

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


## THE DAYTON CAM PUMP.

Our engraving represents an improved direct and double acting steam piston pump, which, it is claimed, is absolutely positive in its action, simple in construction, and economical in the use of steam. The principal feature is the mode of working the steam valre by means of a cam bolted on the piston rcd and moving with it. By the shape of this cam the stroke is rendered slower at each end, thereby giving ime for the water colinder to fill. A full stream is thusin sured, and the pump is prevented from cushioning against sured, and the pump is prevented from cushioning against the water when the cyli
ment is euch that the ment is such that the valve cancot be thrown into such a position as to shut off steam and stop the pump. The operation of the mechanism needs no further description, as the reader will readily un. derstand the adaptation of the vaiouspart to each other from an inpection of the annexed illuatration. It will be seen that there ale no dead centers and tbat the action is absolutely positive. The arrangement of the cam movement, in counection with the piston, causes he water valves to lift and to set easily and without jar, thereby saving the wear and tear of valves and seats. The maximum of speed is attaiked when the valves are lifted and the water is flowing.
The manufacturers, in enumerating the various advantages of the apparatue, point outespecially the simplicity of its construction, strong and durable material being uped, and tbe various parts 80 constructed as to be readily accessible. There are no small|over four competing pumps at the Cincinnati Industrial intricate steam paseages to fill up with dirt and grease, and Exposition, 1873. For supplying tanks at railway stathe water valve chambers may be earily opened to reach the valves. The steam valve, being of the plain slide description, is also not liable to become out of order.
Tbe pump, it is stated, will start at any part of the stroke, discharging the condenced water, and will lift either hot or cold water єqually well, without change of valves. It can be
used as a boiler feeder, or a fire and marine pump combined, and, it is claimed, will pump water at a temperature of $211^{\circ}$. Either water or steam pressure may be used as a motive power ; a No. 2 boilt $r$ feeder, $i_{v}$ is stated, has run at 25 double trokes per minute with only 20 lbs. water pressure. The team cylinders are fitted with a patent mstallic epring packng, and the water cylinders with a packing of linen rubber. The boiler feeders are well adapted for forcing water uner great pressure or to a high elevation. One pump of this description, the manufacturers state, fed water at $210^{\circ}$, from a heater, against 80 lbs . boiler pressure, and gained a medal
ted and thore above described as boiler fecders, is tbat the steam cylinders are much smaller, as it requires less pressure o do the work.
A clafs of low preseure pumps is also manufactured, which can be used in connection with a low pressure heating apparatus, thereby paving extra boiler and machinery. There are quite useful in case of fire, as the areas of the steam cylinders are as 9 to 1 of the water cylinders. Tlie fire pumps constructed on the same geveral model are adapted for ucein high buildings and for throwing water to great elevations. The machine is well adapted for all the various uses to which steam pumps are applied, foremploj ment in industrial establish$m \in n t s$ of all kinds, and for lifting oils, acids, and, in brief, any kind of liquid. It is manufacturtd by the Barney and Smith Manufacturing Company, car builders, Dayton, Ohio, an old and well known concern, whose excellent reputation is, perhaps, the best guaran. tee of the superiority of their productions.

## THE HAMILTON SUR-

 FACE PLANER. The improved surface planer herewith illustrated combines several new features which are intended to increase its adaptability to a large ex $\in \mathrm{n}_{\mathrm{t}}$, making it (al. though a pony pladerin size) a very useful la bor and time saving machine. It bas adjusia. ble tables above snd beble tables above snd below the cyliuder, which enable the optrator to smooth and plave material perfect:y atra:gbt and out of wisd above the cutter head. The material may be subre. quently planed from five inches to one fixternth inch thick below the cylinder, thereby insuring straight, footh and evtn ourfaces, or it may be fimply plated out of wird, to a hickners, or \&moothed off at the will of the opera'or. This improvement enables the macbine to perform a large variety of work, and allows of the finishing of piects after they are framed together, dispensing with bench fivishing to a greatextent. iramed
extent.


the hamiliton surface planer.

Two different kinds of these surface planers are manufactured, with or without the attachment to plane out of wind above the cylinder. Referring to the accompanying engravings, Fig. 1 represents the surfacer, with attachment to plane above as well as below the cylinder. Fig. 2 represents the same planer without the attachment to plane above the cylinder, and only for planing below the cutter head. Three sizes of each of the two machines are made, to plane 24 inches, 20 inches, and 16 inches wide. The difference is only in the width, all working parts being the same. The frame of the machine is strong and heavy, the joints are carefully planed and then bolted together, and the table is cast in a planed and then bolted together, and the table is cast in a
solid piece, resting on two slides and screws, which are opesolid piece, resting on two slides and screws, which are ope-
rated simultaneously by one hand wheel. An index attached rated simultaneously by one hand wheel. An index attached
to the table shows at a glance the different thicknesses to be to the table shows at a glance the different thicknesses to be
planed, from five inches down to one sixteenth of an inch. planed, from five inches down to one sixteenth of an inch.
There are six feed rollers, made of the best wrought iron, four resting in the solid table. The center feed rollers, of which one is fluted, are close to the cutter head, so that short as well as long material may be planed without clipping the ends. The gear wheels are very strong and are covered with a bonnet to keep them free from dust and shavings. An ada bonnet to keep them free from dust and shavings. An ad-
justable roller scraper is attached to the back feed roller to justable roller scraper is attached to the back feed roller to
keep it free from gummy matter. The feed rollers are all adkeep it free from gummy matter. The feed rollers are all ad-
justable, and the front and back pressure feed rollersare kept justable, and the front and back pressure feed rollersare kept
down by strong spiral brass springs, which can be easily addown by strong spiral brass springs, which can be easily ad-
justed and furnish an even yielding pressure. The pressure justed and furnish an even yielding pressure. The pressure
bar is also of a new construction and is held to its place and evenly forced down where the pressure is needed. The cutter head has a cast steel journal, rests in self oiling boxes, and is made with two or three knives, as may be ordered. The bonnet and feed roller apron can be swung to the side so as to enable the operator to sharpen the knives whenever necessary. The feed of the machine can be changed by a patent differential pulley, from fast to slow or vice versa, and started or stopped by means of a feed lever, which is of a
new construction and very easily operated. The driving pulley on the cylinder is of five inches diameter and has a five inch face, and should make 4,000 revolutions per minute. The upper tables are adjustable, so that, in planing out of wind, a cut from 1-32 to $\frac{1}{2}$ inch can be taken on stuff up to 24 inches in width (the width of the cutting surface of the knives), or, in other words, stuff up to 24 inches in width can be planed out of wind, from 1.32 to $\frac{1}{2}$ inch cutat one time, passing over the cutter head.
Patented through the Scientific American Patent Agency, March 24 and April 7, 1874. For further particulars address Messrs. Bentel, Margedant \& Co., Hamilton, Ohio.

## Surntifir Amoriram.

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the sewing machine monopolists again at
The sewing machine ring, not content with the enormous sums already extorted from the people, are again attempting to renew their power by lobbying a bill through Congress, which will extend their monopoly for seven years longer.
The A. B. Wilson feed patent was granted for one of the
irst abortive attempts to make a practical sewing machine;
but so imperfect and crude was the model, filed with the ap but so imporfect and crude was the model, fled with the ap
plication, that we doubt if any machine constructed like it was ever used. or was capable of being used practically. Yet as it happens that this is the first case in the Patent Office that shows an approximation to the modern feed motion, the patent has been construed by the courts to cover all styles of feeding devices in which the cloth can be turned around the neerlle, or in which the cloth is fed between two clamp. ing surfaces. In view of these decisions of the courts, al though the patent was granted for an impracticable machine, the Commissioner of Patents extended it for seven years; and Wilson, with an eye to the present application for an extension, immediately sold, for the comparatively insignificant sum of $\$ 50,000$, all his rights to Messrs. Wheeler \& Potter as trustees for the Wheeler \& Wilson, Grover \& Baker, and Singer companies, and it has ever since been held and used in common by those companies as their most effectual instru ment in monopolizing the sewing machine business, and in extorting millions yearly from the poorest and worst paid people in the land. On the strength of the small amount o now wor which Wilson sold his patent, the combination for seven years have the privilege of plundering the peopl it should be remembered that this valuable sale of $\$ 50,000$ owned by a poor man who was obliged to sell his rights for mess of pottage; the wealthy Wheeler \& Wilson Manufacturing Company were doing business amounting to millions of dollars yearly, of which three fourths were clear profit; the patent was sold to the presidents of the Whee ler \& Wilson and Grover \& Baker companies as trustees for a combination of three corporations, of which the Wilson company was one of the most interested; that any capitalist conversant with the sewing machine business would gladly have purchased it by paying a double eagle for every dollar that Wilson is stated to have received; and that whoever owned this patent had the whole sewing machine business n his control, and could dictate his own terms as to royalty. In view of this, it is plain that the object of this sale was
simply to form a foundation on which to apply to Congress for another extension to enable the owners of the patent to continue their extortions, and compel the poor seamstresses and other purchasers of sewing machines to contribute for another long period to the groaning coffers of these grasping corporations.
A few figures will show something near the amount that has begn wrung from the people by these cormorants. The Singer machine is probably the most expensive one made by
any of these companies, and that, as we learn by a sworn statement of I. M. Singer, costs, on an average, $\$ 11.83$ to build. Those made by the other companies referred to cost much less; but we have been unable to find any reliable or aworn statement of the expense of building these machines, and we will therefore, for the sake of argument, estimate them at the same price. The plainest and cheapest of these machines are priced at $\$ 55$ dollars each. If from this we deduct $\$ 25$ as a fair selling price (which would be considered atiormous profit, in any other business, on a first cost o \$11.83), we find that these companies have extorted from the people $\$ 30$ on each machine they have sold, over and above
the very liberal profit we have estimated above. These three companies alone, according to their sworn statements, sold, in 1872, 445,776 machines; and if one fourth of these were exported, the balance sold in the United States will amount to 334,332 . Now multiply this by the $\$ 30$ above the fair profit, and the product gives the enormous amount of $\$ 10,029,960$. If, in addition to this, we deduct one fourth, for export, from the number of machines sold by the favored licensees of these companies, we have a balance of 289,788 and if we multiply this by the $\$ 30$ as before, we have a pro duct of $\$ 8,693,640$, which, added to the above, will give u a grand total of $\$ 18,723,600$ as the amount extorted, mainly from the poorest and neediest of the people of the United States, in one year alone, by the operations of this ring, who, not content with this wholesale robbery so far, want the privilege of continuing it seven years longer; which will enable them, without allowing for any increase of business, to bag the modest sum of $\$ 131,065,200$, over and above a enormous legitimate profit.
That the extension asked for will be for the benefit of thi ring of capitalists, and not solely for the poor (?) inventor and ostensible applicant, is clearly shown by an inspection of the before mentioned assignment, in which it is stated that "I have assigned, sold, and set over, and do hereby assign, sell, and set over unto said Wheeler \& Potter my right, title, and interest in and to the "am
From this it is very plain that the only object of this appli cation is to renew the power of this formidable ring; and if the people generally do not stir themselves, this mighty incabus will be fastened on them for seven years longer, as the best of legal talent and the most influential members of the "third house" have been retained to work the case
through. The sum of $\$ 50,000$ has, we are credibly informed, been raised as a first instalment and sent to Washington to be "placed where it will do the most good;" and if the peo ple do not let their representatives know their will on this point, it is possible that the weighty reasons of which the ring is so lavish will have their usual influence, and th people be obliged to endure another seven yoars' servitud to these wealthy extortioners; but if due efforts are made in the course of a year or two, as soon as manufactories now organizing are ready with their machines, the price of these necessary implements will be reduced to reasonable propor tions, as machines can be built which may be sold at a good proft at from $\$ 15$ to $\$ 20$ each.

