustion, it so mingles air with the watery vapors as to prevent their subsequent condensation and dripping in the pipes, when the combustion proceeds slowly. Those who have experienced the annoyances, caused by such condensa tion and dripping in the use of hot air furnaces, will ciate the importance of an improvement which removes these ciate the import
The furnace does not need to be inclosed by masonry; a wilight feavation in the earth bottom of a cellar is made to
receive a foundation of bricks laid without mortar. The fresh cold air is led in from the outside of the building through a board flue, and the setting may be done quickly and cheaply In case the cellar has a brick or cement bottom, no excava tion will be required. The radiating pipes are of sheet iron and therefore radiate their heat to the passing currents of air


## MYERS' IMPROVED PRESS.

with rapidity. A suitable water pan for regulating the hy- of blood each day grometric condition of the heated air is provided.
The heater can be used where a cast iron heater would take up too much room. By setting the dampers properly it is claimed the fire can be kept smoldering for forty-eigh hours. It is further claimed that the furnace is made wit air tight joints, so that leakage of gas is impossible. It re quires but slight attendance, and seems a very perfectly con For further for the purpose of heating buildings. For further information address Holcomb \& Gould, of


HOLCOMBS HOT AIR FURNACE
Painesville, Ohio, in whom the patents on the original fur nace and recent improvements are now vested.

The manufacture of hoop iron is fast getting to be a speciality, limited to those who make no other kind of iron, roll trains being adapted in speed and constructed with a view solely to this purpose. The rolls are turned so that the iron can be rapidly reduced and greater quantity produced with better finish, while very strict attention is given to the selection of metals for mixture.

The fourth Atlantic telegraph cable is now being made by the French Transatlantic Telegraph Company, and is to be laid between the coast of Massachusetts and France in 1873. Three Atlantic cables are now in operation, two
via Ireland and one vid France. suicidal,

## Maple Sugar

Nearly all our hard wood trees will yieldmore or less sugar, but only a very few of them furnish it in large quantities or enough for domestic use. The Acer or maple family tands at the head of the list in this respect, and chief amon hese is the Acer saccharinum or sugar maple, the juice which contains from three to six per cent of cane sugar. That which comes from the tre when it is first tapped is much richer than that which flows later in the season. The first sap ascending the stem naturally dissolves out the largest proportion of the starch and gum.
After the sap is drawn, it is concentrated by boiling until it commences to crystalize, when it is allowed to cool and deposit the sugar During this concentration of the sap, the lime salts which have been held in solution are gradually precipitated as the sirup becomes more dense. This deposit, or "niter," as it is called consists, according to some authorities, of car bonate of lime; others consider it to be malat of lime or saccharate of lime.
The flow of sap varies much with the state of the weather, being most abundant when the nights are cool and the days warm. This has been explained on the supposition that on warm days the air contained in the trunk of the tre expands, thus forcing the sap out; while as th tree cools off at night the air contracts, and th sap rises from the roots to supply the vacuum to be again forced out the next day. As soo as the leaves commence to expand the flo ceases, because then the leaves are able to evap orate all the water that the roots can supply. But the continual tapping of the tree and th withdrawal of its stores of nourishment soo cause it to languish, and it cannot survive such treatment many years any more than a ma could survive the loss of a considerable portio

## Telegraphing at Sea

Captain Columb, R. N., in a paper recently read before the Society of Telegraph Engineers, London, said:-
Telegraphing at sea by night was confined to a very few et messages, represented by white lights displayed in diffe ent numbers and forms; this was continued until twelve ears ago, when what is now called the "flashing system was introduced, which has since been completely adopted in the English navy and army. This is nothing more than the adoption of the "dot and dash of Morse, or the " long and short flash," as they are now called, to universal application.
It was shown how, by the long and shor display of a single light, the long and short wave of a flag, the long and short appearanc of any object, or the long and short sound on a horn or steam whistle, all the present want of telegraphing at sea were supplied.
The paper was illustrated by various dia grams and specimens of apparatus actually in use, one of the most important being a flashing light, known as the Chatham light, of grea power and simplicity, the light being produced by jets of diluted magnesium powder into the flame of a spirit.
It was shown that all telegraphy was reduci ble to a system of visible or audible signs fol lowing in certain succession. The means of distinction in visible signs were difference of form, color, and motion ; in audible signs, dif ferences of tone and motion (or time), whil semaphores represented form, and flags, colo and form ; the most powerful distinction of all motion, was more practically employed until the flashing system made its appearance, and it not only threw open the hours of darkness to the purposes of telegrapby at sea, but it made the transmission of messages more rapid, while enormously extending their range. Instance were given of messages sent thirty miles from mid channel to the coast of England at night and of messages read by the naked eye in the day time, when flogs could not be read with the most powerful telescope.

## Javelle water

Old engravings, wood cuts, and all kinds o printed matter, that hasturned yellow, are com pletely restored by being immersed in this pre paration for only one minute, without the least injury to the paper, if the precaution is taken to thoroughly wash the article in water containing a little hyposulphite of soda. Undyed linen and cotton goods of all kinds, however soiled or dirty, are rendered snowy white in a very short time by mere ly placing them in the liquid mentioned. For the prepara tion of Javelle war four pounds of bicarbonate or put ine ortle $p$ in boil from ten to fifteen minutes, then stir in the chloride of iime, avoiding lumps. When cold, the liquid can be kept in a jug ready for use.

To allow the clothing to dry upon you, unless by keeping up a vigorous exercise until you are thoroughly dried, is

# Srientifir gmmicm. 

MUNN \& CO., Editors and Proprietors. published weklly at
wo. 37 pari row (park building) new tork.

o. D. MUNN.

A. e. beach.

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## double PLows

Considerable attention has been recently given in England to the use of double plows, the advantages gained being claimed to be considerable as compared with those of single plows. As inventors are ever on the alert to improve agri cultural implements, it may not be amiss to place before them some facts connected with this subject, from which they may possibly derive useful hints.
The idea of using double plows is not new. In a lecture delivered before the Framlingham Farmers' Club (England), Mr. J. E. Ransome stated that he had found in a book enti tled "England's Improvement," written by Captain Walter Biith in the time of Cromwell, the first account of such a plow. In Arthur Young's "Tour to the North," published in 1771, is also found the account of a double plow fitted with two wheels, then in use in Worcestershire; this plow was afterwards improved by Mr. Berney, of Bracon Ash, Norfolk. Mr. Ransome referred to the plow patented by Lord Somer ville in 1802, and also to the first adjustable double plow made by a Leicestershire plow wright, Mr. Handford, of Hathern; and to show what was actually accomplished at that early date with double furrow plows, he quoted from an article on the subject, given in Rees's "Encyclopædia," in which ticle on the subject, given in Rees's "Encyclopedia," in which
it is stated that at a trial which took place on the Royal it is stated that at a trial which took place on the Royal
farm at Windsor, $17 \frac{1}{2}$ acres of unstirred land were plowed farm at Windsor, $17 \frac{1}{2}$ acres of unstirred land were plowed
with four Devon oxen, one man and a boy, in six days and a with four Devon oxen, one man and a boy, in six days and a
few hours, and that the oxen were in better condition after few hours, and that the oxen were in better condition after
the trial than at the beginning. This is close upon 3 acres a day, which Mr. Ransome thought was not bad work. In the same article, a letter from an Essex farmer occurred, in which it was stated that Lord Somerville's double plow effected a saving of 5s. a day while in use. Various trials of double plows were conducted by the Bath and West of England Agricultural Society at the beginning of this century, and so thoroughly did they then consider it a standard implement that it was engraved at the head of their printed forms used when giving diplomas in connection with the Society.
Various reasons may be assigned why, notwithstanding these attempts, the single plows still retained their supremacy in popular esteem. They were lighter, easier to handle, and did not require so much power to draw them; while the double plows were so constructed as not to offer the advan tages claimed for the new double plow known as the Pirie plow, and improved by the Messrs. Fowler, of Leeds. This plow may be described as follows:
It consists of two plow bodies, carried on a wrought iron frame wrirk, entirely supported on wheels, two of which run in the furrows, one in front, the other behind, ard a third wheel runs on the land a considerable distance from the furrow, about midway between the other two, so that the plow is supported on three points at the corners of a triangle. The leading furrow wheel is steered by a lever leading to the back part of the plow, and handles are dispensed with. The plow is turned at the headlands by depressing the land wheel and steering the leading furrow wheel. An improve ly, its weight resting upon two wheels in turning the headlands.
Instead of the ordinary slade or land slide, these plows are each fitted with a friction wheel which runs along the cut edge of the plowed land and greatly reduces the friction. I this way, a saving of fifty per cent of the power is claimed
to be made in moist land, in which the friction against the to be made in moist land, in which the friction against the
slade is very great. In very dry clay land, the saving is not slade is very great. In very dry clay land, the saving is not
so great. It is maintained that in moist land a team of horses
will do one third more plowing per day, with the same labor, with this plow than with the ordinary single plow, a claim which challenges attention and which, if demonstrated to be founded in fact ought to revolutionize the present system of plowing. We are not prepared to admit so much, but there plowing. We are nve prepared orther advantages of consideration. The double plow is as easily managed by one man as the single double plow is as easily managed by one man as the single
plow, so that if three or four horses were required to draw plow, so that if three or four horses were required to draw
the former, the wages of one plowman would still be saved. It is former, the wages of one plowman would still be saved.
that the work is done better, the plow It is also claimed that the work is done better, the plow
working steadily and turning its furrows better than the single plow. The pan or furrow will evidently not be so much trodden if two horses can do the work of three. The bottom and the land side of the furrow are not glazed by the friction of the bottom and slade, as with ordinary plows. The double"plow is also claimed to possess peculiar advantages for subsoiling and hillside plowing. Without conced-
ing all these claims, they are sufficient to a waken thought ing all these claims, they are sufficient to a waken thought, and perhaps to suggest some improvements upon the present a portion of result worthy the efforts of any inventor, and one that would bring a sure reward.