## the depression in the iron trade.

"The iron trade," aays Mr. Samael J. Reeves, President of the Iron and Steel Association, and also of the Phernix Iron Works, the largest establishment in the country pro ducing manufactured iron, "has not been so bad for fifteen rears; and there is little prospect of improvement before the all." Manufactured iron, according to the same authority is a drug; the demand is less than that of three months since, and the delay of Congress to settle the vexed question of the currency, the late panic, and the strikes, past and im pending, have, it appears, all contributed to produce a con dition of affairs, in one of the most important branches of the national industry, which indicate widespread and alarm ing distress.
A brief review of the course of business during the past welve months shows that, up to the summer of last year rade was quite briek and iron in demand at moderate rates The year bid fair to be a prosperous one until the opening f autumn, when a falling off took place, followed by the financial crash which blocked business. Still trade dragged on until February of the present year, when, in the opin on of some, a very slight improvement took place, and has continued: ochers however, maintaining that such is not the case, and for a reason point to the fact that the demand for manufactured iron is far below the average. A correspond ont of the Tribune says that new railroad improvements are t a comparative standstill; railroads in operation are doing nly a limited carrying trafic; the coal market is dull and flat, and operations in improvements are not by any means as extended as they have been. The product of rails at Pittsburgh is said to be not more than one fourth the quan tity of the same period of last year- 630 furnaces are out of blast in the State-and the antagonism existing between the ron Manufacturers' Union, composed of capitalists on one hand, and the United Sons of Vulcan, of puddlers and boilers on the other, appears to be increasing, rendering labor troules imminent, which must tend still further to complicate the unfortunate state of the trade.
In Pittsburgh, the iron workers are becoming restive under he reduction of 20 per cent in wages since the panic, and a trike is impending, the result of which cannot but be ruin ous to the interests of both sides. The leading bouses are not running at their full capacity, and declare that is impossible for them to raise the rate of wages because their mar fins are scarcely two thirds of what they were last year. To those who are working at a loss, strikes are a matter of indif ference ; but to such operators as are striving to lift themselves rom the effects of the panic, the closing of the works will bring renewed distress.
In the eastern section of Pennsylvania, the points of dispute between employers and employed are the sliding scale of wages and arbitration. The workmen, the vast majority of whom belong to the union, demand that their wages be so adjusted that when prices of iron advance they shall par ticipate in the manufacturers' gains, and conversely share in the losses in times of depression. The employers are op posed to thene conditions and assert their right and privilege to pay the men such wages as they choose. Arbitration is a conference between a committee for the Central Union and the manufacturers, which aims to settle difficulties which may arise before a strike is resorted to. Eastern operatives, it is arise before a strike is resorted to. Eastern operatives, it is
said, dislike the unions and the established scale. Weat of said, dislike the unions and the established scale. West of affairs now stand, and it is to be hoped that an amicable set tlement may in the end be reached, though at the present time none seems clearly apparent.
The reports in the English journals show that the British ron trade is suffering severely from foreign competition, and that it is probable that the advantage of the increased imports to us, necessitated by the difficulties in our domestic productions, will be secured by continental manufacturers to a much greater extent than by those of England. The Iron nonger affirms that iron making in Great Britain is not only profitless but attended with loss. A tun of rails made in South Wales and delivered actually costs $\$ 70.25$, while at the present time they are sold at from $\$ 45$ to $\$ 47.50$ per tun The slackness of orders necessitates taking them at almost any price to keep the works going
It is also stated that never before has Belgian competition proved so severe. Bar iron from that country is offered in England at $\$ 52.50$ per tun, which English masters could not furnish at less than $\$ 62.50$. Iron, while admitting the tate of affairs to be bad, predicted some time since renewed activity, owing to the falling prices of fuel; but in the latest issues received, the trade summary of that journal says tha business is in a state of suspense, and will probably remain so until the prices of fuel and the wages question are again ettled.
glacial remains in central america
Until quite recently it has been thought that glacial action n any extensive scale was altogether a northern phenomenon its southern limit on this continent appearing to be about the latitude of Washington and St. Louis, and in the Old World a line of corresponding temperature, that of Paris and Vienna. Lately evidence has been accumulating to prove the prevalence of glacial cold at the same time, not only in the southern hemisphere but practically over the greater part of the globe. Professor Hartt has discovered glacial drift all the way from Patagonia, its supposed northern limit, to within ten degrees of the equator; while Professor Agassiz claimed to have found glacial moraines under the very line The development of glaciers north of the equator was no doubt equally general, since their remains are found to be abundant where they might have been least expected, in the most central part of Central America. At Libertad, the
center of the mining region of Chontales, on the northeastern shore of Lake Nicaragua, the author of "The Naturalist in Nicaragua" observed transported boulders that gave unmistakable proofs of ice action, while in the adjoining district of Matagalpa the evidences were overwhelming. All along the eastern flank of the sierra are ranges of boulder clay, some of tbem exceeding a thousand or twelve hundred feet in hight, made up entirely of a brown clay mixed with angular and partly rounded blocks of stone derived from the higher mountains to the west. These ridges were particularly ob served by Mr. Bell between San Rafael and Yales and north ward to Ocotal, the capital of Segovia. A section of strata between Ocotal and Depilto, a amall silver mining town nine miles nearer the boundary of Honduras, shows very clearly the depth and importance of the glacial deposits. At Depilto the rock appears to be Laurentian, great, bare, rounded masses of hard quartzite protruding through the scanty soil, while the river bed is filled with enormous boulders of granite-like gneiss. Descending the valley the massive beds of quartz and gneiss are soon succeeded by overlying, highly inclined and contorted schists, with veins of quartz running between the laminæ. About a mile below Depilto un. stratified beds of gravel, enclosing boulders of quartz and schist, begin to je exposed in natural sections, which deepen as the river is descended, until at Ocotal they are from two to three hundred feet in depth. The undulating plain on which the town is built is composed of the same material. Near the town the formation is almost level, excepting where it is worn into deep gulches by the water courses. Across the river the same gravel beds extend two or three miles to where a deeper deposit of gravel, with boulders of trap and conglomerate, overlies the schists.
The evidence of glacial action along this valley seemed to Mr. Bell-with a single exception-as full and clear as could be found in any Welsh or Highland valley. There were the same rounded and smooth masses of rock, the same moraine like accumulations of unstratified sand and gravel, the same transported boulders that could be traced to their parent rock several miles distant. The exception was doubt less one of observation rather than of fact. His visit was a hurried one; and as he did not see any rock near Depilto that had been recently bared, his failure to see any glacial scratches is not surprising.
That the gravel and boulder clay formations were not due to floating icebergs is argued on zöological grounds. It is well known that the faunas of the two oceans have been dis-
tinct, certainly since the miocene period. Had icebergs floated in the neighborhood of Ocotal (now three hundred floated in the neighborhood of Ocotal (now three hundred
feet above the sea) during the glacial period, the low pass feet above the sea) during the glacial period, the low pass
between the Atlantic and Pacific, through the valley of the between the Atlantic and Pacific, through the valley of the
San Juan and the lake of Nicaragua, must bave been submerged something like twenty-eight hundred feet. That the faunas of the two coasts could have been kept separate under such circumstances it is impossible to believe.

## dead subjects and a live discussion.

If the taliz about cremation ever amounts to anything more than talk-and the present indications are that it must-it will afford a memorableillustration of the power of the press, if nothing more.

A gentleman not very widely known, and to most of those who have heard of him somewhat unfavorably remembered as the suggester of the ' prayer test," publishes in a magazine of limited circulation a few more or less substantial reasons for radically changing a custom, more deeply rooted, perhaps, than any other in the prejudices, inherited sentiments, religious observances, and other conservative elements of Christian civilizations. The proposition is taken up and discussed in rapidly widening circles, and in half a year is a familiar topic wherever newspapers are read. Still more surprising: the reform is, in the main, not unfavorably considered, societies are organized for carrying it out; and in some cases, city corporations have made provisions for the exercise of the new rite by any so disposed.

As might have been expected in the general discussion by all sorts of people of a subject appealing to sentiment rather than reason, there has been a vast amount of nonsense uttered on both sides. Indeed, with the coolsst headed, it is almost impossible to consider the subject dispassionately the moment we cease to think of the dead abstractly, or as belonging to some one else, and take ourselves and our own dead into account
Burning has so long been associated with violence and accident, and burial with the undisturbable repose which we have learned to look forward to under grass and flowers, that few can compare them calmly. And though we may personally think with Laurens that our bodies are too good for the worms, and prefer that the elements of our castoff frames may be quickly and surely dispersed by the purifying agency of fire, rather than slowly, uncertainly, and loathsomely by natural corruption, yet the most logical among us might shrink from the sight of a wife or child, parent or dear friend, thrust into the furnace seven times heated, and beg for the accustomed ministrations of earth and air in the quiet burial ground.
Unreasoning prejudice, it is true; but it is a power in the world none the less, and, like inertia in mechanics, it is an essential factor in all social calculations. A generation must grow up familiar with the thought from childhoud before the practice of burning the dead can have a more than sporadic development among us.
The greatest difficulty, or rather danger, to the proposed reform is the wild and offensive extravagance of some of its advocates. The cessation of breath does not immedi-
and to demand their treatment as such is not likely to make converts to the new rite-hideous orong, the sensi tive may rather say-except to the limited extent of apply ng it to its proposers.
It is true that a lifeless body may be represented chemi cally by a few symbolic letters and signs, which also stand for plant foods and manures. It is true that the seques tration of the bodies of our dead withdraws annually som hundredweights of fertilizers from our fields. But there are other and higher values than those quoted in the guano markets-higher to us, if not to the rabid utilitarian. Be sides, it is slightly absurd, to say the least, for him to de claim so earnestly against our burying, once for all, a hun dred pounds or so of loved remains, when he deposits yearl in the sewers a vastly greater weight of more available fer tilizing material, and thinks nothing of it,
We are not opposed to cremation. Indeed there is one aspect of the case in which it is all but imperative; only let it be done decently, and with due regard to sense and sensi bility. From a sanitary point of viow, our present mode of disposing of our dead is anything but commendable. The ordinary graveyard is demonstrably dangerous to the living, and a source of possible poison to generations that are to come. Especially where the burying is rapid or unwisely done, as is too commonly the case, the air is tainted, and the underground water courses are polluted: a double evil made increasingly noxious by the tendency of modern society to congregate in cities, and consequently to accumulate grea numbers of dead bodies within limited areas near centers of population.
As for the alleged cheapness of cremation, that is a matter altogether doubtful and of small moment. It is true that a couple of dollars' worth of coal, properly burnt, will speedily convert a corpse of average weight into a few pounds of clean ashes and an indefinite amount of invisible and inoffensive elementary gases; but funerals will be a burden none the less. Fashion will invade the pyre and the urn as surely as it has the cemetery and the grave ; and it can be as lavish in expenditure in the one case as in the other. To expect that funeral rites will be done away with, and the possibilities of ostentatious grief prevented, by burning the dead, is to over look some of the strongest impulses of haman nature. It is more likely that burning would simply add another item to the expense of funerals, since a few eccentrics only would have their ashes scattered to the winds, while the multitude would retain their decorated burial plots, and have their ashes interred as formally as now. Indeed, if made harm less by fire, we are disposed to think the cemetery, with its shady walks and well kept shrubbery and flowers would and should be retained. It is well to leave some spots sacred to bereavement and tender recollections of the dead.