## the utilization of water in its . Relation to

It is needless to say that in regions the products of which are largely increased in value by manufacturing them into articles of utility or luxury, the possession of unlimited water power is an advantage scarcely to be overrated. Yet it seems undeniable that the utilization of water power is
attended with certain disadvantages. The latter, while not attended with certain disadvàntages. The latter, while not sufficient to induce the public to neglect such natural re
sources, are still of enough importance to render their possisources, are still of enough importance to render their possi ble diminution a subject of consideration
Our attention has been specially called to this by an article on mill dams and other water obstructions, and their relations to public health, published in the report of the Massa chusetts Board of Health.
This article, prepared by Mr. George Derby, the Secretary of the Board, contains many interesting facts, some of which we must pass over entirely, but one of which is of great significance. This is stated as follows:
"There is reason to believe that the territorial line of di ision (always ill defined) between fevers of a continued and of a periodic type is extending northward, and that our immunity from remittents and intermittents is far less com plete than in previous generations. Thirty-four years ago,
Dr. Oliver Wendell Holmes instituted an inquiry, among the most experienced physicians of the time in New Eng land, with the purpose of learning what they themselves knew and whatever had come down from their predecessor concerning intermittent fever originating within the field of their practice. The materials thus collected were made the basis of an essay of singular interest, which was published in 1838 as a Boylston prize dissertation. It appeared from all the evidence collected by Dr. Holmes that the traces of indigenous intermittents in Massachusetts were, except in a very few places, but scanty.
About the year 1828, a dam was built for obtaining water power for mechanical purposes on the Housatonic, two or three miles south of the Massachusetts Iine. It affected the hight of water on that sluggish stream for a distance of ten miles, and was followed by such increase of intermittent fever that the people sought and obtained legal authority for he removal of the dam on the ground that its effects on ublic health were such as to constitute it a public nuisance Twenty five years ago, it was taught in our medical schools
that intermittent fever was a disease almost unknown in Hat intermittent fever was a disease almost unkno
Massachusetts, except when contracted in other places.
The exemption of the people of this State from periodic fever seems to be far less complete at the present time.
The gradual enlargement of the area of malarious influ ence from the latitude of Long Island toward the southern border of Massachusetts is a fact, to which earnest attention is called. There have been during the past eight years, as near as can be estimated, 6,700 cases of periodic fevers in and abou New Haven, Conn. According to Dr. E. W. Blake, who furnishe these statistics, these cases " have been of every form and type regular, irregular and defective; the latter covering cases of dumb ague which are very common in the old fevar and ague ocalities. Cases of remittent have also been quite numerous In many localities, whole families have been prostrated with the various forms of this malaricus disease; old and young ave alike suffered. There have been instances of the closing f factories by their proprietors from this cause.
While this increase of malarial disease is not attributed Mr. Derby entirely to the increase of mill dams and ther water obstructions, there can be no doubt that these re in many cases fruitful sources of fevers. Tide mills in crowded neighborhoods are particularly named as objectionable in this respect. Probably any of our readers are cognizant of many dams in which the water becomes stag ant and offensive in hot weather. Such are unc have, it is stated, not been found profitable, but their dams remain to poison the air and injure the general health. All along the Massachusetts coast are to be found old dams likely to be come similar nuisances.
No dam ought ever to be abandoned and left undrained et these may be met with in many parts of the country tagnant pestiferous pools of corruption.
While there can be no doubt that water obstructions ten promote fevers of various types, we believe that othe causes have a more direct relation to the increase of malari
ous disease in the New England States. There has been, in
hese States, an enormous reduction of standing timbe during the past decade. Wood working of all kinds has been making inroads upon the wooded districts, scarcely credible except to those who are well acquainted with the magnitude of this class of manufactures. The depletion of he timber sets in motion a train of causes which has been well recognized as a fruitful source of malaria in new countries. The indreased evaporation of water, through the action of heat upon the newly exposed soil covered with decaying vegetable matter, at once engenders malaria, while the lessened flow of water in the entreams exposes marshes the lessened flow of water in the streams exposes marstes
and bogs, previously covered with water, and the moist stagand bogs, previously covered with water, and the moist stag-
nant mud thus denuded ferments and pours forth streams of nant mud thus denuded ferments and pours forth streams of
fetid and poisonous gases and vapors. It is well known fetid and poisonous gases and vapors. It is well known that of late the streams in Massachusetts and Connecticut have run very low in the summer season, leaving, in many it laces, wide flats of ooze directly exposed to solar heat.
It has been well said that civilization has its penalties, and this spread of malaria is probably unavoidable. Certain compensations will take place in time. Bogs will gradually fill up and become drier. The newly cleaned lands will gradually cease to emanate malaria, and the country will probably resume its original healthy condition.
In building dams, much might be done to prevent their ill effect upon the general health. The construction of cheap dykes will often prevent the shallow overflow of acres of ground without materially limiting the useful capacity of the dams. In many instances, the value of the land re claimed would more than pay the cost of the dykes. This method of protection could undoubtedly be enforced, without oppressive restrictions and to great advantage. In building dams, a little plowing and scraping will also often change the contour of the surface so as to obviate shallow margins without at all lessening the amount of water the dams will
hold. In short, there are few instances where a little cost hold. In short, there are few instances where a little cost
and pains might not remove the objectionable features of and pains might not remove the objection
The report of the Massachusetts State Health Board is full of interesting information, but we have not space to review it more extensively. We close with its following ex tract:
If the cycle of malarious influence should again come round, if intermittents and remittents should prevail in Massachusetts as they do now in Connecticut, they need not be looked for on the dry pine plains or on the hillsides, but will surely be found by the sluggish water courses, in the salt water marshes, by the side of obstructed streams and reservoirs, and wherever the natural flow of water is so hindered by man's contrivances that the result is stagnation

## THE AIR" FILTER.

Professor Tyndall, after a long series of experiments with atmospheric air, concluded that many of our most formida ble diseases, such, for example, as small pox, cholera, and ty phoid were propagated by the flotation of invisible particles in the atmosphere, and that, by the use of a suitable breath fiter, it would be practicable for any person to enter an in fected apartment without danger. The same apparatus, he stated, might be used by firemen, enabling them to ente buildings filled with dense smoke without injury, as the filter would arrest the particles of carbon, of which smoke is composed, allowing only the air to pass into the lungs. A further use of the breath filter is to facilitate miners in ex ploring and working in mines where carbonic acid gas is presen $t$ in noxious proportions.
A recent trial of filters, made substantially as suggested by Professor Tyndall, has lately taken place in England, and we will describe some of the results. The filter itself consists of a cylinder, four or five inches long and two inches or more in diameter. Its interior contains, at the top, laygr of cotton wool which has been moistened with glycerin, then a layer of dry cotton wool, then a layer of charcoal then cotton wool, with wire gauze covers at both ends, and a the upper end a mouth piece so shaped as to fit closely over the mouth of the wearer. By drawing the breath through his instrument, the most dense smoke may be entered with impunity. This filter has been tested by the London Fire Department with such success that the firemen of that city are to be provided with it for regular use. When places are to be entered, such as mines or wells, where carbonic acid gas is present, it is necessary to add another layer of cotton wool and to place a layer of slaked lime between the two bottom layers of cotton. The object of the lime is to arrest the car bonic acid and oxide gases
A recent test consisted in placing the experimenter, who ad one of the instruments secured over his mouth, within a mall closet, with a rabbit and tewo birds for companions. arbonic acid gas and carbonic oxide were then injected un til the atmosphere of the closet was rendered highly poison ous. In 23 minutes, the animals were dead, but the experi menter came out at the end of 30 minutes, having suffered no inconvenience from the noxious gases; but the work of breathing through the small instrument for so long a period and the heat of so small an apart.nent rendered him uncom ortable. Experiments are still in progress to determine the best sizes and forms for the instrument, and ere long we may expect that the air filter will be an instrument of common use.
The shortening of puddling furnaces, by leaving out the neck almost entirely, is now being done after trial by some mills. The improvement contracts the entire furnace about hirty inches. The fire chamber and working chamber ar he same as usual. Some half dozen of the Pittsburgh mills the same as usual. Some half dozen of the Pittsb
have adopted the change; the saving is obvious.

FOLDING CHAIR, LOUNGE, AND BED.
Mr. Henry James, of North Adams, Mass., has recently pat ented, through the Scientific American Patent Agency, a fold ing and extension chair, which has many points of utility worthy of special mention. Its first office is that of an easy chair, in which capacity it is really luxurious, being capable of any style of comfortable and ornamental upholstering, which may be desired, as well as of being upholstered as cheap ly as any other chairs in market. Very simple adjustments convert it successively into an invalid's lounging chair, child's crib, a complete iron bed, an ottoman or table, in all of which capacities it is a serviceable and comely piece of furniture. For those occupying small furnished apartments, nothing could be more admirably adapted, as it economizes the room usually occupied by a bed, besides doing duty through the day as an easy or lounging chair. For druggists' clerks and night clerks who sleep in stores, it will also prove servicea ble, as besides the merit of utility, it has that of cheapness The frame work, being of iron, does not harbor vermin, and is very strong ; and being placed upon castors, it is easy to handle.

## PHOTOGRAPHIC TOILET AND HAT RACK.

A unique and ornamental design for a hat rack has been devised by Mr. William McEntyre, of North East (Erie Co.), Pennsylvania. It consists of a hat rack, which can either be suspended from the side of a wall or supplied with a suitable stand. In the center is a circular or oval mirror. At the sides are brackets for the support of vases or toilet bottles. But the most novel feature of the design is that each of the pegs or supports for hats, coats, etc., has a place provided in the end, for the reception of a circularphotograph, about two and one half inches in diameter. A family picture gallery may thus be placed in the rack, or the vacancies may be supplied with views of public places or other objects of interest. Mr. Josiah Partridge, of 368 Pearl street, is the sole agent for New York.