## OLEOMARGARIN.

We recently published an illustrated description of the mode of manufacture of the oleomargarin ; and so far as our investigation of the process by which it is made extends, so long as pure caul fat is employed, the resulting product pre sents no qualities either in taste or smell at all offensive or even dieagreeable. It is unquestionably, when thus made, superior to the detestably bad low grades of revamped but ter which are sold to the poor from corner groceries in this city, and to a large extent shipped South; but if, as is as serted, it be produced from soap fat and butchers' waste, then a more revolting mass could hardly be placed upon our tables, and the resolution of the Exchange, condemning its sale, has not come too quickly.
It has also been alleged that it has been sold for genuine butter, and that it has been employed as an adulterant for the same; hence the Exchange "emphatically condemns any process of adulteration or mixture and the fraudulent at tempt to sell such product for pure butter."

## SCIENTIFIC AND PRACTICAL INFORMATION.

the bamboo a dangerods poison.
The Strait Times, a Javanese journal, publishes some novel information on the poisonous properties of the bam boo, which heretofore has been considered one of the most inoffensive of vegetables. The natives of Java use the poi son against their enemies, and obtain it by cutting the bam boo at a joint, and detaching from the saucer-shaped cavity, formed by the cane at such portions, some small black fila ments, which are covered with almost imperceptible needles. edy has ing to the stomach, they appear to catch in the throat and work their way to the respiratory organs, where they imme diately produce a violent cough, followed by inflammation of the lungs. The poison, tried upon dogs, produces loss of appetite, severe cough, burning thirst, and gradual emacia tion. The animal froths at the mouth, and finally dies by suffocation as if under the influence of a deleterious gas. floating particles in the air.
When a ray of sunlight crosses a shaded rooms an immense oumber of fine particles will be noted, apparently in suspen sion therein. M. Tissandier has recently made some inves tigations into the quantity of this dust contained in 35.3 cu bic feet of air, by causing that quantity of air to pass through a tube packed with gun cotton, which filtered out the partithus wes enabled to obsain the the gun cotton in ether, an dition. After.a heavy rain, M. Tissandier has collected 09 grains of dust in the above mentioned quantity of air, but

With regard to the nature of the material, he found that about one third was organic, another third silicious, and the rest composed of various substances and sulphate and oxide of iron.
an alcohol and vinegar polypus.
The Jardin d'Acclimatation of Paris was recently present ed with a medusan polypus, which, on its reception, was placed in a tank of water with similar organisms. To the urprise of the curators of the aquaria, it was found that af ter the lapse of twenty-four hours the creature had killed every other occupant of the vessel, and remained alone in the midst of a quite large empty space. After some speculation over the apparent mystery, the analysis of the water was made, proving that the liquid was water no longer, but inegar. The polypus, it appeared, was one of a very rare species of mollusk, which when placed in pure water, has the property of changing the same into a strongly character zed acetic solution. The animal, it is said, produces alcohol, which it transforms into vinegar.

## egyptian blue.

A remarkable and very beautiful shade of blue is noticea ble upon many of the ancient ornaments found in the tombs of Egypt. Analysis sometime since proved the color to be ormed by a combination of soda, sand, and lime, with certain proportions of copper, from which substances the Egyptians managed to produce three different products: first, a peculiar kind of red, green, and blue glass; second, a brilliant enamel, and lastly the color to which reference is above made, and which was used for painting. By synthetical ex. periments, M. Peligot has succeeded in reproducing this pe culiar shade of blue, by heating together 73 parts of silica with 16 of oxide of copper, 8 of lime, and 3 of soda. The emperature should not exceed $800^{\circ}$ Fah., as, in such case, a valueless black product is the result.

## THE AKKAS.

The Italian Geographical Society has recently received news of the death of the African explorer Miani, and also a num ber of interesting objects forwarded to them by that traveler just previous to his decease. Among the curiosities were two African dwarfs belonging to the tribe of Akkas. These individuals, aged respectively 18 and 19 years, are but 28 and 34 inches in hight, and belong to a peculiar race of people, the existence of which, first affirmed by Herodotus, has of late years been rediscovered by Du Chaillu and Schwein furth. These strange beings are of a light copper color and noticeable for their extreme ventral prominence and very thin members. The lips are very long, the cbin sharply re cedes, and the hair, though tightly kinked, is very long and abundant. Their agility is said to be remarkable in view of their peculiar build.

## dolteration of chocolate.

Chocolate is one of those articles of food which are rarely sold in an unadulterated condition. These adulterations are o considerable that frequently the spurious chocolate is mere imitation, containing every ingredient except the principal one, the pure cocoa. Particularly is this the case with the imported material from France, a fact very evident considering that the poorest chocolate is sold in that country at wholesale for some three cents a pound, when the cocoa alone sells for 21 cents. The imitation chocolate is a mix ure of cocoa shells finely pulverized, burnt flour, beef mar row, and a little spice, and such is the composition of much of the stuff for which medals have been awarded at fairs and expositions.
The purity of the chocolate can,however, be determined by vei'y simple means. One part of the material to be tested is warmed with ten parts of water. The solution is allowed to cool ; and on being thrown on a blotting paper filter, leaves a reddish brown deposit. The liquid should pass through promptly and be of a clear red, having an agreeable cocoa aste. The material on the filter should also on being dried yield a light powder of very little coherence. If, however, the chocolate is adulterated, the liquid passes through the filter slowly, and is of yellowish color, having a sweet taste. A viscous mass remains on the paper, which dries slowly into a solid form. The more viscid the residuum, the more burnt flour the chocolate contains. Glucose is frequently substituted in the spurious material for cane sugar.

## A Fortunate Inventor.

Our readers will remem ber that not long since we devoted our first page to a description and illustration of Mr. E. F. Loiseau's machinery for the manufacture of artificial fuel from coal dust, and have since frequently alluded to the inventor's progress in introducing the invention. We have recently learned with much pleasure that Mr. Loiseau has disposed of the right to manufacture the fuel in Great Britain, under his English patents, for the sum of $\$ 60,000$ gold and a royalty of twenty-five cents per tun when coal sells at from 15 to 25 shillings per tun in London, the royalty vary ing with the price above or below these figures. The pur hasers agree to manufacture a minimum amount of 100,000 uns the first year (!), and after that to keep the market sup plied, on failure of which the inventor can manufacture for himself. This at the beginning, supposing coal to sell at the above figures, would give the inventor th $\epsilon$ neat income
of $\$ 25,000$ for the English market alone. Mr. Loiseau is organizing a company for the manufacture of the fuel in this country.

To give Iron a Temper for Cutting Porphyry:-Make your iron red hot, and plunge it into water distilled from net tles, acanthus, and pilosella, or else in the juice pounded out tles, acanthus, and
from these plants.

## AN INEXHAOSTIBLE INRSTAND.

Mr. Adolphe Teysonnière, of No. 18 King William street, Westminster, England, has recently patented in this coun try an ingenious inkstand, which, he says, is capable of yield ing ink of a uniform color and quality, for a long period, by the simple application thereto, from time to time, of pure water.
The device, as shown in our engraving, consists of an inkstand divided into two compartments by a perforated partition. Access to both divisions is afforded by orifices above represented, covered with screw caps. In the smaller compartment a quantity of dry coloring matter, which may be aniline of any colors, ink powder, ordinary ink evaporated, evaporated extracts of dye woods, soluble dyes, indigo, Prussian blue, or any other similarmaterial, is placed, after be ing enveloped in a porous bag or envelope of unsized paper. In the larger compartment is an inverted truncated cone, $A$, which forms the dipping cup, and the lower end of which rests against a sponge, which serves as a filter to keep back

any particles of undissolved coloring matter which may escapefrom the envelope containing the pigment. When the case is thus fitted, the cover is secured in place, and the inkstand is ready for the market. In order to use it, water is poured, through the opening for the purpose, in to the smaller compartment. A portion of the coloring matter is then dissolved, as the water thus turned into ink flows readily through the perforated partition and sponge, and rises sufficiently in the cone, $A$, to be taken up by the pen. When all the liquid is used, more may be made by simply adding more water, and this may be repeated until all the pigment is dissolved. The inventor also proposes several modifications of the form represented herewith, but all are constructed on essen tially the same principle.

## THE COLORADO POTATO BUG.

The Colorado potato bug, or doryphora decemlineata, a representation of which we herewith present, has for several years past made alarming ravages in the potato crops of the western section of the country. Some forty years ago, it was known in the Rocky Mountains, where it seemed to be indige nous, feeding upon the solanum rostratum, or wild potato. When the common tuber was introduced in that region, the beetle soon attacked it; and spreading from one field to another, in 1859 it had reached a point one hundred miles west of Omaba. In 1861 it invaded Iowa, and, crossing the Mississippi in 1864-5, it has since proceeded eastward at the rate of about sixty miles per year; so that it will probably reach the Atlantic, unless some means be found for its extermination, during 1878.

Professor Hall, of Chicago, states that the beetle lays its eggs on the under side of the potato leaf. There are speedily hatched. The larva, when full grown, is over hall an inch long, very thick in the middle, and tapering towards head and tail. It is of a pale yellow color, often dusky or freckled on the back, with small blackish dots, and along each side are two rows of large black dots. The legs are black, and the head black and shining.


The mature insect, the beetle itself, is nearly half an inch long and a quarter of an inch wide. Its shape is oval, very convex above and flat beneath; of a hard crustaceous texture, smooth and shining, and of a bright straw color, the head and thorax being sometimes tawny yellow; head and head and thred with black apots. the wing cases with black thorax marked with black spots: the wing cases with black stripes arranged longitudinally, five on each case. The antennæ are twelve-jointed; the first five joints are pale or tawny yeilow, the remaining joints black, the last joint being small, and sunk into the penultimate one. The legs are tawny yellow, the hips, knees, and feet being usually black. It requires less than a month to pass from the egg to the beetle state. The accompanying figure, for which we are indebted to the Field, is a representation of the insect on an enlarged scale, the line alongside showing its actual length.
Where the bug once gets a footing, it speedily destroys the entire crop. It is believed to effect all its transformations in fifty days, so that a single pair would, if unmolested, pro
duce sixty millions of progeny in a single season. Various modes of preventing its ravages have been suggested. Brushing or shaking the larvæ from the haulm into a vessel is sometimes tried, but this is a laborious and dangerous operation. Dusting the leaves with white hellebore powder is an effective remedy when it is well done; the powder must, however, be freshly ground, as ic loses its efficacy when kept too long. Paris green is also recommended, but both pow. ders are irritating to those applying them, while the latter is extremely poisonous. Birds, it is said, will not destroy the bugs, as the emanations from their crushed bodies are nox ious even to human beings, and, it is said, have caused several deaths. The symptoms resemble those caused by the bite of the rattlesnake. The beetle has several insect enemies, especially some varieties of ladybird, which prey upon its eggs and larvæ.
There has been considerable alarm in England, lately, lest the pest should be imported thither in American potatoes, and official investigations have been made in order to determine the advisability of prohibitingimportations of the vegetables. The report, however, points out that the larva of the parasite are not deposited in the tubers or conveyed by them, and that with the exercise of propercare no danger need be apprehended from bringing American potatoes into the country.