ON THE REASONS WHICH HAVE CAUSED THE ADOPTION OF THE NEW ATOMIC WEIGHTS
We mentioned, at the close of an article on the modern status of organic chemistry, in a former number (page 232), that there were different reasons for the adoption of new chemical equivalents, or rather for the correction of many of the thus far accepted atomic weights. We will now explain one of these reasons.
Gay Lussac discovered the law that the ratio in which gases and vapors combine by volume is always a very simple one, and that the volume of the resulting gaseous product bears also a simple ratio to the original volumes. So one volume of oxygen will combine with two volumes of hydrogen, and condense to two volumes of water vapor; one volume of chlorine will combine with oneric acid ras; on gen, and form two volumes of hydrochloric acid gas; one volume of nitrogen will combine with three volumes of gas, etc. It is seen that the compound has sometimes a volgas, etc. It is see sum of the component gases, and someume equal to the sum of the component gases, and some-
times is condensed to a less bulk; but this less bulk will be times is condensed to a less bully; two thirds, three quarters, etc., of always exactly one half, two thirds, three quarters, etc., of
the original bulk, that is, it will bear a simple ratio to the the original bulk, that is, it will bear a simple ratio to the
same, as stated above. Ampère assumed that equal volumes same, as stated above. Ampère assumed that equal volumes
of elementary gases contained the same number of atoms, that thus the numbers representing the specific gravity of the gases, when accepting the lightest, or hydrogen, as unit, also represented the atomic weights. Let us test this:
table of the specific gravity of some elementary

| Gases and |  |  |
| :---: | :---: | :---: |
| Hydrogen. |  |  |
| Oxygen. | - | 16 |
| Nitrogen | $\mathrm{N}=$ | 14 |
| Chlorine. | Cl | 36 |
| Bromine vapor | Br | 80 |
| Iodine vapor. | I | 12 |
| Phosphorus vapo | P | 31 |
| Sulphur vapor. | S | 32 |
| Zinc vapor. | Zn | 65 |
| Potassium vapor |  |  |

It is seen that the numbers for $\mathrm{N}, \mathrm{Cl}, \mathrm{Br}, \mathrm{I}, \mathrm{P}$, and K correspond with the accepted atomic weights, while those of $\mathrm{O}, \mathrm{Zn}$, and S , are twice as large. If, therefore, the latter are adopted as representing the corrected atomic weights, we have also to correct some of the chemical formulæ in which they appear, as these formulæ are founded on the actual ratio of the constituents of bodies and the assumed value of the atomic weights. So water, which contains 8 parts by weight of oxygen with 1 of hydrogen, was expressed, after the old assumption of $\mathrm{O}=8$, by the formula HO ; while, after the new assamption of $O=16$, it must be written after the new assumption of $\mathrm{O}=16$, it must be written
$\mathrm{H}_{2} \mathrm{O}$, in order to presenve the ratio, of its constituents, of $\mathrm{H}_{2} \mathrm{O}$, in order to presenve the ratio, of its constituents, of
$1: 8$. Ammonia, $\mathrm{NH}_{3}$, hydrochloric acid, HCl , oxide of $1: 8$. Ammonia, $\mathrm{NH}_{3}$, hydrochloric acid, HCl , oxide of
zinc, ZnO , and all those compounds of which the value of both constituents has not been changed, and also those of which the value of both has been doubled, remain the same. Thus sulphuric oxide, which consists of 2 parts of sulphur and 3 of oxygen, was written $\mathrm{SO}_{3}$, which for the assumption of $\mathrm{S}=16$ and $\mathrm{O}=8$ is correct; but, for the new assumption of $O=16$ and $S=32$, it is equally correct. Sulphuric acid, however, which consists of the oxide $\mathrm{SO}_{3}$ and an atom of water, which formerly was written $\mathrm{SO}_{3} \mathrm{HO}$, is now written $\mathrm{SO}_{3} \mathrm{H}_{2} \mathrm{O}$, or $\mathrm{H}_{2}\left(\mathrm{SO}_{4}\right)$. Nitric oxide, which was written $\mathrm{NO}_{5}$, becomes, by giving O the double value, $\mathrm{N}_{2} \mathrm{O}_{5}$; and, on combining it with an atom of water, it forms nitric acid, formerly $\mathrm{NO}_{5} \mathrm{HO}$, now $\mathrm{N}_{2} \mathrm{O}_{5}+\mathrm{H}_{2} \mathrm{O}$, or $2\left(\mathrm{HNO}_{3}\right)$. Phosphoric acid, formerly $\mathrm{PO}_{5}+3 \mathrm{HO}$, is now, for the same reason, $2\left(\mathrm{H}_{3} \mathrm{PO}_{4}\right)$. Zinc oxide, ZnO , is the same, but potash, formerly KO, is now $\mathrm{K}_{2} \mathrm{O}$. Sulphate of potash, or potassic sulphate, according to the new system of naming, is $\mathrm{K}_{2}\left(\mathrm{SO}_{4}\right)$ in place of $\mathrm{KOSO}_{3}$.

Since Claudius has shown that the law, which Gay Lussac found in a purely empirical manner, was a direct result of the theoretical assumption of Ampère, the new numbers have been adopted by the advanced chemists of the day; but it is to be deplored that a temporary confusion results, which is especially trying for beginners, chiefly because the existing books are almost all founded on the old formulæ, so that students trained only in the new style cannot understand them; and, in order to understand all, one must, now-a-days, be familiar with both styles of formulæ.
We will still add here the remark that the atomic weights for the alkaloid metals, lithium, sodium, potassium, rubidium and cæsium, are the same as before; those of the metals of the alkaline earths, magnesium. calcium, strontium and barium, have been doubled, as well as the earthy metals, and all the heavy metals, as well as carbon and metals, and all the heavy metals, as well as carb
silicon; but boron and arsenic are the same as before.
We close this article with a few of the modern meth of representing the manner in which the atoms in the compounds mentioned may be considered to be connected pounds m
together.


It is not asserted that these combinations represent the actual position of the atoms in the compounds, as they are here spread out over a flat surface, while in reality they are combined in all directions in space; but this way of pre senting the combinations to the eye is a powerful aid to the imagination, chiefly in connection with the atomicity explained on page 232, above mentioned.

The experiments of Dr. H. Vohl, of Cologne, appear to not derived from the coal itself, but has been absorbed from the atmosphere. This view is confirmed by the fact that when charcoal is freed from its carbonic acid and saturated with pure oxygen, no further trace of carbonic acid is dis. coverable, even when heated to $680^{\circ}$ Fahrenheit.

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personal instruction.

## Thateqg Tugrise


1.-Separation of Mercury in a Thermometer.-How can I cause the mercury which has been br
ter or barometer tube to unite?-F. D . H.
2.-Question in Acoustics.-Is there any instrument for measuring the force of sound, and how is it constructed? To what degree is it sensible, and does it re
the maximum?-W. M. K.
3.-Coating Iron with Emery.-How can I cover a sheet iron cylinder inside with emcry,
tenacious as if on wood ?-J. M.
4.-Tempering Plow Shares.-How can slabs of steel such as plow share
shape? - P. A. H.
5.-Galvanizing.-What is used, on the top of the pot of zinc, in galvanizing? I have heard of several things, and would like to now wat is best.-J. 1. B,
6.-Paint for Galvanized Iron.-I want a durable paint for galvanized iron roofing, and also for water tanks, bath tubs, etc., made of the same material. -W.
7.-Overshot Water Wherel.-What is the most economical motion for a 20 foot overshot water wheel, to gain the largest per cent or power for the water usel? - M. H.
8.-Bats.-How can I banish bats from an old house ? It is impossible to fasten the house upso as to exclude them, as they eat through ad re-enter.-J. E. P.
9.-Cleaning Cotton Waste.-Would some of your correspondents kindly give me a simple and economical method of cleaning cot-usable?-S. R. F
10 -Removing Salt Water Rust.-Is there any simple method of removing salt water rust from sheet iron, where the rust is on in spots? Are there any acids or liquids, into which the sheets could be immersed, which will dissolve and effectually remove the rust without eat-
ing or injuring the clean parts of the iron exposed?-S. R. F.
11.-Cement for Glass Gage Tubes.-What cement other than rubber can I use to cement a glass gage tube to its moun
which will resist the action of the hot water and steam?-F. D. H.
12.-Working Corundum.-Will some one of your many readers inform me how corundum wheels are made, and if corundum can be
molded and worked on an iron base? If it can, where can the pulverized corundum be procured?-A. D. C.
13.-Dyeing Skins.-I wish to know the process and ingredients used in producing different colors on the grain of sheep, dog, deer, is off, but cannot color with it on.-A. B. S.
14.-Painting Canvas Cover.-What can I paint a wagon cover with, to render it watcrproof? The material is heavy ducking; the
color is to be dark. I want something that will stand hot and cold weather, and neither crack nor peel off.-F. A. K.
15 -Expanding the Ends of Boiler Tubes.-What is the best mode of expanding the tubes of a steam fire engine boiler, so as to prevent leakage? There are 152 solid drawn composition tubes, which were
put in with a dudgeon expander; and frequently the leakage of steam and Water around the upper end of tube would be so great as to extinguish the fire. After several times expanding, $I$ had the upper end of tubes feruled
with taper iron ferules, which give entire satisfaction at that end, but now with taper iron ferules, which give entire satisfaction at that end, but now
the lower ends weep, around each tube, so as to keep the wood in furnace perfectly wet, after six hours standing in house, with water cold.-A.
16.-Telescope.-Will some one please inform me how to make a ches diameter. I have made a tube, of sufficient length, of brass. two inches diameter. 1 have made a tube, or sumcient it contains four
The eye piece is one taken from a smaller instrument. It cont
lenses. The first one, nearest the eye, is seven sixteenths diameter, the lenses. The first one, nearest the eye, is seven sixteenths diameter, the
second five eighths, (these two are one and three eighths apart) the third lens is three eighths diameter, and the fourth, one half inch. These two
latter are one and one hal f inches apart, so that the eye piece is tour and later are one aid one hall inches apart, so that the eye piece is tour and
five eighths long. Now when I put it together, and get it to the focus, the image is quite dim, so much so that the instrument is useless. Also: How can I grind a speculum, about four inches or five inclles diameter, forty-
eight inches focus, for a reflecting telescope? What kind, and what proeight inches focus, for a reflecting telesc
portion, of metal would be best?-T. J.
17.-TELEGRAPH Sounder Queries.-I have a telegraph sounder and key, of my own construction, worked by a Daniell battery. The magnet on my sounder was wrapped with cotton insulated wire, of the size
known to oparators as " office wire." This instrument works well, giving a clear distinct sound, as long as it is not in connection with an instrument such as is used in offices; but on connecting it with such an instrument it
failed to operate although the other instrument responded promptly to the fanied to operate, although the other instrument responded promptly on the worked readily from Its own key, without altering the connections. By
cutting off from the office sounder, and attaching my sounder directly to the battery, it worked well; but it seemed that, after the current passed the batery, it worked welt; but it seemed that, after the current passed
throught the coil on the other instrument, in thad no effect on mine. Is this
due to the sizi of the wire, making a difference in the number of coils on the due to the size of the wire, making a difference in the number of coils on the
two magnets? If my nagnet is wound with regular "magnet wire," will it $t$ wo magnets? If my .nagnet is wound withregular mag.

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and Personas.

## and Personas

Power of Windmill.-Query 10, page 217.-For three horse power, in a gentle breeze,
feet of sail will be required. - S.
Tanning Buffalo Robes.-O. A. R. will find an answer, to his query, on page 265, current volume of the Scientific Amedions. Polishing Gun Barrels.-E. o. McC. will find full direc tions for this process on pages 217 and 266 of the current volume of the
Welding Copper.-F. E. R., of Cal., is informed that we had the directions for this from a first class European authority on the
subject. We shall be glad to have the experience of other readers, if there are any who have tried the process.
Rattlesnakes.-A correspondent, C. F. Gerald, of Camden, Ala., disputes the currently accepted theories about rattlesnakes, an
asserts that they will bite when in any position, and in the daylight well as at night; and he states that he can shoot them in the head with rifle, hitting every time.
Violin Varnish.-Query 7, page 233.-Take two ounces gum shellac, half an ounce gum copal, one ounce sweet spirits of nite
one pint alcohol. Dissolve the gums in the alcohol, then add the niter. F. D. H., of N.

Cleaning Glass.-Let W. G. E., query 16, March 16, rub his glass with rotten stone and alcohol. This method is used by photo-
graphers for cleaning glass.-C. H., of Ky.

Fusible Metals.-To O. E., March 23, page 200.-An alloy of parts of bismuth, 5 of lead, and 3 of tin melts at $212^{\circ}$ Fah. Bismuth parts, lead 1 , tin 1 , melts at $201^{\circ}$. Bismuth 5 parts, lead 3 , tin 2 , melts a
199.. By the addition of a little mercury, it becomies more fusible.-W. H. B., of Conn.

Brass Castings.-Query 27, March 30.-Make your sand a dry as it can be worked; do not pack it hard. Run your metal at a medi-
um heat, give what vent you can, pour your metal in one hole, and allow it to rise out of another.-O. K., of --.
having with Pumice Stone.-If G. P. and H. E. M. will first shave their faces clean, but not so close as to leave a sore face, then
get a piece of very small pored pumice stone, and use it frequently get a piece of very small pored pumice stone, and use it frequently
never allowing the beard to grow out, they will soon find it delightful shaving, keeping the beard always under the skin. This method of shav
ing has been in use in London for more than torty years.-A. D. C.
Fusible Alloy.-Rose's fusible metal contains lead 1 ounce, tin 1 ounce, bismuth 2 ounces, and meld at $200^{\circ}$ Fah. Lippowitz's fusible
metal is more expensive, and melts at $140^{\circ}$ Fah. It is composed of cad mium, 3 ounces, tin 4 ounces, lead 8 ounces, bismuth 15 ounces.-J. s . of N. Y.
Driving Elevator.-To C. W. W., query 9, page 233.-I have repeatedly driven elevators from the bottom with perfect success,
having elevated 3,000 bushels per hour. I place the upper pulley in yoke raised by weights to give the necessary tension.-G. W. P., of N. Y
 are made of sweet unfermented cider boiled in sugar to the consistency
of jelly, flavored and colored to taste. The boiling point can be ascer of jelly, flavored and colored to taste. The boiling point can be ascer
tained by frequently taking out a few drops of the article and cooling in a saucer or tin plate. Grind or crush your apples and press out the
juice, add $31 / 2$ pounds of sugar to each gallon of cider, boil and strain hrough jelly bags. Flavor with the fruit the jelly of which you wish to imitate.-J.D. T., of Cal.
Test for Nitric Acid.-To P. C. H., query 19, March 9.The best test for nitric acid is as follows: Put a few copper filings into the suspected article, and boilit
red fumes.-J. D. T., of Cal.
Test for Lead in Water.-To F. C., query 24, March 9.On adding a solution of sulphuretted hydrogen gas to water containing lead in solution, the water turns brown or black according to the quan tity of lead in the water.-J. D. T., of Cal.
To Prevent Cider from Freizing.-To J. D. R., query 15, March 9.-There is nothing which you can put into cider to prevent it from freezing but alcohol; and a sufficient quantity of this would render
your cider too intoxicating and unpalatable to be drinkable. The best your cider too intoxicating and unpalatable to be drinkable. The best
way to prevent its freezing is to keep it in a cellar or bury it.-J. D. T., your cid
way to $p$
of Cal.

Preserving Natural Flowerg.-Take some fine sand wash it well and sift; mix thoroughly with a little stearin. Dry the sand all over them, so lightly that the leaves will not be injured, till they re completely imbedded. Expose the vessel and its contents to a heat until they are dried; they will then retain their shape and color. This method is not so successful with flowers of which the petals are thick and contain mu
cies.-G. H., of Mo.
Vacuum in Casks.--To J. A. P., query 6, page 233.-The weight of the atmosphere is more than sufficient to keep the liquid in a
cask, but the cohesion of the particles of fluid, when presenting considerable area, is not sufficient to overcome their own weight as against the effort of the air to enter. Fill a goblet with water, and place carefully over it a piece of the finest tissue paper, and then invert and you will find
that the pressure of the atmosphere will keep the water in. The colesio that the pressure of the atmosphere will keep the water nn. The conesion
of the particles of the paper seems to be enough to aid the particles of of the particles of the paper seems to be enoug
the water to maintain theirs.-E. H. H., of Mass.
Varnisif for Viouins.-J. D., query 7, page 233, may use shellac dissolved in alcohol, and add a little gum elen it E. H. H., of Mass.

Gold Solution.-F. M., query 10, page 233.-To a dram of solution of terchloride of gold add two ounces of ether and shake toge-
ther. Polished steel articles immersed in this clear liquor will become ther. Polished steel articles immersed in this clea
covered with a fine film of gold.-E. H. H., of Mass.
Preparation of Indigo.-To D. C.,query 11, page 233.-Sulphate of indigo or chemic is prepared in the following way: The indigo is $150^{\circ}$ Fah. For each pound of indigo, six pounds of highly concentrated sul. phuric acid are put into a large jar or earthen pot furnished with a cover. This is kept as dry as possible, and the indigo is added gradually in small quantities. The vessel is kept closely covered, and care taken that the heat of the solution does not exceed $2122^{\circ}$ Fah., but the heat must be kept at about $150^{\circ}$ Fah., and allowed to stand, stirring it occasionally for forty-
eight hours. If neutralized extract is wanted, the extract is put in eight hours. If neutralized extract is wanted, the extract is put in ho
water and well stirred, and a quantity of powdered chalk added untilthe acidis is exactly neutralized; this is a nice operation and requires great
care. Some dyers use carbonated alkalies to neutralize their acid. The care. Some dyers use carbonated alkalies to neutralize their acid. The
sulphate of indigo of coinmerce is much better than that prepared by the sulphate of indigo of coinm erce is much better thanthat prepared by the
dyer.-S. W. S., of N. Y.

Dyeing Prussian Blue.-To S. W. o., query, $\mathrm{k}_{5}$, page 249.-Nitrate of iron is used as a mordant on cotton, and is prepared a $22^{\circ}$ Baumé and five pounds water in a stone pot, hoop iron or wrough $22^{\circ}$ Baume, and, five pounds water in a stone pot; hoop iron or wrought
fron chips are added slowly. When all the iron is dissolved, add slowl five pounds copperas. Old undissolved iron ought never to be left in Fifty pounds of well boiled cotton are passed through a cold solution of four pounds nitrate of iron and six ounces of tin crystals. Give fiv turns, then take it to another bath of three pounds yellow prussiate o
potash and one pound sulphuric acid ; give it five turns in this, take it out again, pass back into the iron bath, and thence back into the prus siate bath, and so on until the required shade is reached. Rinse well be fore drying. -s. W. s., of N. Y.
Dyting Green on Cotton.-Color twenty-five pounds of yarn with Prussian blue as above, but use more tin crystals. Rinse well,
then boil ten pounds citron bark, strain it into a suitable tub, and ad then boil ten pounds citron bark, strain it into a suitable tub, and add five pounds of allum. Enter at about $170^{\circ}$ Fah., and handle for half an
hour. Boiling will spoil it.-S. W. S., of N. Y. Preparing Skeleton.-If G. L. F., query 10, page 200, will cut all the soft parts from his subject, remove the sternum at its junction
with the ribs, and dislocate the large joints, put all in a watertight barrel with the ribs, and dislocate the large joints, put all in a watertight barre (changing watch it lest the cartilage be destroyed, or place his barrel in a ning brook for two or three months in summer, he will have as nice and clean a skeleton as he can desire. If he uses any chemicals other tha ether, he will certainly destroy his skeleton.-Ex., of Mo.
Worcestershire Sauce.-Take the walnuts when you can stick a pin through them and rinse them well; put a layer of them in
stone jar free from grease. Sprinkle each layer with salt until the jar ia filled, cover, and let it stand five days. Strain off the juice after pound ing the walnuts. To every gallon of juice add one pint of onions and on clove of garic, each chopped fine, one ounce each of allspice, ginge
cloves, black pepper (all to be ground), a nutmeg grated two best cayenne pepper, and two quarts of the best cider vinegar. Put the mixture in a preserve kettle and set it on the fire ; let it boil until reduced one third. When cool, bettle and cork tight. Age improves it.-S. E. M. Breaking of Cast Iron Pulleys.-- -, page 185, is altogether in the dark, and so was C. M. R. in supposing the piece, broken
from his pulley, was too long to allow of its being replaced. The rim of from his pulley, was too long to allow of its being replaced. The rim of
the pulley was thinner than the arms and center; hence, when cast, the the pulley was thinner than the arms and center; hence, when cast, the
rim cooled first and set, while the arms and center continued to cool and
contract, which caused the arms, being curved, to spring outwards with contract, which caused the arms, being curved, to spring outwards wit
a tendency to draw the rim inwards at the points of their connection and when the arch of the circle was broken, the strain was relieved and
all parts assumed their natural position; which movement shortened the all parts assumed their natural position; which movement shortened the diameter of the pulley equal to the formerspring of the arms, and length ened the whole rim in proportion to its divergence from the true befor
it was broken. 世encethe opening fron whence the piece was taken was made shorter.-C. H. J., of N. Y.
Fusible Metal.-To O. E., query 14, page 200.-An alloy of bismutt2 2 parts, lead 1 part, tin 1 part, melts at $201^{\circ} \mathrm{Fab}$. The addition of lead and tin, it will resist a higher temperature. I have found that the same alloy under the same tension would part at different temperatures, a fact which is unaccountable to me. The metal is very unreliable, under tension, torsion, or compression. If your correspondent 0 . E., in
his experiments, produces any satisfactory results, I should be pleased to know it, as it might be for his advantage as well as mine.-G. M. H.,
to of N. Y.
balancing Gang Saw Mir:Ls.-To E. F. J., query No. 18, page 154.-Attach two crlinders, with heads in the upper ends, sixteen
inches in diameter, one to each side of the gang saw frame, so that the pressure of the atmosphere on the under side of the piston heads would sustain all the weight of the saw frame and its attachments. A vacuum
will be formed above them by the descent of the heads, and all should be made on the top of each cylinder head to permit the air that should be made on the top of each cyl
might get into it to escape.-J. C., of 0 .
Packivg Rings.-Query 31, page 169.-D. \& N. are in
formed that brass is one of the best packings in use. The rings should be formed that brass is one of the best packings in use. The rings should be the outside ones. This is to prevent the rings from moving round so as to bring the open spaces together.-J. C., of O.