## THE SHADOW SAIL

We extract from Land and Water the accompanying engravings of a new sail recently patented in England, and called the Shadow. It seems well adapted for racing yachts, as it allows of a remarkably large spread of canvas. The fitting is, however, not American fashion; and although when once distended the sail would be of considerable asoistance we think that the extra quantity of gear required, and the cumbering of the masthead rigging with an extra gaff, will hardly secure for it much favor from American yachtsmen. We should imagine that the plan might be so modified as to get rid of much of the clumsiness, particularly if the gaff, as our contemporary suggests, could be arranged so as to be easily and quickly shipped and unshipped in any kind of weather.


As represented, the gaff is attached by a gooseneck to ron work fitted on the foreside of the mast. This iron work projects from the mast in such a manner as to allow the topmast to pass through it when requiring to be housed, and is fixed about two feet six inches below the hounds of the rigging, just above where the jaws of the mainsail rest. The length of the gaff is regulated by the hoist of the main sail, but should, when hanging down from the gooseneck and in use, reach within about four feet of the deck. In cutters, and for the foremasts of schooners, two halliards are necessary, one on each side of the forestay; but on the main masts of schooners, one will be found sufficient. When the

sail is not set, the gaff can be stowed either alongside the mast or lashed to the rigging as most convenient. The sail hoops seized on it; and when being set, these hoops are slipped over the gaff before hooking on the peak halliards.

As the hoops are passed over the gaff, the throat of the sai is hauled up; and when all are on, the head of the sail is brailed close to the mast. The gaff is then peaked up on the proper side of the forestay, and the boom, which is exactly similar to a spinnaker boom, is rigged out, and the foot of the sail set on it exactly in the same manner as a spinnater Fig 1 reprents the ail as it now or Fig. 1 represents the sail as it now is, or when close being set, When the sail is half reefed, the gaff will re-

quire more peak to set it. The sail, when fully set, is shown in Fig, 3, which also explaine how a topsail can be set over the Shadow in light winds.
From the gaff end are fore and after guys, with which to brace the gaff to its proper position. When gybing, all that is necessary is to brail up the sail, lower the peak of the gaff, unhook the halliards and guys, pass it under the forestay, hook on again, and hoist away. of course having.first shifted the boom.

## IMPROVED LARD AND BUTTER CUTTER.

We illustrate herewith a new form of spatula adapted for -moving lard, tallow, butter, or similar material from the tub, which provides an easy mode of freeing the ladle portion from the clinging material. The device is made of wood, and its lower end is broadened, beveled to a sharp edge, and passes through an opening in the sliding piece, A. To the latter is secured a bar, B, which is slotted and through the opening in which passes a confining stop, C. A button on the upper extremity of the bar allows it to be convenient. ly moved.


After the material is cut and iitted up upon the broad end, as shown in Fig. 1, the piece, A, is slid down to the extrem ity, as represented in section in Fig. 2, thus pushing the lard off upon the receptacle placed for it, leaving it in a smooth, ttractive shape.
The device is simply constructed and easily operated, and will doubtless form a convenient arrangement for the use of grocers, dairymen, and others.
Patented July 30, 1872. For further particulars, address the inventor, Mr. W. M. Bleakley, Verplanck, N. Y.

Motto for the Temperance Crusade. " $\mathrm{H}_{2} \mathrm{O}$ ! every ne that thirateth!"
strain diagrams and their revelations.

In tine preceding article, a brief account was given of the method of formation of strain diagrams, whether made by plotting the results of experiments (made as described in the illustrated article published in the Scientific American of January 17, 1874) or by an autographic testing machine; and an explanation was given of the method of obtaining valuable and interesting information by the interpretation of the initial portion of the diagram.
In the figure here given are rough copies of severan complete strain diagrams, produced by the autographic torsion machine at the Stevens Institute of Technology, by which this novel internal examination of materials, and its revelathis novel internal examination of mater
tions, can be more completely exhibited.
tions, can be more completely exhibited.
The curves here shown do not exhibit the
The curves here shown do not exhibit the
effect of peculiarities in the material as perfectly as the originals, because it is neces sary to reduce the horizontal scale very much in order to bring the figure into proper shape and size to enter the columns of this paper. Theoriginalstrain diagrams of iron occupy a space nearly a yard long and but two and a half inches high. Those of steel are two and a half inches high. Those of steel are
five or six inclies high. The column of figures at the right of the engraving reprefigures at the right of the engraving repre-
sents the maximum stress per square inch sents the maximum stress per square inch
of section exerted upon the fibers of the of section exerted upon the fibers of the
metal by tension, when the product of the metal by tension, when the product of the
weight on the end of the lever by its leverage is equal to the figure at the opposite end of the plate.
Referring to the figure, the curve, $A$, is that of zinc. Its form at the commencement, concave toward the base, shows its inelastic nature. Its gradual rise shows that it may take a set under the action of the smallest forces. Its maximum hight is small in comparison with its companion curves, and this
shows its weakness; it actually has a strength, in tension, of but about, 10,000 lbs. per square inch, and this was an unusually good specimen. Breaking off at about $65^{\circ}$, we learn that its ductility is slight, the metal only stretching about four per cent. Tin, T, is still weaker but vastly more ductile, and its strain diagram runs quite off the sheet, the metal twisting completely around before breaking; but its maximum resistance only reaches about 5,500 lbs. per square
inch. $B$ is the curve of cast copper, and $C$, that of forged copper. Could we follow the latter to the end, we would copper. Could we follow the latter to the end, we would
find that the specimen hai yielded through more than $500^{\circ}$, its fibers stretching to three times their original length. It exhibited a resistance equal to over $28,000 \mathrm{lbs}$. per square inch. Its limit of elasticity, that is the point at which it begins to take a set nearly proportional to its distortion, is at a very low strain, less than 10,000 lbs., and it yields very considerably before it offers its maximum resistance. Its ductility is its most remarkable quality. Cast copper contrasts strikingly with the forged metal. Its limit of elasticity occurred at about 5,000 lbs. per square inch, its ulti-
mate strength was between 12,000 and 13,000 lbs. per square inch, and its elongation was but two and a half per cent. inch, and its elongation was but two and a half per cent.
This piece was from carefully selected ingot copper, cast in dry sand at the Stevens Institutes of Technology. It, like the majority of the specimens here described, is therefore an unusually goodexample of cast copper ; and were it of impure scrap, or had it been cast in green sand, its inferiority to forged copper would have been still more marked. Green sand seriously injures the metal by the production of porous castings, rendered spongy by vapors from the damp mold.
Good wrought iron gives the line, D. The beginning of the diagram, a line nearly straight but slightly curved in a direction the reverse of the preceding, and inclined toward the left, shows plainly that this is a somewhat elastic material, having a little internal strain. The short stretch of nearly horizontal lines, which appears far more distinctly in the original diagram, indicated that it is a fibrous iron, well worked and rather hard. It takes a set at very nearly 20,000 lbs. per square inch, and its maximum resistance is nearly $60,000 \mathrm{lbs}$. It finally breaks at some point beyond $240^{\circ}$; its maximum elongation is about one half ${ }_{f}$ on some lines of fiber.

On this strain diagram will be noticed two of the lines ex. hibiting elasticity. They are apparently perfectly parallel, a fact which proves, what had already been suspected and almost proved by more than one distinguished philosopher, that elasticity remains unimpaired until fracture actually commences. Comparing the inclination of these lines, $e e$, with that of the initial part of the diagram, we find all very nearly of the same inclination; and the deduction, already made from the slight curvature of the beginning of the diagram, that this iron is very slightly weakened by internal straid, is thus confirmed. The line, E E, shows the form of the terminal portion of the diagram when the metal is very tough and ductile, like Swedish iron, for example. With ordinary irons and with steel, the curve ends abruptly, as shown in all those here given. The diagram, F F, is that of the excellent iron, referred to in the previous article as having given a curve of such bsautiful regularity. The line exhibits perfection in quality by its great symmetry and smoothness. Were it shown in extenso, it would be seen that the specimen only broke after a complete revolution, ductility as for its homogeneousness and purity. This is the ductility as for its homogeneousness and purity. This is the
specimen illustrated and described as No. 22 in the article of specimen illustrater
January $17,1874$.

The effect of the presence of carbon upon the properties of iron is shown by the succeeding diagrams. A low steel, containing 04 per cent carbon, and produced by the Bessemer process, tells its story at $G$. The line $H$, is that of a Sie-mens-Martin steel, containing one half per cent or a trifle more of carbon, while I and $J$ are tool steels; $K$ and $L$ are medium and spring steels, and $M$ is the strain diagrsm of double shear steel. It is seen, at a glance, that the introduc tion of carbon lessens the ductility of the metal, while in creasing its strength and raising the elastic limit. The least ductile are the tool steels containing one per cent and upward of carbon. The most ductile is pure iron, containing no measurable quantity of that element. Intermediate degrees of ductility are produced by intermediate proportions of carbon. Their strengths vary in the opposite direction, ncreasing with the dose of carbon, in a pretty regula increasing with the dose of carbon, in a pretty regular
proportion, which is expressed quite accurately, for unhard