## NEW BOOKS AND PUBLICATIONS.

The Rival Collection. J. W. Schermerhorn \& Co., New York.
This is a handsome volume of 500 pages, containing pieces, serious and ditor, Martin Larkin, and consist of extracts from the choicest writings of thors. It is a book that should have extenive sale
The American Historical Record. Édited by Benjamin J. Lossing. Published by Chase \& Town, Philadelphia The april numb
The April number is full of interest. Among other entertaining things,
we find a variety of autograph letters from La fayette, Cornwallis, Dart we find a variety of autograph letters from La fayette, Cornwallis, Dart-
mouth, Rochambeau, Ge eral Pigot, and others. A chapter on the " Early mouth, Rochambeau, Ge eral Pigot, and others. A chapter on the "Early
History of American Wood Engraving " is given, with a fac simile of one of the earliest engravings-a portrait of Washington. It was a rough picture.
We regard "The Historical Record" as one of the most useful periodicals er regard "The Historical Record" as one of the most useful periodicals of the day. Its pages abound with entertaining facts and curious details.
Concerning the early condition of our country and the personages who đgured in its history, it supplies very valuable information. Standard his-
tories are neoessarily conflined to general statements; but the peculiar misIgured in its history, it supplies very valuable information. Standard his-
tories are neoessarily confined to general statements; but the peculiar mission of "The Historical Record" is to give us the par
does in the most interesting manner. It is ably edited.
Appendix to the Fifth Edition of Dana's Mineralogy. By George J. Brush, Professor of Mineralogy in the
Sheffield Scientific School of Yale College. New York: John Wiley \& Son, 15 Astor Place.
This is one of a series of appendices to be published from time to time to supplement the original work. The present one includes descriptions of
eighty-seven minerals announced as new, and some important facts relative eighty-seven minerals announced as new, and some important facts relative
to others, the whole being arranged in alphabetical order for easy reference.
We are in receipt, from Mr. Francis A. Walker, Superintendent of the
Census, of a copy of Statistics of the Population of the United Census, of a copy of STatistics of the Population of the United
States, as determined by the Ninth Census, and also of the Statistics of States, as determined by the Ninth Census, and
Wealth, Taxation, and Public Indebtedness.

## Inventions Patented in England by Americans

[Compiled from the Commissioners of Patents' Journal.]
From March 22 to March 28, 1872, inclusive
air brase. -G. Westinghouse, Jr. of Pittsburgh, Pa.), London, England. Artificial stone.-F. Ransome, London, England, E.
Francisco, Cla.
Conbination Lock, etc.-T. J. Sullivan, Albany, N. Y.
Compination Lock, etc.-T. J. Suliivan, albany, N. Y.
Composition Bearing.-S. Croll, R.T.Barrett, E T.Plush, Philadelphia,Pa. Converting Motion.-R. M. Fryer, Nashville, Tenn.
Elevator.-A. M. Patrick, Long Lane, Mo
Elevator.-A. M. Patrick, Long Lane, Mo.
Fire Extinguisher.-W. L. Ellsworth, Br
Freezer - J. Tingley, Philadelphin, P, Brooklyn, N. Y
Freezer.-J. Tingley, Philadelphio,
Looy.-J. Shinn, Philadelphia, Pa.
Mrchanical Movement:-A. B. Hendry, A. W. Webster, Ahaspnia, Conn
Preventing Corrosion.-G. H. Smith (of New York city), Londou, Eng.
Retort Jontr.-J. R. Floyd, ©. F. Dieterich, , S. Sclüssler, New York city.
STEAM STREET CAR,-E, Lamm, New Orleans, La.

Zecent Smexian and foreigy equents. Under thus heading we snaul pubbish
nent home and foreuan vatents.

Extension Lathe Caritirb.-William A. Lorenz, of Newark, N. J.This improved extension carrier for securing work to the face plate of a combination of two bars, one of which has two holes formed through it to
receive the bodies of two screws, which serew into screw holes in the other coeceive the bodies of two sercews, which screw into screw holes in the other
rarto hold the work. The bars are arranged with their longer ends projectbarto hold the work. The bars are arranged with their longer ends project-
ing in opposite directions. In the longer ends of the bars are formed screw holes at right angles with the holes above named, to receive the screws by
which the carrier is secured to the face plate of the lathe. These screw which the carrier
pass throun siots in hece opposite sides of the face plate of the lathe, and
which are in line with each other and with the lathe center. When the carrier is used as a common extensioncarrier, a tuil is used, which is made with a long head to enter one of the slots in the tace plate, and thus carry the
work. When the carrier is used as an extension carrier on line lathe center long screws are used, which are passed through the slots in the face plate,
and are screwedinto the holes therein, so as to hoid the work back to the
 expanded and contracted, will always be in line with the lathe center. The
first and most important object of the carrier is is $i$ use as a tool for holding frrst and most important object of the carrier is iss use as a tool for holding
shafting and back to face plate of lathe by means of long scirews pass shatting and bace to race plate of athe by means of ong sciews pass-
ing trough slots of face plate, the shatt mean while resting on a steady
on rest at one end, and on the live center of lathe at the other. The lathe center is the governing center point. The screws are serewed up until they
just tighten the shaft on its center point. It is sclaimed to nevers spring out just tighten the shaft on its center point. It is claimed to never spring out
of center when held in this manner. In this position the screws act a tails to carry the shaft around. Drils or tools or suen machine shop practice, the
brought to bear upon end of shaft. In ordinary coumon dog istied with a string or belt lace back to the face plate, or a
clamp with bots (such as is used for holding wheels in boring lathes) is
cis put before the dog, and fastenen back to face plate against the dog by bolts.
pith
ches This extension carrier dispenses
ly and in a workmanlike manne.
Bridge.-John H. Diedrichs, of Richmond, Va.-The object of this inven tion is to produce a practical suspension truss for bridges, which shall be
economical in construction, durable, though light, and of graceful appear ance, and in which a greater proportion of strength may be derived from ance, and in which a greater proportion or strengss system now in use. The
given quantity of material than in any other trus
invention consists principally in a novel judicious distribution of the tie rods that conect the lower ends of the pendent posts with the top chord o
the bridge. These tie rods are applied in the following manner: From the the bridge. These tie rods are applied in the following manner: From the
lower end of each post project two tie rods in opposite directions, but at equal angles, one to the nearest buttress, the other to the top chord. This
will cause every post to be connected with but one buttress, except the middie post, which is united to both. At the upper ends only every alternate post is braced, provided the posts are all at equal distances apart from each
other, which is preferable. The top chord and posts may as well be made o wood as of metal. In the first case, the upper ends of the tie rods are se cured, where they join, to boxes placed upon the top chord. In the other
case, the connecting bolts may pass directly through the metallic top chord. Contraction and expansion by cold and heat cannot injure or strain the parts of this bridge, as the tie rods projecting from each post are of equal length.
A lateral shifting of the connecting pins is thereby made impossible from A lateral shifting of the connecting pins is thereby made impossible from
the above causes, which is an item of great importance, and an advantage of this system over most others now in use. The system recommends itself further on account of the equal thickness of the rods throughout for bridges
of a considerable length, only the rods projecting from the posts nearest of a considerable length, only the rods projecting from the posts neares
the middle may be made somewhatstronger. Other advantages are that by the proper distribution of tie rods the top chord is relieved from excessive
strain, and will, therefore, be more durable; that special bracing of panels, strain, and will, therefore, be more durable; that special bracing of panels,
etc., is unnecessary; and that the general appearance is harmonious and