Much mors could be learned by the study of our strain diagrams, but space will not permit further examination of his method of molecular inspection, which physicians might probably term a stethoscopic examination of materials used n construction. Should the opportunity offer, we may, a ome future time, be able to discuss some of the more novel facts which have been learned by the appiication of this new method and apparatus to research in a field in which much has been done, but in which there still remains much to be discovered.
Stevens Institute of Technology.
A Six Acre Rolling Mill.
The Phœnix Iron Company, whose great works are at Phœnixville, Pa., about an hour's railway ride up the Schuylkill from Philadelphia, have nearly completed a new rolling mill building, which is noteworthy in several respects. The Ledger saysit is believed to be the largest single mill building, under one roof, in this country. The ground plan covers about six and a quarter acres of ground. Its longest dimension is nine hundred and thirty-eight feet, and its breadth is two hundred and ninety feet. The principal material of the building is wrought iron, the roof being slate. The building rests upon about two hundred and fifty wrought iron flange columns of three eighths thickness of iron, of the well known Pkœnixville pattern. Theze rise about thirty feet to the eaves of the roof and are but eight and a half inches in diameter through the cylinder, and about twelve inchesin diameter from the tip of one flange to the tip of the flange on the opposite side of the column. At, a short distance they look very slender, considering the great ex panse and weight of the superstructure they have to support, but they have been proved
ened steel, by a formula, constructed by the writer: ' I ' $=$
$60,000+70,000 \mathrm{C}$, in which T . $60,000+70,000 \mathrm{C}$, in which T represents the tenacity in
pounds per squareinch, and C , the percentage of carbon present in the given steel. In the low steels, the lack of homogeneousness, due to porosity in the ingot, is seen to be much more noticeable than in the tool steels, which are rendered more quiet in the mold by their higher proportion of carbon and of manganese.
In these high steels, the limit of elasticity, for the unhardened, is seen to rise to 60,000 lbs. and the ultimate strength to over 120,000 lbs. per squareinch. The elongation is reduced by the maximum dose of carbon to about one and a half per cent.
N and P are the strain diagrams of white and of gray cast ron. The one is stiff, hard, strong and brittle, its line rising steadily upward without a sign of curvature or ductility until it suddenly snaps, after sustaining a very heavy stress. The other offers barely a half as much resistance; the curve bends sharply and runs a little way to the left, and breaks after the piece has twisted less than $20^{\circ}$, indicating a strength of but a half of one per cent. It has, however, five times the ductility of the white iron.
Malleableizing the white iron, a material is obtained of which the line, 0 , represents the characteristics. It is very homogeneous, has lost no strength, and has gained immensely in ductility. For many purposes it is better than average wrought iron; and the readiness with which irregular forms may be made of it, if of small size, makes malleableized cast iron a very useful material. "Steel" castings are usually made of an exceptionally good quality of this metal.
Glancing over the collection of strain diagrams, it is easy to select the proper kind of iron for any specified purpose. If mere strength is required, it is evident that the tool steels are the best materials. If ductility is desired, something re-
sembling Swedish iron is the proper metal sembling Swedish iron is the proper metal. Comparing the lists, we may readily determine which is cheapest for the specified work. When shocks are to be resisted, or blows sustained, strength alone is not sutficient. Tool steel is too brittle a material to be used in such situations, and even moderately hard steels were long ago found to be less valuable than moderately good iron for such purposes. That metal which is at once strong and ductile is the proper one to choose, The power of a substance to sustain live loadssistance into the distance through which it stretches before breaking. A close approxization may be obtained bis multiplying two thirds the ultimate strength by the distance through which elongation takesplace. The metal giving the highest product is the safest against rupture by blows. Of two metals giving equal products, choose that which is stiongast. An area of the strain diagram measures precisely the value of a material to meet shocks. It is exactly proportional to the product just referred to, and its construction affords the only means, yet discovered, of determining resilience with precision. Examining the diagrams, it is seen that, except the very purest and most expensive wrought iron, the low steels excel all other materials in this respect, while they are
stronger than any iron; and we perceive a very excellent stronger than any iron; and we perceive a very excellent
reason for the wonderfully rapid introduction of Bessemer and Siemens steels, in rail and machinery making, which has recently taken place. A steel containing less than one half per cent carbon is not affected injuriously by changes of temperature, cannot be hardened, has at once great strength and considerable ductility, and is the best known metal,all things considered, to be placed wherever a structure is liable to severe blows and heavy strains, and therefore must be bot
light and strong.
o be capable of sustaining many times the greatest weigh or force they are ever likely to have to resist. The roof rises to the hight of sixty feet at the ridge, the framework boing exclusively of wrought iron, firmly braced and tied with rods and links. The furnaces, engines, and machinery will cost nearly a million of dollars. The cost of the building will be about $\$ 280,000$.

Elongation of Conductors by Electricity.
Various physicists have from time to time studied the modifications in the molecular state of conducting wires, due to the passage of the electric current. Wertheim arrived at the conclusion that the transmission of the current modified the elasticity of the conductor, but Edlund, on the contrary, by a long series of careful experiments, has determined such not to be the case. This latter investigator has found, however, that the elongation of the wire under the influence of the current is sensibly greater than the dilatation due to the elevation of temperature resulting from the passage of the electricity. Two calculations were made of the temperature of the wire, one deduced from the relation previously estab. lished between the galvanic resistance of the conductor and its temperature, the other from the elongation of the wire directly measured and of its coefficient of dilatation, equally known. The second mode of determining the temperature constantly gave higher figures than the first, and M. Edlund therefore concluded that the current produced a special elongation in the conducting wire which is added to the expansion resulting from the accession of heat.
Quite recently M. Streintz has taken up this subject, ard, by further investigation, has sought to measure accurately the galvanic elongation for different metals.
The observations were made on wires 0019 inch in diame er and 21 inches in length, the ends of which just toucled wo levers which carried mirrors placed in the prolongation of their axes of rotation. The divisions of a graduated scale were reflected in the mirrors, and thus the displacement of the extremities of the wires could be accurately read. All the wires except those of hard tempered steel showed a marked excess of expansion under the action of the current which varied,according to the different metale, from 11 to 27 per cent of the dilatation of the wire under the action of heat alone when brought from the normal temperature, $68^{\circ}$ Fah., to that fixed as a limit, $131^{\circ} 4^{\circ}$.
M. Streintz sums up his results as follows: 1. The gal. vanic current causes no other modification of the elasticity o a conducting wire than suc
of the temperature produced.
2. Under the action of the current, the conductor expands more than when it is carried to the same temperature without the current; tempered steel alone does not present this excess of dilatation.
3. Galvanic dilatation does not manifest itselfimmediately on the closing of the current, but gradually, as does calorific
4. Galvanic dilatation is not the consequence of an electrodynamic repulsion, but probably results from a calorific polarization or an orientation of the calorific vibrations.

The superior effect of kindness over brutality, in the ma agement of balky or restive animals, is forcibly illustrated in the following incident, related of one Sam Jones, who lived up in Orange county, N. Y. Now Sam was an enormous eater, and it happened that he was one day hauling a load to the nearest village, when his team was stuck in a sand hill. Well, did Sam fret and scold his oxen or unload his team? Not he. He very coolly took down his dinner from the load and sat down and ate it, when his oxen started off with the rest of the load wiuhout further trouble.

## PROCEEDINGS OF THE NATIONAL ACADEMY OF

We continue our abstracts of the papers read before the National Academy of Science at its recent session in Washington. Dr. E. Bessels gave some further scientific

## results of the polaris expedition.

It is probable, he thinks, that Smith's Sound must be re garded as the best of the three gateways to the pole. A chan nel, of almost 300 nautical miles in length and in some places scarcely twenty-five miles in width, separates Greenland from Grinnell Land and the archipelago south of it. This separation, as the nature of the land between $81^{\circ}$ and $82^{\circ}$ latitude demonstrates, took place in a south-north direction. The speaker then proceeded to explain various phenomena which tend to confirm this view, and pointed out the truth that the southern end of the strait is the older as is apparent from the fact that the southern portion of it is evidently broader than the northern; and also the fiords on the south. west cosst of Greenland are by far more numerous and deeper than further north. According to the theory, a warm current must have moved along the east coast of America, and must have entered Bafin's Bay, having the full strength of an unweakened current in washing the end of that bay. Thereby considerable atmospheric precipitation as rain was occasioned, accelerating the growth of the glaciers, which moved on toward the valleys, and then formed spurs. The fiords we must consider as the former beds of these spurs.

What was the agency which caused the separation, we can only surmise. There are two probabilities: either the channel is a fissure which gradually widened because of the influence of the current, or it has been eroded by the action of a glacier, the south end of which gradually melted down. The latter hypothesis seems the more probable of the two, and we may regard the channel itself as formerly an immense fiord. But we know that the soundings of fiords are usually shallower at the mouth than at the head, while with Davis's Strait and its continuation exactly the reve is true: the greatest depths are found at its entrance.
In reality, nothing else could be expected. We know that the bottom of the North Atlantic is slowly but continu ally sinking, and has been ever since the miocene period. Among other evidences is the fact that the Bermudas rest on a coral foundation. This motion reaches far north and incl Ades a part of Greenland.
Professor Wm. Ferrel of the United States Coast Survey spoke upon
the tides of tahiti,
the peculiarity of which is that the solar tide is for the most part greater than the lunar tide, although the force producing the latter is more than double that producing the former. There is only one other case of the eort in the world-at Courtown, Ireland. It is not, however, due to any exception in the general theory of the tides. Certain constants in the tidal expressions, which have to be determined by observations, are unusually large in this case. It is yet impossible to specify, however, what are the irregularities of ocean bottom and of coast outline which occasion the of ocean bottom and of coast outhine
phenomena in this particular instance.
In a paper on

## METAMERISM IN ORGANIC CHEMISTRY

Professor Wolcott Gibbs, of Harvard, presented a novel and valuable discovery regarding metamerism, which has never before been observed in organic substances. Bodies are said to be metameric when they are of the same composition and atomic weight, but differ entirely in their properties in consequence of different molecular constitution. Professor Gibbs has discovered six such bodies, bearing such a relation to one another and to a seventh. The substance with which the series begins was discovered by Dr. Eidmann and is an exceedingly stable compound denoted by the formula: $\mathrm{CO}_{2}$ $\left(\mathrm{NH}_{3}\right)_{6},\left(\mathrm{NO}_{2}\right)_{6}$, or two equivalents of cobalt, six of ammonia, and six of nitric oxide. In the following formula, the ammonia is represented by $A$ and the nitric oxide by $X$, for the sake of abridgement
First serles-Eidmann's discovery:
.. $\mathrm{Co}_{2} \mathrm{~A}_{6} \mathrm{X}_{6}$
Second series-Dr. Gibbs' discovery
$\left(\mathrm{Co}_{2} \mathrm{~A}_{4} \mathrm{X}_{8}\right) \stackrel{\text { II }}{\text { II }}\left(\mathrm{Co}_{2} \mathrm{~A}_{8} \mathrm{X}_{4}\right) \stackrel{\text { II }}{=} 2 . \mathrm{Co}_{2} \mathrm{~A}_{6} \mathrm{X}_{6}$
$\left(\mathrm{Co}_{2} \mathrm{~A}_{4} \mathrm{X}_{8}\right) \underset{\text { II }}{2}\left(\mathrm{Co}_{2} \mathrm{~A}_{10} \mathrm{X}_{2}\right) \underset{\text { IV }}{=} 3 . \mathrm{Co}_{2} \mathrm{~A}_{6} \mathrm{X}_{6}$
$\begin{aligned} & \left(\mathrm{Co}_{2} \mathrm{~A}_{4} \mathrm{X}_{8}\right) 3\left(\mathrm{Co}_{2} \mathrm{~A}_{1_{2}}\right) \\ & \text { Third series—Dr. Gibbs' discover. }\end{aligned}=4 . \mathrm{Co}_{2} \mathrm{~A}_{6} \mathrm{X}_{6}$
Third series-Dr. Gibbs' discovery:
( $\mathrm{Co}_{2} \mathrm{X}_{12}$ )
$\left(\mathrm{Co}_{2} \mathrm{~A}_{12}\right)=2 . \mathrm{Co}_{2} \mathrm{~A}_{6} \mathrm{X}_{6}$
$\left(\mathrm{Co}_{2} \mathrm{X}_{12}\right)$
$\underset{\left(\mathrm{Co}_{2} \mathrm{~A}_{8} \mathrm{X}_{4}\right)_{3}}{ }=4 . \mathrm{Co}_{2} \mathrm{~A}_{6} \mathrm{X}_{6}$