Pump.-Samuel.M. Young and Philipp Brand,of Jacksonville, Ill.-A-glass
lining with tapered ends is inserted from the lower end of the barrel or lining with tapered ends is inserted from the lower end of the barrel o bular plug of wood or other suitable sibstance is inserted below, which fit and the barrel and the said tapered end. The upper ends of the barre wedges are similarly titted with the flaring shoulder of the bore. The plug may be tapered, if preterred. The bore of the lining and the wedge is the
same size as that of the barrel above the lining. This lining is employed for superior wearing qualities, and for the same reason a cylindrical glass
valve seat is used in the top of the joint of a pipe which connects with the vawer end of the barrel by being insulated in it. The pivot of the lever or handle is madesquare or of other angular shape in the part which fits in the lever, and round at the ends which are fitted in bearings o turn instead o
having the lever turn on it, which makes a very much more durable ar rangement, for the boxes and journals do not wear as fast as the lever whe the pivot, and the lever is prevented from vibrating laterally a much as when turning on the pivot. The cla
pumps, edge beveled and tastened by wedges.
Stricil Plate.-John McCullagh, of New York city.-This invention can be conveniently and quickly changed as may be desired. A top and bottom plate are hinged together. The bottom plate has cut therein as
many square holes as it is desired to have letters or figures. Around this plate, at such a distance from the edges of the holes as will leave a margin wide enough to fully support the edges of the letter plates, is formed a rib. The letter plates each contain a single letter or figure, and they are laid side by side. Upon the inner side of the side, ribs are formed, or to them are tions or stops to prevent the lateral movements of the letter patates. The
corners of the letter pates are notched to fit upon the stops. The top
plate, which is hinged at one of its side edges to the side edge of the bottom plate, is slotted longitudinally, the width of said slot corresponding with
the width of the holes in the bottom plate, and its length being equal to the
length of the series of holes in the said plate plate is actached, or upon it is formed, a rib at such a distance from its edges
that the rib will fit within the rib on the bottom and rest upon the edges o the letter plates, locking them securely in place. To the side ribs, at their lower inner edges, are attached, or upon them are formed, bars, the lowe so placed as to overlap and fit closely upon the adjacent edges of the letter each other, by buttons or other suitable fastenings. The two parts of th stencil plate may be struck up out of sheet metal, or they may be cast, as
may be desired or convenient. This is, we think, a very good and practical may be desired or convenient. This is, we think, a very good and prac
invention, as it will often save the use of many different stencil plates.

TUG Clip.-John B. Welpton, of Tabor, Iowa.-This improved hame tug
clip is so constructed as to allow it to be conveniently detached when desired for changing the hames or other purposes. The body or loop of the at right angles with a nolt, passes through the eyes of the loop. The
bolt is made with a head upon each end. The head upon the forward end i made oblong, and flaring upon two sides, and has a rabbet or shoulder
formed upon the third side to receive the end of a small spring attached to ormed upon the third side to receive the end of a small spring attached to
the arm or loop. Both the holes or eyes of the body or loop are made obong, so that the oblong head of the bolt may pass through them, and the head, so that the bolt cannot come out when in use. In the other head of the bolt is formed a slot or groove to receive a screw driver for turning the
bolt in inserting it and removing it. To remove the bolt, the point of some sharp pointed instrument is inserted beneath the free end of the spring,
which is raised slightly, and, at the same time, the bolt is turned one quarte around, the head of the bolt passing beneath the end of the spring, and thus passing out freely. In inserting the bolt, the forward head of the bolt is
passed through the holes or eyes of the loop or body until it rests against passed through the holes or eyes of the loop or body untilit rests against
the spring, when a slight pressure and a one quarter torn with a screw
driver brings it to its piace. The spring does not require to be very strong
as there is so strain upon it, its only office, when the clip is in use, being to beep the bolt from turning.
Loom Shuttle Actuating Mechaxism.-George V. Sheffeld and Walter
S. Horton, Providence, R. I.-This invention consists of the application of eam or air or otherwise actuated pistons, with long projecting rods, to th hthe of a loom, for carrying the bobbin through the shed, a carrier for th hen moved through the shed, and delivered to a holder or receiver read rthe rod on the other side, and the ends of the rodsbeing magnetized to insure the holding of the carrier as they move backward with it through the nd, in the place of the orditrary shuttle boxes, each of which has a pisto ith along rod projecting in the crosswise direction of the loom, and capa nough to leave space for the bobbin carrier to clear the warp. Each cylin der is also provided with a steam or air chest, induction and exhaust ports,
and a valve, by which to work the piston in the manner of ordinary steam nd a valve, by which to work the piston in the manner of ordinary steam
or air engines; and it is also provided with springs for cushioning the or air engines; and it is also provided with springs for cushioning the
piston at each end of the stroke. The valve will be shifted by any suitable ving part sal the lathe, the movement of the valve may be effected by the said pro ections coming against any fixed part of the loom. At each side of the warp threads, and under the positions where the carrier stops, is a block
ising slightly above the top of the lathe, withthe upper surface slightly de sing slightly above the top of the lathe, with the upper surface slightly de rom the upper surface and slightly converging toward the cylinders. The obbin carrier is received upon these blocks between the wings at the re urn of each rod, and the rod withdraws lightly, leaving the carrier ready
o pe taken by the opposite rod after the beat and a new stred fis been ormed, when said opposice rod comes through, enters the tube, secures th carrier by the action of its magnetized end, and carries it back to the oppo ind of friction devices like manner, ready for the next operation. An after the rod has been disconnected and while the lathe is beating up; or the magnetic attraction of the rod may be utilized for the purpose, the sep
aration of the rod from the carrier not being so great but thatthe magnetic ation of the rod from the carrier not being so great but that the magnetic

Fastening Key for Coffins.-John Homrighous, Royalton, Ohio. He object of this invention is to provide a substitute for screws, used a mey and annoyance may be saved. It consists in a key, ordinarily constructed so that it can be
urned like a thamb screw. The shank of the he (see accompanying engraving) passes through
the cover and enters the side or end of the comfin, he same as a common wood screw. One or more purs project from the side of the shank near its
end. These spurs are preferably flat and sharp ke the thread of a screw, so that when the ke is turned the spurs will draw the key down and
ighten the cover to the side, the same as would ghten the cover to the side, the same as would
e done by turning down a screw, a shoulder on he shank of the key giving the desired hold on
the cover. To apply the key, a hole is bore hrough the top or cover and in the side or end, of sufflcient size to admit the spurs. With the ole thusprepared, the key may be dropped into penetrate the wood and act trie same as a screw
hread to draw the parts of the coftin, box, or
ther article, together. The lowwer edge of the
 sharpened or made thin, so that it will readily penctrate the wood. Ordinarily, the spur or spurs will be placed so that the key would be turned
to the right to fasten, and to the left to unfasten. One fourth of a revoluon will do either. A great saving of time is thus effected, as compare ith the time required for driving screws with a screw driver. The sam nd other purposes. Those wishing to negotiate for the purchase of thi atent may address the inventor as above
Carbureter.-Horace Holton, of St. Louis, Mo.-The cylindrical shell o er, and the gasoline chamber. The air is to be for ced into the gasolin hamber and the mixers therein through a pipe by a water wheel consisting cycloidal buckets and an air chamber at one end, into the top of which to receive the air when so pressed in. The invention in this whe wa ir to receive the air when so pressed in. The invention in this wheel con y reason of their peculiar form and arrangement and the number used y about eight, more or less, to produce a regular and continuous pressur nd flow of air, which has heretofore been irregular in these machines by eason of the use of square shaped buckets or large capacity and few in ir is driven into a thin hollow cylindrical colun pecularimechanism the nters the gasoline in a diffused condition very favorable to the necessary union. An agitating wheel is constructed in the form of an overshot whee
and driven in the direction to carry the fluid over and let it tall again in and driven in the direction to carry the fluid over and let it tall again in ing manner as to agitate 1 very thoroughly. A combination of an agita perforated cylinder and pistoned gas hider, djacent chambers, constitute the claims allowed. The machine is drive a weight and a train of clock work.
SAWing Machine.-Safaryne W. Nyce, Blooming Grove, Pa.-The seve
ral devices and arrangements, which are claimed to constitute a very eflient and desirable machine, are a combination of saw shafts, provide esigned as a sawing machine for small shops, etc., where saws driven by esigned as a sawing machine for small shops, et
team, animal, or water power, are not available.
Hub for Carriage wheel.-Isaac E. Bower, Bainbridge, Ga.-The bo and principal portion of the hub is bored out to receive the nut and as ange around this part, against which an inner spoke plate bears. The main spoke plate is bored, or an opening is made in it to allow it to slip on
to the pincipal part, where ${ }^{t} t$ is securely held by a screw nut. The inner poke plate is securely faitened to the main spoke plate by bolts, and con ned between the principal part of the hub and the inner spoke plate lange. through which the fastening bolts pass. A nut of sufficient size cover the opening in the main spoke plate laps out on to it so as to hold Pipe Tonas.-James E Boat rench is of very simple construction, its moving jaw being arranged ide, and actuated by a lever and spring, while the fixed jaw is adjustable by lock. in which the stationary jaw of the pipe wrench is held by a screw. The movable jaw of the wrench is fitted in a recess provided at the elbo behind the jaw, has a projecting lug that bears against the back directly A spring is concealed within a cavity of the block, and bears against the face of a stud which projects from the jaw. The spring has the tendency to crowd the jaw against the lever and to open the tongs, while the le
used to bring the jaws together for clamping the pipe between them. east very frequently; and when low or dirty stock is used. the doffer soo thus necessitating cleaning of the doffer several times a day. This of course ccasions a stoppage in production, and entails much loss. The invento the doffer for cleaning it for several weeks at a time, as it is cleaned by th

Fireproof Building.-Joseph J. Bartlett New York city.-This inven position containing asbestos when applied to a metallic framework in heets or sections of suitable extent. The invention alsu consists in the esuliar arrangement of the metalic framework, altough the invento e main invention is the construction of a fireproof building of metal and roof to all practical intents, and, therefore, it is claimed, best adapted hen in combination, to the purposes specified.
Hoe.-John S. Carroll, Covington, Ga., assignor to himself and J. W. tton and for other purposes, claimed to be better adapted to the purpose han hoes of ordinary construction. It consists in the construction of the lade, a handle is fastened to the blade by a ring and key in a very novel manner, he invention is in every
Clipping Machine.-James W. Moyer, Cooperstown, N. Y.-This is an improvement upon that class of horse clippers in which air power is
employed, either upon the compressive or exhaustive principle. Pumps of ny suitable kind, or any equivalent thereof,for impelling the air, with con ducting tubes of flexible character, air chambers, and flexible diaphragms
cor actuating the movable cutter bar are used, said bar being connected to e said diaphragm in any suitable way to be moved by them as they ar noved by the air, the said apparatus being either doubie or single acting, the alternate action of air forced against one side, and the action of the e arranged in the handte when the frst side is reheved rom pressure didy of the animal, while the pumps or other impelling apparatus may be