As each of the salts thus obtained is beautifully crystaline and perfectly well defined, and each salt of the second and third groups gives the reactions of each constituent with perfect distinctness, no doubt can exist as to their real chemical structure.
Professor Alexander, of Princeton,gave some brief remarks on the
COMPARATIVE VELOCITY OF LIGHT IN AIR AND IN VACUO, relating to a small correction of the velocity of light as deduced from experiment. This, according to the undulatory theory, must be less in atmospheric air than in vacuo, in the inverse ratio of the index of refraction of atmospheric air to 1 , that is, as 1 to $1 \cdot 000294$. The velocity then, as ascerby jast about 0.000294 of itsolf to be equal to that in
vacuo ; that is, to the extent, almost exactly of 55 miles per second, a very small quantity indeed in comparison with the whole velocity of 185,000 miles per second; and yet,small as it is-and so small as to be below the limits of error of the experiments in question,-it is yet very closely equal to three times the velocity of the earth in its orbit.
Professor Hayden presented a general account of scientific explorations in the west and gave a brief summary of the forthcoming seventh annual report of the expedition under his charge. Professor Silliman described the

## TELLURIC ORES OF COLORADO.

The mineral is found on the side of a dyke some fifty feet in thickness, and was introduced ly a plutonic invasion of this formation. The speaker had found that, in many in stances, telluric ores were associated with gold, and the association was very unfortunate for the gold miner, as in one instance $\$ 3,000$ worth of gold thus associated was thrown away (through ignorance), while the yield of the rest of the ore was only $\$ 40$ or $\$ 50$ to the tun. Professor Silliman asked Professor Endlich to perform an experiment, showing the presence of tellurium by using concentrated sulphuric acid. A bright purple color was rapidly obtained when the ore was thus treated with heat in a test tube. In one speci-
men of these telluric ores, there was $\$ 55,000$ extracted from a tun.
Wi

## With reference to

THE LAWS OF CYCLONES,
Professor Ferrel reviewed the theories of Espy and of Redfield, Reid and others, and re-enunciated his own views published several years since.
Concerning

## the great telesoope at washington,

Professor Newcomb gave some interesting facts. The question is frequently asked, how does the new instrument compare with other telescopes? This is difficult to answer, sincethere are no refracting telescopes in this country of comparable dimensions. The question as to the comparative efficiency of refracting and reflecting telescopes is frequently raised. It must be admitted that great reflecting telescopes factory. As an instance of this, if we examine the record of Herschel's work, we find that nearly the whole of it was done with his two foot reflector; we shall almost arrive at the conclusion that all the work accomplished with the four foot reflector might have been done with the smaller instrument. The same comparison of results leads us to a similar conclusion with regard to the four foot reflector of Lassellprobably the largest ever constructed. He had under the clear skies of Malta made many important observations; but when he took his four foot reflector there, hoping with it to verify his discoveries, it does not distinctly appear that he succeeded. Struve, after looking through the four foot telecope, wrote that it was not in any remarkable degree more powerful than his 15 inch instrument at Poltava. The only exception to this generalization is the fact that the four foot
instrument of Lassell did really discover the two inner instrument of Lassell did really discover the two inner
satellites of Uranus. Profeasor Newcomb having rediscovered these with the new instrument, and thus verified Lassell's discovery, thinks that they could never be seen with a 15 inch refractor. In the new telescope the outer satellites of Uranus look as if of about the size that Ursce
Minoris appears to the naked eye. The smaller satellites, Minoris appears to the naked eye. The smaller satellites, shinge to say, have been its light was plainly apparent in the telescope; the first of these appears about half as bright, and the second about one third as bright, as Titania.
Our friends have asked whether there is difficulty in the Washington telescope on account of spherical aberration. This proves to be a very small factor; its total amount is less than that produced in the lens by ordinary atmospheric variations of temperature-an effect which is noticed when work is first begun with the instrument of an evening, but which rapidly wears away as the glass acquires the uniform temperature of the rest of the instrument. It seems to be only the rays near the edge of the glass which are thus affected. Profersor Newcomb has looked through many other refracting telescopés, by way of comparison, and after full consideration believes the new instrument to be a great success.

## planetary satellites,

Professor Alexander said, are claimed to resemble our moon in the coincidence of their times of rotation and revolution; and that in consequence every satellite presents always nearly the same side to its primary. One occasion for this belief is found on observing the special vicissitudes which the light of the satellites exhibits, each specified change recurring when they have again arrived at the same position in their orbits around their respective primaries. Another evidence is found in the remarkable phenomena of their apparent loss of light on certain occasions.
The loss of atmosphere is one of the supposable conse quences of those stringent conditions, as indeed M. Laplace has intimated, when, after stating the distance at which the attractive force of the earth is in equilibrium with that of the moon, he adds: "If at this distance the primitive atmosphere of the moon had not been deprived of all elasticity, it would be carried to the earth, which would thus draw to itself. This is perhaps the reason why the moon's atmosphere is nearly insensible." We may fairly inquire whether this has not been the case with all the satellites, and their common experience.
Professor Loomis, in a paper on the
LAWB OF STORMS,
explained the process by which he computed the relative vo
locities of the winds, etc., at high altitudes, such as that of locities of the winds, etc., at high altitudes, such as that of
the signal service stations at Mount Washington, coming to the conclusion that, at the hight of $6,000 \mathrm{ftet}$ in the western quadrant of a storm, the velocity of the wind is more than double that of the storm. By another series of computations he obtained the forms of the isobaric curves in at least 200 cases. In 55 per cent of the whole number of cases, the major axis of the isobarexceeded its minor axis by half its length; in 30 per cent the major was double the minor; in 3 per cent the major axis was at least four times the minor. The storms of the United States are mostly of an oval form, with the longer axis most frequently in a direction about N. 40 E . About three quarters of the great storms originate in the extreme west. In a case of which the details were particularly reviewed, it seeneet probable that the first development of magnitude in a storm began with the collision of moist air from the Pacific Ocean against the peaks of mountains in Oregon, resulting in heavy rainfall. But the most remarkable fact elicited was that the storm, once originated and organized, traveled over the highest mountain ranges without indicating sensible obstruction, proceeding eastward across the whole continent of North America.
An exceedingly interesting and valuable paper on the mode of formation of the earth, its condition as to interior fluidity, and the probable limits within which it was reduced from a fluid state to its present condition, under the title of from a fluid state to its present condition, under the title of
" A Criticism on the Contractional Hypothesis of the Earth's Surface Changes," was read by Captain Clarence Dutton of the Ordnance Corps, U. S. A. Mr. James D. Warner of Brooklyn read a technical paper on a new set of Bernouilli's numbers, which are a mathematical invention for shortening certain processes by their application to the coefficients of development of expanding series.
At the conclusion of this paper, Professor Henry simply remarked "The Academy is now adjourned," and thus the marked "The Academy is now adjourned," and thus the
session ended without the passing of resolutions or any other session ended without the
of the usual formalities.

## $\mathscr{C}$ Crrespoundence.

## \section*{Freight Cars. ientific American.

 <br> To the Editor of the Scientific American:}I notice, in your issue of April 11, an article headed "A Chance for Inventors," which article attracted my attention. Bearing as it does upon a matter of great importance, it ought to be called to the attention of car builders generally; and while I am compelled to differ with the author very widely in many respects, I fully concur in the belief that here is a need of improvement in this direction.
But where is the inventor who is able to overcome the the numberless difficulties that stare him straight in the face at every turn? We wait for him to appear. The author of the article referred to seems to exhibit a wonderful lack of knowledge in regard to the difficulties which must be met, when he supposes that the strength for carrying of a country wagon is to be placed in comparison with the strength for carrying of a freight car, and that its paying weight should be, in proportion, equal to the former.
For the past seventeen years, I have been a practical car For the past seventeen years, I have been a practical car
builder, and have tried a great many experiments in building very light cars, both for passengers and freight, and every experiment has proved a failure. Some fifteen years ago, box freight cars weighed only from 15,000 to 16,000 lbs. and would carry 10 tuns. These cars proved to be sufficiently strong and durable at that time, when the railroads were doing only a local business, running short trains and resting them at almost every station (a car requires rest as well as a man, if it is to last long). Then every railroad had its cars under the master car builder's sare, who watched over them as carefully as over his children; and if they did not return when they ought, they were looked after in the same way. Our repairs were then very light. But since that time, the world has not only been revolving, but moving in other directions; and today freight cars, formerly simply local carriers, are interchanged by nearly every railroad in the United States, and are drawn (in tramendous trains) thousands of miles, with but short stops and no rest from their loads.
It has been said that the steam engine is subject to fits and starts, and, when attached to one of these long trains, must starts, and, when attached th of the most workmanlike and thoroughly built car to itg utmost capacity, which would not be the case if only a few cars were taken. Couple even twelve or fourteen country wagons together, and I doubt very much if they will carry the load referred to $(3,000 \mathrm{lbs}$. to a wagon) for very long, successfully.
Box freightcars have and can now be built to weigh not over 12,000 lbs., and I will guarantee to build them, not to exceed that weight, so that they will carry successfully 10 tuns to the car. But they must be taken in very short trains, as they would be lisely to receive injury by sudden starts and stops it taken in long trains. Consequently, as the rule and not the exception is long trains, we are placed under the necessity of building our freight cars about three times as strong as they were built fifteen years ago; but the weight has not increased in that proportion, being only one or two thousand lbs. more: we therefore have reason to bo thankful for this improvement already made.
Freight cars are subjected to very rough usage; for example, an engineer couples his engine to a train of forty cars, and undertakes to start gently; he finds that this makes no impression on his train; he therefore backs up with as much force as possible,and then,putting all the ferce of the power. ful machinery to work, starts up again, and perhaps may repeat this severaltimes before succoeding. In view of these.
severe tests that our freight cars are called upon to encounter, I think every engineer will say that the fault is not in their strength, but ratherin their weakness. Wood or iron of a certain dimension has a capacity of overcoming a cerlain re sistance; and when it is forced beyond its capacity, it breaks Now the question is: In what form will a certain dimension of wood or iron resist the greatest force? This can only be settled by constant experiment.
How long would a train of country wagons stand the pressure above named? I am very anxious to learn how to build a lighter car than I am now building, to give me the ame strength or power of resistance; and have therefo written this for the purpose of drawing out information
Our box freight car bodies weigh 9,785 lbs., truck with brake, 4,445 lbs., truck without brake, 4,140 lbs., total weight of box freight car, $18,370 \mathrm{lbs}$. Our passenger car bodies weigh 27,330 lbs., trucks weigh 13,200 lbs., total weight of car, 40,530 lbs. The car will seat 72 passengers with saloon and 76 without a saloon.

New England.

## Patent Afiairs at washington.

To the Editor of the Scientific American:
The past winter has probably been one of the busiest ever known in the Patent Office, and the work is still increasing, as will be seen by the fact that the number of fees of all kinds paid in during the first three months of this year is 19,528, being an increase of five hundred and twenty over the corresponding period of last year.
With this increase of business and the constant accumulation of material, such as files, drawings, models, etc., there is a great necessity for more space, especially in the model halls. The cabinets for exhibiting the models being full and running over, most of them having their tops covered, in some cases the models are piled, one on another, until the lower ones are broken with the superincumbent weight. Unless something is done soon, the models will be in such a terrible confusion that it will be almost impossible to examine them. The machinist is doing his best to make room by putting the models closer together, but this is a mere temporary expedient, and gives but little space. If the galleries in the South Hall were completed, a large number of cabinets counld be added, but these, it is stated, cannot be built for want of money, although enough has probably been wasted in building a private conservatory over the roof of the West Hall to complete the galleries and have money to spare.
From the number of applications before Congress, it would appear that the lobbyists are endeavoring to run another Patent Office in the Capitol, as the following list of cases now before the Committee on Patents will show :
THE CONGRESSIONAL PATENT OFFICE.-LIST OF APPLICA
TIONS FOR EXTENSIONS OF PATENTS NOW BEFORE CON GREss.
A. B. Wilson, Sewing Machines.