Belt Tightener.-Homer C. Allyn, Fall village, Ct.-The in
ention consists in providing the single bearing which holds the fly whee shaft of a sewing or other small machine with means for quick and easy ad
justment, whereby the belt which drives the mechanism may be tightened hen it is de
Apparatus for Transporting Vessels over Bars.-John E. Worth
man, Mobile, Ala.-This invention relates to a floating apparatus designed or taking in vessels, without unloading, and transporting them over bars, hallows, etc., where there
vessel to pass when loaded.
boring Machine.-Jacob Gardner, Bigler, Pa.-The invention con sists in a boring machine in which posts or rake heads, having different bored without any but a single and momentary change. In miscellaneous work, it must necessarily be a great saver of labor
Machine for boring Hubs and Tenoning Spokes.-Jacob Gardner ingler, Pa.-This invention relates in part to a machine for borin which receive the butts of the spokes, the invention comprising, under this head, a device for placing the hubs at such an inclination from the perpen-
dicular while they are beirg bored as may serve to produce holes sufficientinclined to the axes of the hubs to give the spokes, when placed in suc oles, the requisite "dish" or slant. The invention also relates to a ma evice for clamping the spokes while the tenons are being formed on them. Cotton Chopper and Cultivator.-James M. Harcrow, Marshal, Texas.-This invention relates to a machine by which a row of
otton plants is barred off on both sides, chopped, and dirted all at the

Corn Planter.-Morriss Schnapp and Wm. J. Hollis, Dewitt, M and droping of an ordinary shovel plow or cultivator from which they can be readily deached when desired.
Washing Machine.-Mrs. Sarah Mundy, (administratrix of James H This improved washing machine is claimed to doits work quickly and thor ughly, whether few or many clothes be operated upon, and not to injure of various farts by which stationary and movable rubbers act upon th clothes so that they will be completely turned over as they pass from th higher to the lower parts of the rubbers, and all their parts will be com letely cleaned.
o Watertown, Wisconsin.-This invention relats, - anarles W. Chappel Watertown, Wisconsin.-This invention relates to an improved lock fo
olding or sliding doors; and consists in a new arrangement of swinging atch and mechanism for locking the same by a spring bolt, and unlocking if from the outside by means of an eccentric and from the inside by a lever.
swinging latch arranged in combination with a spring bolt, rib, lever and ccentric, arranged to operate in a peculiar manner, are claimed, the com Combined Splice and Safety Hook for Ladders.-John Edmunds, e
South Adams, Mass.-This is a device for splicing ladders, and for adaptin an ordinary ladder for use as a root ladder. Two or more ordinary ladder about the construction of which there is nothing new, may be used. A b
of iron, the upper end of which is bent forward to form a hook, is employ catch upon the ridge of a building when the ladder is to be used as a roo upon a round of the ladder. The middle part of the bar is slotted longitu dinally, to receive the shank of a second hook so, that the latter can be moved toward or from the first hook; according as the rounds of the ladde is tightened upon the round of the ladder by a hand nut, screwed upon it ank upon the other side of the bar. Upon the other side of the lower pa dhook, to receive of the upper ladder. The shank of this hook passes through the slot in the
ar, and is secured in place, when adjusted, by a hand nut, according as the ounds of the ladder may be further apart or closer together

Monry Pookzt won Gansicxiss.-Ernest Schnopp, of East New York, N,
Y. -This is a new combination of pocket books with articles of wearing pparel, consisting in the direct application of such books to the garment as pockets, thereby providing the neeessary divisions, etc., without re airing the carrying of a separate receptacle. The pocket book is applied becket to an article of wearing apparel for either ladies or gentlemen pocket, and closed by a flap, which is also covered with the fabric const uting the garment. The interior of the pocket book is of suitable con
truction, also the snap or lock whereby the same is closed.

Plow.-Samuel A. Fanning, Jacksonville, Ill.-This invention furnishe n improved riding plow, claimed to be simple, convenient, and effective The features or the invention embraced in the patent are a roller, arrange pulverize the furrow slice as soon as turned over, also a bar pivoted to the elo of plow, and notched so as to fasten over a bar on the rear of the plow
rame, to give steadiness and firmness to the plow, and to aid it in resisting irame, to gi
side draft.
Sast Holder.-William W. Amos, Olathe, Kansas.-This invention fur and not liable to get out of order, and which will hold the sash securely applied to any sash and will not ar when down, and which may be readily box, rubber rollers, ratchet wheels, spring pawl bar, and spring or spring also a combination, with the spring box, of an extension or flange, carrying
the spring and fastening bolt, constitute the claims embraced in the patent

Washing Machine. - Grove M. Hall and Lawrence White, of Orford,
Iowa. - This invention has for its object to improve the construction of washing machine for which letters patent were granted February 21, 1871. By this new arrangement of the parts of the machine, the space for the clothes is brought furward into a much more conveni ent position, and, at the same time, the machine is adapted to receive a wringer, so that the
clothes may be wrung directly from the box. The power is also applied to clothes may be wrung directly from the box. The power is also applied to
the beater more direatly and more advantageously. The clothes are pressed and slightly rubbed, and, as they are released by the rearward movement of the beater. fall back into the water, turn partly over, and change their places, so as to always present different parts to the faces of the beater and washboard
Furnace Grate Bar.-William Mellor, of Paterson, N. J.-The main or upper portion of this grate bar is an open tube from end to end. A rib is
attached to the under side of this tube. There are openings from the top of the bar into the tubular opening, also openings on the under side on each side of the rib into the tubular opening. Recesses in the sides of the bar form full openings through the grate when the bars are placed side by side to form the grate of the furnace. These grate bars are so placed or arranged on their bearers at each end that the air has a free circulation from one
one end to the other, and they may be connected with an air chamber at their front ends, so that, when a blower is used, air may be forced into the chamber and grate bars and distributed through the side openings, not only to increase the combustion of the fuel, but to preserve the bar from the effects of intense heat. The ordinary or natural draught of the furnace operates in the same ma
power of the draught.
Extension Table Slide.-Samuel R. Garner, of Independence, Iowa.The object of this invention is to simplify and render more strong and durable the slides or adjustable rails of extension tables. In an extension rail composed of three or more sections, the two outside sections are provided with dagonal or angur grooves, ane mind description of grooves in both its sides. The grooves are made in pairs, and
are uniform as regards their depth, angle, and distance from each other Lips of clasps enter the grooves and slide therein, and thus form the connection between the sectio s . The outer sections of the rail are connected with the legs of the table by tenons. Loose strips in the grooves limit the movement of the sliding sections. The clasps at the ends of the sections
serve to strengthen those parts and prevent the ends from splitting. The center or middle section is stationary, and while the parts aresecurely held held together by the clasps, the other sections are drawn out and the table extended, as may be तesired
Plow.-James M. and Geo. W. Moyers, Gordonsville, Va. - This inven tion relates to certain improvements in the construction of the moldioord land side, slide or wheel, point and share of $\Omega$ plow, all tending toward in-
creased simplicity and strength in the machine.

## [OFFICIAL.]

## Index of Inventions

For which Letters Patent of the United States were granted
for the week ending April 16, 1872, and each bearing that date.
Animal matters, apparatus for rendering, M. J. Stein................. Axle skein, reversible, A. F. Smith.
Bag tie, J. W. H. Doubler.
Baling cotton, etc., B. W. Collier
Baling short cut hay or straw, C.
Barges, construction of, A. Snyder
Barrel head, C. W. Saladee........
Basket, reticule wicker. J. Venet
Bayonet, spade, Chilling worth and Merrill
Bed bottom, D. E. Bishop
Bee hive, H. K. Wilson
Bee hive, C. s. Newsom
Bell, alarm donr, Gerhardt and Lande
Beit tightener, H. C. Allyn.
Berth, ship's, J. Evans.......
Boats, etc., steering device f,r canal, E. and J. McCreary
Bobbin winder, E. Wilder..
Boiler, horizontal flue steam, B. .... Wood
Boilers, safety plug for steam, J. R. Robinso
Boiler tubes, plug tor leaky,
Boot, lady's, D. H. Murphy
Boot and shoe, T. W. Brown.
Boring machine, J. Gardner...
Boring machine, J. L. Metcalf
Boring hubs and tenoning spokes, machine for, J. Gardne
Bricks, etc., kiln for burning, A. Morand.
Buggy body, C. P. Kimball.
Burner, regulator for gas, I. and A. Herzberg
Button hole cutter, gage for, G. Stackpole,
Caps, machine for lining percussion, A. J. French
Car, brake, J. Darling.....
Car coupling, J. B. Shelly
Car ventilator, W. C. Stickney .............
Cars, door latch for railroad, C. Graham
Carpet beater, J. Hothersall.
Carriage wheels, hub for, Dump and Moore
Carriage, top prop for, D. M. Valentine
Carriages, top prop for, A. Aradley, (reissue)
Cartridge, metallic, I. M. Milbank.
Chair, rocking, c. Streit.
Chair, spittoon, A. Quirol
Churn, R. Carmack.....................
Cigar machine, J. L. Weatherhead
Clamp, rope, T. J. and G. M. Clark
Clod fender, R. T. Gillespie..
oth shearing machines, guiding apparatus for, L. M. Collins
Cock. lock, $\mathbf{H}$. Essex.
Cock and faucet, valve, A. Crossley
Collar and muff combined, M. Wannaga
Collar and cuff, paper, H,
Cooler, beer, R. Dreher
Cotton chopper and cultivator, J. M. Harcro
Cultivator, R M. Melton, (reissue)
ultivator, J. Wood.
ultivator, G. E. Hutchinson
Curbing tor streets, D. Herr.
Cutter heads, molding, D. Stanley.
Dryer, fruit, Stevens'and Gray
Earth closet. J, A. August........................
Embalming birds, S. A. Morey
ngine, compound, A. Morey
Engine, oscillating, J. w. Van Sant
Engine, rotary, G. B. Massey
Engine, steam, A. T. Nichols.....................................
Engen operated by heated liquid, . . Bald win, (reissue).
Engines, valve gear for steam, Tifft and Love...............