McClintock Young, H
J. Fritz, Rolling Iron.
J. Hazeltine, Water Wheel
L. Ketchum, Harveste
T. W. Mitchell, Finishing Brush Handles.
C. W. Williams, Canal Locks.
J. Wvman, Setting Blind Staples

Vinton \& John, Furnaces.
Mos es Marshall, Knitting Machine
J. Lilley, Surveying Instrument
A. Dillman, Corn Shellers.
A. Dillman, Corn Shellers

Akin \& Felthausen, Sewing Machines.
Rudolph Eickemeyer,
Reynolds, Power Loom.
A. J. Hathaway, Converting Motion.
L. C. Chase, Buckles.
J. Haines, Harvester.

Hard, Bullet Machine.
" ard, Molding Shell.
W. W. Burrell, Corn Sheller.
H. G. Bulkley, Kilns.
A. Attwood, Car Wheel
T. R. Crosby, Wiring Blind Rods.
A. G. Batchelder and others, Car Brake
J. Young, Washing and Wringing Machine
J. A. Pickering, Boot Straps.
J. C. Cook, Webbing.
J. C. Cook, Webbing.

Eliza Wel's, Forming Hat Bodies.
A. S. Macomber, Straw Cutter.
J. W. Marsh, Sewing Machine Attachment. W. Wickersham, Sewing Machine.

## I. J. Vandergrift, Grain Separato

In addition to these cases, $I$ find the following names of parties who have applications filed, but the records do no show the inventions protected by their patents: $S$. H. Hodges, Henry Lill, N. Whiteball, Alpha Richardson's wid ow and heirs, T. \& L. Winans, J. Kirby, E. P. Torrey, J. G Derry, and G. Wellman.
One of the most conspicuous of these jobs is the case of the Wilson sewing machine, which is up before Congress for th third time. This patent covers up every " roughened surace," "four motion " or "wheel feed," and the sewing macine rings have controlled it now for twenty-one years, theres shutting off all competition, which has enabled them to wring millions yearly from the people; " and yet they are not happy," but want this pretty little privilege for seven years lenger. It is rumored among the knowing ones that the pronoters of this extension expect to diepense some thing nice among those who are disposed to help them, and that $\$ 50000$ has already been sent down here as an
earnest of the good things to come. The plan proposed a present, as near as I can learn, is to get Congress to pase a
act directing the Commissioner to examine and decide the case in the same manner as a first extension, and then bring heir whole force to bear upon him to decide favorably. At the two previous attempts, the application has been kicked out, the Congressmen being afraid to face their constituents with the additional discredit such a palpable job would give them-the Credit Mobilier and " back pay grab" being a much as they could hope to carry comfortably-but, by turn ing the matter over to the Commissioner, they hope to be able to oblige their good friends of the sewing machine ring and yet throw the blame on the former should their constituents make trouble about it. The ring hope to succeed with the Commissioner by means of a pretended sale of the first xtension for $\$ 50,000$, so as to make out that this was all the benefit that Wilson received from it, and that he should therefore have another term of seven years as a compensa tinn for being such a fool as to sell a patent worth million for such a paltry sum. By means of this sale, and by tales of the hardships, sickness, and other troubles which Wilson en countered in his early days, they hope to work on the bene volent heart of the Commissioner and induce him to gran another extension. There are some persons who even go so far as to say that the same weighty reasons are to be employed with the Commissioner that are found so efficacious with the lobby, but, of course, people who know him will not believe word of this; yet, in view of the rumor, it would give an ugly look to the matter to those unacquainted with him should this extension pass.
In addition to this there is the Akin \& Felthausen case which, if extended, will also cover up the sewing machin business completely; but these parties, although formerly connected with the combination, appear to be-and I believe they are-working against them. They want Congress to extend their patent so that every one shall have the right to manufacture by paying them a small royalty. Such an extension, however, would have to be very carefully worded, or otherwise it would fall into the hands of the ring who bought of them the last extension, the assignment being so worded as to carry with it any future extension.
Besides these extension bills and the bills reorganizing the Patent Office, several bills have been introduced into Con gress, affecting inventors and patentees. One of these au thorizes the payment of $\$ 100,000$ yearly for ten years as premiums for meritorious inventions, in the sums of from one to ten thousand dollars. Another bill proposes the extension of any patent for seven years on the payment of $\$ 100$ by the inventor. Both of these, I believe, have been report ed unfavorably. A third bill provides, first, that there shal be no more extensions; and, secondly, that any person or cor poration shall have the privilege of manufacturing patented articles by paying a certain percentage (not yet fixed) on th
Occasional. selling price.
Washington, April 30, 1874.

## Steam on the Canals.

To the Editor of the Scientific American:
If a man, using a lever, were to place his fulcrum on water when he had a chance to place it on dry land, he would not be considered fit for a juryman. But this is what inventors are doing in the Erie canal problem. If they would take one of the engines out of a boat which they are trying to run with a 200 tun cargo at three miles an hour, and put it on the tow path, it would take eighteen boats of 230 tuns each ( 4,140 tans) two miles in an hour loaded, and go back light at four miles an hour, averaging on the round trip three miles.
Trains of boats could be drawn in this way, of such a length and so frequently that the capacity of the canal would be equal to the number of boats that could be got through the locks. A train every six hours would do a business of nearly $4,000,000$ tuns in the season, at a cost of about one dollar per tun, including river and harbor expenses.
Highland, Iowa.
William Sloan.

## The Mercurial Telescope. <br> To the Editor of the Bcientiflc American:

On page 20 of the present volume of the Scientific AmeriCAN may be found a communication on this subject from Mr. John Linton, of Baltimore. In reply let mo state that if, on account of the instability of the mercury at the center f the revolving vessel, it is desired to dispense with a portion of the center, the loss will be only in point of illumina-
tion; in fact, if the mirror is large, therewill be enough reflecting surface remaining. A diameter of three feet in the cen ter of a ten foot mirror might be dispensed with, and at the same time the efficiency of the mirror would not be impaired; for we should lose only one eleventh of the entire reflecting surface.
One plane mirror would suffice for keeping the beam of light, from objects out of the zenith, always vertical upon the mercurial surface. Its width must be equal to the diameter of the mercurial mirror; and its length must be greater as the altitude of the object is greater.
By actual calculation, it is found that, when the latitude of the object is $30^{\circ}$, the plane mirror must be 19.99 feet long, in order to reflect vertically a beam of rays ten feet in diameter. If the object is $60^{\circ}$ above the horizon, the length of the mirror must be 38.64 feet. Of course it is impracticable at present to construct an accurately plane mirror of these dimensions; consequently the great mercurial concave can be used only for the examination of objects when in the xact zenith. Nevertheless, its use would secure important results. At many available latitudes in the United States zenith; and even during the short time of their passing the
field of view, the distinguishing features of each object might be noted. That an object may pass through the enith of any place, its declination-which may be found in the star catalogues-must be equal to the latitude of the place.
The concentration of light, also, would greatly facilitate an examination, by the comparison method, of the spectra of celestial objects whose illumination is feeble. These few facts are presented with the hope that Mr. Linton may continue the experiments he appears to have begun. Lat him communicate to the Scientific American at some future time a few details of his method, whether the results at tained were successful or otherwise.
Amherst College, Mass.

## The Reclamation of the Colorado Deser

To the Editor of the Scientific American:
The possibility of the project of raclaiming the Colorado desert by turning the Gulf of California, or the river, into it, will be more readily understood when it is known that the whole desert is interlaced with high mountain ranges, leaving the valleys between them generally at considerable ele vations above the level of the sea. The most traveled route from San Bernardino to Fort Mojave, nearly along the 35th arallel, shows this. After crossing the sierra at an eleva ion of about 5,200 feet, we steadily descend to and along the Mojave river, to about 1,100 feet above the level of the sea; we then rise until, at Marl Spring, it is above 4,000 feet; and it remains at or above 4,000 feet for fully 40 miles, when, fter crossing Piute creek and the Mount Newberry range, it descends rather rapidly to the Colorado river, at about 500 eet elevation. Except part of the Armagozza region and Death Valley, north of said route (said to be the only spot in he United States actually below the level of the sea-by bout 120 feet), the whole vast extent hardly shows a depres ion below 2,000 feet. The lofty unbroken Wahsatch moun tain range seems to prohibit, pretty effectually, any attempt to turn the waters of the Colorado from above the Big Cañon of the Colorado into the desert.
A government grant, ostensibly for that purpose, will no doubt benefit some interested parties speculating upon the monopoly of the mines embraced in the region in question; but it is more than questionable whether the alleged objec will be accomplished.
R. D'H.

Fayetteville, N. C.
The Relative Attraction of the Earth and Sun. To the Editor of the Scientific American:
In your issue bearing date March 14, I find an article from the pen of Mr. Ericsson, in which the subject of the relative attractions of the earth and the sun is presented in a
most happy and satisfactory manner. Mr. Ericsson is right. most happy and satisfactory manner. Mr. Ericsson is right. he centrifugal force, as a looked by
correction.
W. B. Slaughter.

Brownville. Neb.

## Transparent Paraftin.

The paraffin of commerce is a colorless, translucent sub stance, perfectly inodorous and tasteless. It floats on water and has a density of about 0.870 , and melts at about $113^{\circ}$ to $149^{\circ}$ Fah., forming a colorless oil which, on cooling, again solidifies into a crystaline mass. It boils at about $698^{\circ}$, and volatilizes without decomposition. Paraffin does not absorb oxygen from the air, and is only slowly attacked by sulphu ric acid, even at the boiling point of water. It is not at al attacked by dilute nitric acid, and only by the strong acid after prolonged boiling. In fact, chlorine or any part of our most energetic chemicals but slowly acts upon this curious substance, which may be considered to be as neutral to the general run of chemicals as our glass vessels. Lately it has been discovered that if parafin be heated for some con siderable time in a tube sealed up, the result is a more fusible paraffin, exactly similar in its apparent chemical compo sition, but much more soft and fusible-that, in fact, if the heat be continued for a considerable time, the paraffin being still under pressure, we obtain ultimately a perfectly trans still under pressure, w
parent liquid parafin.

Ascent of Sap in the Bark of Trees.
M. Faivre bas recently performed a series of experiments on the mulberry, hazel nut, and cherry laurel, which he considers goes far to prove the fact that the substances which supply the food of plants have an ascending motion in the bark. For this purpose, he made perfect or imperfect annular incisions through the bark, or detached piecэs of the bark, to which buds were attached, or removed entire cylinders of bark from the trunk. The result of the experiments was that the buds always continued to develop when the commulication remained uninterrupted with the lower portion of the trunk; while when this communication was com pletely destroyed, the buds invariably withered away. If the bud was separated by a perfect annular incision, it withered the more slowly the greater its distance from the incision; and in these cases the starch disappeared entirely from the portions of the wood above the incision between it and the bud. When entire cylinders of bark with buds on them were removed, the buds continued to develop, and even produced branches bearing leaves.