Envelope, c. Crowell.
Fare box, c. Newman.... Felly plates, die for forming, F. B. Morse ence, W. P. Rollo..

## Fence, E. Fales.

Fire arrester, G. W. Coo
Fire arms, breech loading, A. E. Whitmo
Fire arm, breech loading, I. M. Mibank
Flour bolt stand for testhg, . Lehn
Flour bolt, I. B. Lewis................
Fuel, manufacture of, D. E. Breinig
Furnace door way, st
Game, J. M. Fletcher.
Gas works. dip pipes in hy draulic mains for, J. Hannan
Gage, J. A. Marden..................................
Gold and other metals from ores, reducing and separating, C. M. Ne Glue pot, T. C. Howes..
Hame, C. D. and R. Hazard
Harness, spring loop for, A. M. Osborn, (reissue)
Harvester, H. Wells..
Harvester, J. P. Manny
Harvester, J. P. Humphreys
Harvester rake, J. Seibel
Harvester rake, H. W.
Harvester rake, H. Wells...
Harvester rake, J. P. Mann
Harvester, steam, R. C. Parvi
Heater, gas. G. Smith.
Hinge for tables, M. C. Brinser.

Horses, mode of harnessing, J. Murray, Jr
Jack, lifting, J. s. Bodge
Ladder, step, M. N. Lovell
Ladder, step, w. J. Emens
Lamp, W. Staehlen
Lamp burner, S. W.
Lamp burner, S. W. Fowler.
Lamp bracket and reflector, E
Lamps, glass globe or reservoir Boesch..
Lanterns and lamps, glass for, M. V. B. Shaver
Latch, locking knob, F. Hegner......
Lock, seal for, F. W. Brooks, (reissue)
Lock, permutation. J. Farrel...
Lubricator for steam e
Match, parlor, F. Zaiss
Mattress, life preserving
Meat cutter, I. Siegrist
Meat cutter, I. Siegrist..........
Medical ccmpound, M. Connell
Meter, liquid, H . C. Sergeant.
Meter, liquid, , De Navarro and Sergeant.
Meter, water, De Navarro and Sergeant.
Miler, , water, De Navarro and
Minding, Crease....
Mirror, hand, W. M. Wellin
Mirror, hand, W. M. Welling. Wental, W. M. Davis.
Mitering machine, H.. G., W., and A. D. Malin
Moldings, machine for making metallic, B. K. Pric
Motion, machine for transmitting, C. P. Grout
Nall, picture, J. Uster
Net, fly, Cantner and Zeigler..
Oil can, portable, c. J. Hauck
Organ, G. Woods..
Ores, reducing and separating gold and other metal from, c. M. Nes Packing. piston, J. H. Teal
Pail, C. W. Bartlett.
Pail, garbage and slo, c. T. T. Voss
Paper fastener, J. C. Jensen.......
Paper pulp, process for bleaching, J. Campbell
Pavements and foundation for same, composition, G. H. Moore Pavements, forming blocks for, G. L. Eagan.. Pillow anc bolster, T. S. Sperry..
Planter, corn, Schnapp and Hollis
Planter, corn, schnapp and
Planter, potato, J. L. True....
Plostering, corner bead for, E. F. Rice.
Plated articles, nickel. Whitman and Neal.
Press, baling, w. R. King .
Printing press,
Printing, inking apparatus for color, L. .........................
ump, has
Pump, vacuum, C. F. Leopold...
Rag washing cylinder, Hammond and Foster
Railway rail splice, W. C. Gould
Roofs, fastening sheet metals to
Roofs, fastening sheet metals to, A. Johnson, (reissue)...............................................
Rubber, vulcanizing, Walker and McBurney.
Rubber rolls, manutacture of India, W. Cable
Saddle, harness, S. E. Tompkins.
Sail hank, D. G. Low.
Salt brine, evaporating, G. E. Sellers
Sash holder, P. Conver
Sawmill, Reinnart and Houghton
Sawmills, head block for, H. C. McEwen
Sawing staves. machine for, N. J. Temple
Separator for ores, grain, etc., L. Duvall.
Sewing machine, Gordon and Kine
Sewing machine, E. Waterbury
Sewing machine, E. A. Weeks.
Sewing machine attachment, support for, P. Grosfeld
Sewing machines, hemmer for, A. Moorehouse......................
Sewing machines. uck creasing attachment for. S. P. Babcock.
Sewing machines. luck creasing anders, tool for adjusting balance, J. Ingram.
slates, implement for ruling F . Soehner
Sleigh junner, B. F. Watson.
Sleigh'rnoners, attaching shoes to, Budd and Daved.
Soap, apparatus tor mixing, H. N. Humiston.
Solder, manufacture ot rod, F. Deming.......
Speed in machinery, device for changing, w. Heckert
Speed and reversing motion, device for changing, w. Hecker
Spindle bearing, etc., for spinning machines, F. H. Perry...
Spinnino machines, drawing and twisting head for, T. Nutting.
pinning machines, as.
Spring, pneumatic, M. F. Maury
Stamp, hand, E. D. Chamberlain...
Stone, mode of cutting, A. S. Gear
Stone, mode of cutting, A. s. Ge
Strap machine, A. F. Stowe.....
Straw cutter, T. E. Marable
Sugar, centrifugal machine for draining, J. Cottle
Table, revolving extension, F. Menze
Telegraph pole, A. H. Trego.
Telegraph pole, metallic, F. B
Telegraph pole, metallic, F. Boy
Thill coupling, C. S. Sanford
hill coupling, C. s. Sanford....
Tongue support, B. Nunamacker
Trunk guard, F. Peterson

Tweers, A. Warren Vehicles, spring for, R. Dudley....................
Vehicles, umbrella holder for, H. W. Pettibone
Venctilat Ventilator for windows, G. W. Pell Vessels, lighter for, J. E. Worthman Wagon body, Sommer and whitmire............. Warping machines, stop motion for, F. H. Perry
Washing machines, cylinder for, W. J. Dodge
Watches, implement for regulating, L. Walldor Water closet, W. J. Warren..
Water wheel, J. A. Fairban
Water wheel, J. C. Clime
Water cut off, rain, T. Lee
Water cut off, rain, T. Lee................................................... 125, 1242
Windmill, E. C. and E. D. Little
Windmill, E. C. and E. D. Little.............................................................125,821
Window frame, F. McStocker.........
Whe.
Wrench, R. S. Sanborn...
Wrench, wagon. R. J. North...............................................................1255753
Yarns, machine for doubling and twisting, F. H. Perry............. 125,88
DESIGNS PATENTED.
5.767.-Carpet.-T. Barclay, Lowell, Mass.

5,768.-Carpet.-M. Blatchford, Halifax, England
5,769.-Breastrin.-A. V. Bock, Chicago, Ill.
5,770.-Carpet.- J. H. Bromley, Philadelphia
5,771.-Carpet.-R. R. Campbell, Lowell, Mass.

5,776.-STEAM ENGINE.-C. M. Farrar, Buffa
5,777.-BADGR.-M. Fecly, Providence, R. I.
578 to
5.781.-CARPETS.- J. Fisher, Enfeld
5,782. - Carpet.-O. Heingke, New York city.
5,783.-SHAWL FABRIC.-J. Hodgson, Philadelphia, Pa.
5784 to 5,786.-CARPETs.-H. Horan, Newark, N. J.
5,784 to 5,786.-Carpers.-H. Horan, Newark, N.
5,887.-CARPET.-L. Jullien, Passy. France.
5,787.-Carpet.-L. Jullien, Passy. France.
5,788.-Ca
5,789 and 5,793.-CARPETs.-A. McCallum, Halifax, England.
5,794.-Ca rpet.-D. McNair, Lowell, Mass.
5,795 and 5,796.-CArpers.-E. J. Ney, New York city.
,797.-Carpet.-J. J. Patchett, Halifax, England. .
5,803.-Carpet.-H. Robinson, Halifax, England.
5,804.-Carpet.-J. H. Smith, Enfield, Conn.
5,805.-InKstand.-L. L. Tower, Somerville, Mass.
5,806.-FLower Pot.-G. P. Palmer, Boston, Mass.
TRADE MARKS REGISTERED.

## 765.-Suspended.

766.-Boot Tops.-C. H. Colburn, Milford, Mass.
767.-CHEwing Tobacco.-A. Gillender \& Co., New York city
768.-Starch.-T. Kingsford \& Son, Oswego, N. Y.
769.-White Lead. - R. Lewenthal \& Co., New York
769.-White Lead.-R. Lewen
770 .-Soap. -J. Oakley, New York city., New York city
770.-Soasp.-J. Oakley, New York city.
771.-AxLe OiL.-C. C. Richmond, Boston, Mass.
772.- Lubrictiting Oil.-The Galena Oil Works, Franklin, Pa.
773.- Mowing, Reapivg, A ND Harvesting Tools.-The Greenwoods
Scythe Company, New Hartford, Conn.
774.-Corn KNiFE.-The Green woods Scythe Co., New Hartford, Conn.
775.-PERFUMERY, Drugs, AND MrDicines._W. A. Weed \& Co., Cnica
$\substack{\text { Tis.- Perrfumery, Drugs, and Mzdicines.-W. A. Weed \& Co., Cnicago } \\ \text { Ill. }}$

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APPLICATIONS FOR EXTENSIONS
Applications have been duly flled, and are now pending, for the extension are appointed for the days hereinafter mentioned:
20,775.-Sewing Machine.-R. Blake. June 19, 1872.
20,923.-Machine for Clemaing Grain.-W. H. Orr. June $26,1872$. 21,004.-Machine for Piling Paper.-J. c. Kneeland. July 10, 1872 EXTENSIONS GRANTED.
19,855.-ICe Pitcher.-E. Kaufmann.
19,824.-Sirup Apparatus for Sopa Water.-

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