A CHECK for $\$ 60,000$ was recently handed the inventor of metallic tips for childrens' shoes, in payment of his share in a reissue of the patent, which he had originally sold for $\$ 100$. And now, with such encouragement as this, suggests the Commercial Advertiser, why can't he win the everlasting gratitude of mothery by inventing come kind of brasa knes
the niagara direct and double acting pump.
". Machinery so simple in its details of construction thatin new mining and oil regiove, where mechanic shops are not yet opened, any man of ordinary intelligence may be able to put it cogether and take it apart as occarion may require." Sucil is the aim of the manufacturer in devising the various varieties of sttam pump, many of which are doubtless already familiar to our readers under the name of Niagara, and as the work of Mr. Charles B. Hardick, of No. 23 Adams street, Brooklyn, N. Y.
In the annexed engraving will be found a representation of an improved form of one of these machines, known as direct and double acting, for which is claimed many advantages which will doubt less commend it to those en gaged in the multitude of induatries to which the steam pump is an indispen sable adjunct.

So far as is consistent with durability, we are told, the pump is cast in separate parts, so that, in care of ac cident or breata tion immediately por tion immediately affected need only be replaced, the cylinders being separate from bed plate, water valve chest, discharga, and air chamber. This independence of parts is claimed to be an important item of economy in severe climates where, by the action of frost all metal vessels are liable to fracture. Thie arrange mert of patented wate valves is such that, in case of obstructions antering the valve chamber through the suction pipe, they may be taken cut, cleaned, and re paired in very ehort time access being had to them through the boonet on the valve cheat $I$ : is ouly ne cfesary to remove one nut as the valves aresimply four square pieces of metal kept in place by the binnet. As the valves on each face pre. gent an accurarely fitting surface in the seat in the chest each of the four faces miy be used; and when, in the csures of yeard, these become wro away, hard blocks of wood, of like form, it is stated, may be empl yed with equal fac lity aud reliability. The valres are madu of composition or mas be faced with leather or valcaniz d rubber.
In the tspe of punpillustrachd, there are n) piston riogs or interior parbing, hence no necessity of removal of the oylind•r beads Ooe plunger ooerates both cyliaders, to pack which it is only necessary to unecrew the outs sbown at the center of the water cylinder, slip the caps of the stuffing box back, inpert the packing, replace the caps, and the work is done.
There is a pat-nt steam valve whicb iosures the starting of the pump, whenever steam is let on, without reference to the point of stroke at which the piston may be, and hence it is impossible to set the ma chin $\rightarrow$ on the center. It can, we are informed, $b \sim$ run at any ra'e of speed, and is thus particularly ueetul in boiler feedıng, giving a certain and steady supp. y of water.

For mines and quarries, the manufacturer claims the pump to have proved itself especially adapted Slould it become submerged in the mine, it will start ujon turning on steam from the boiler at the top of the shaft, and work notwithstanding the condensation of steam incidest to its $b=i n g$ carried over co long a distance. It bas worked, we are informed, in the mines of Pennaylvania, Colorado. etc, under in the mines of Penneylvania, Colorado. etc, under
from 15 to 40 feet of water. Finally it is well suited to the punping of gritty or muddy water, and is claimed to serve thornughly all the purposes to which steam pumps are now applied. For further information, address as abore.

## IMPROVED AUTOMATIC PACKING AND

 WEIGHING MACHINE.The invention herewith illustrated is a machine adapted for use by spice manufacturers, in chemical works, tobacco fac: ories, and in other establishments where po wdered or granulated material is packed in paper, tin, or bottles. The apparatus is constructed entirely of iron, is simple, and does not require skilled labo to attend it.
It is claimed to insure uniformity of weights, with entire freedom from dust, and does not require the packages to be cleaosed. The capacity of the machine is only limited by the number of tubes used and the speed with which it is run Its working parts will be understood from the following deacription:
Through the hopper. A, run two horizontal screws, B, B the threaded portions of which project through the left side, and their shanks through the right side of the hopper. On the screws are placed tin forms, C, C, corresponding to the inside
of package to be filled. D Dis a driving shaft which imparts motion to screw shafts B. B, by gear whesla, E. Oa each screw shaft is placed a pair of cone friction pulleys, F F, one of which is rigidly fixed; the other slides along the shaft on a key or feather. These pulleys are kept in contact by a lever, H , which extends through the table and has weights applied to it as shown. Connected with the lever, H, is the rod, J, run ning longitudinally under the table. On the other end of this rod is an adjustable nut, $K$. $L L$ is a right angled graduating lever, with fulcrum at $M$; one leg of this lever, ex tending upwards through the table, preswes against the follower blocks, T, T. On the other leg slide compensating


## THE NIAGARA DIRECT AND DOUBLE ACTING PUMP.

notably in the city of Rockford, III. A new watch factory is soon to be erected, the entire capital stock of which, some $\$ 150,000$, has been taken up by the citizens, and eeveral establishments for the manufacture of farm implements are in su cessfal operation. Emerson \& Co., the largest house in this business, shipped, in 1873 , nearly 200 car loads of agricultural goods, and emplny some 150 workmen.

## Thomas W. Bakewell.

We regret to learn of the death of Mr. Thomas W. Bakewell, an inventor and manufacturer quite widely known and ese columns. Mr. Bakewel was of English birth, but emigrating to this country at an early age, be took up
his residence in Cincinnati, his residence in Cincinnati, Ohio. At this period steamboats were just appearing upon our Western rivers, and it was a problem to inventors to construct them to suit the requirements of shallow wa ter and other local peculiari ties, as well as to meet th ties, as well as to meet the demands of the large cargoes which they were required to transport. Entering with vigor into the solution of the question, Mr. Bakewell devised vessels on improved plans, which, proving suc cessful, ultiviately neceseita ted the erection of shops and shipyards. The increaping business socn called into ex bustence extended facilities and eventually added very materially to the prosperity of the city.
Mr. Bakewell did not confine his efforts, bowe ver, solely to boat building, but also erected a large madufactory, containing machinery of his own invention for spincing and weaving Kedtucky homp for making cotton bagging. The works were established in Cuvington, Ky , and proved bighly profitable.
The subj-ct of our sketch was well known as a finished
weights, $P$ P, kept in position by set screws. Tha drawer,
s, sliding under the table, catches any material that may drop from the tubes.
In nperation, the atiendant places an empty parkage on form C. The follower. blocks, T, a are moved up against the bottom of the pactage, which brings the frictional pulleys, F , in contact, thusstarting the screws, B, which force the material into the package $n$ the form, C, causing the follower block $T$, and lever, $L$, to recede. The latter is brought in contact scholar, and an able theoretical aud practical mechanic Many very exc llent papera, with raference to the use of steam and on kindred mechanical topice, have been contributed by him to our columps He died at Pittsburgb, Pa., a the advanced age of eighty nine years

Improvement in Treating Photo-Negatives.
When, by means of a camel hair brush or other ai e, iodine is applied to the image, the atoms of metallic silver which


## AUTOMATIC PACKING AND.WEIGHING MACHINE.

 formed the picture are acted upon by the formed the picture are acted upon by the iodine,and are converted into iodide of silv-r. Now, as metallic silver is not, soluble in a wrak solution of cyanide of potassium, but as iodide of silver is soluble, it follows that the application of this menstruum will instantly couvert ioto clear glass every portion of a negative that has been touched by the tincture of iodine. Its use, then, will be obvious. Ererything in a negative not desirable to be retained can be completely removed-a tree a house, a background, a restless baby, or anj other objectionable member of a group.
Iodine diasolves freely in alcobol, ether, chloro form, sulphide of carbon, petroleum, and in solu tions of the iodides. It is the latter of these that $w$ recommend as a solvent when the solution is to $b$ employed in acting upon a negative. Drop a crys tal of iodine into a little water, and no visibl change takes place, the water remaining clear a before; but on adding a cryetal of iodide of potas sium, it will be found that, as soon as the latter ha reached the bottom of the vessel, the iodine imm diately becomes affected and dissolves readily, an the solution becomes of an intensely deep re color.
We find that if the iodine solution be thickene by the addition of a small quantity of mucilage of gum arabic, say a little more in proportion than is contained in common writing ink, all tendency to spread is destroyed. The solution may be ap plied by means of a delicate hair pencil, and in the most minute specks, lines, or stipples; and, afer the clearing up application of the cyanide, there with the adjustable nut, K , carrying the same with it, sepa |specks and touches will be found to be clear and shaply rating the friction cone pulleys, F, and stopping the screws, B, instantly. In packing bottles, tin cans, etc., form, C, is removed and the package placed on the tubes surrounding the screws.
Patented September 9, 1873. For further particulars ad dress Stewart, Marks, Ralph, \& Co., 115 Arch Street, Phila delphia, Pa., where the machine may be seen in operation.

## Now Industries in Illinois.

A correspondent of Inter Ocean gives some interesting in
formation regarding the pioneers of Western industries,
defined, showing that no extension has taken place.-Bitish
Journal of Photograplıy. Journal of Photography.
C. B. L. send us the following recipe for a cement for mending steam boilers: Mix 2 parts of finely powdered litharge with 1 part of very fine sand, and one part of çuicklime which has been allowed to slack spontaneously by exposure to the air. This mixture may bekept for any length of timie without injuring. In using it, a portion is mixed into paste with linseed oil, or, still better, boiled linseed oil. In this state it must be quickly applied, as it soon becomes hard.

## MODERN EGYPTIAN GARDENS,

 Only those who have visited Egypt during the winter months can form any idea of the calm repose that almost invariably pervades that wonderful country at that period of the year. The cleor blue sky and quiescent atmosphere cause such a dreamineas to overspread, as it were, the whele country, that, except near the cities, one may easily imagine one's self in a land of spectre palaces, villas, and mosques. The graceful heads of the date palm, poised calm and motionless in the air, relieve the towers of the country mansions of much of their monotony. It is winter, yet the orange trees are laden with golden fruit, $t e$ jessamine, rose, and geranium are still in bloom. Theh are still in bloom. Tbe leaves of the vine and otber deciduous treeshave just begun to turn have just begun to turn
red and brown, and to red and brown
Our illustration, for which we are indebted to The Garden, is a good representation of a modern Egyptian villa and garden of the Mameluke period. Ths square basin period. Ths square basin and stately cypress, the vine-embowered path, producing shade and grapes in abundance, and the little summer house or kiofque in which the owner and his family onjoy the grateful weed and aromatic coffee, are faithful delinea'ions of Egyptian garden life. During the past thirteen years, gardening has made ra pid progreesin Egypt, the frequent visits of the Pa shas, prirces, and Khe dive to Europe having given the Egyptians of high runk quite a taste for European horticul ture; and gardeners from England, France and Italy have been employed in various localities, but more ef pecially in the neighborhood of Cairo and Alexandria, to carry it out.
The Gezira garden is the best imitation of an English establiebment in Egypt, and it has been created at an enormous expense. Embar kments, artificial mounds, rock work, and water are al very naturally intro duc-d;good breadtbs of lawd, dotted with treep shrube, and parterres of flowers, produce, in thi land of sunsbine, a more pleaeirg effect than in our own country, on account of the scarcity of grass in Egypt. To acbieve thi desideratum, large tanks or reservoirs have been constructed of sufficient hight to serve the fountains and to force wate to every part of the gar den, which, during sum mer, bas to be krpt in a state of perpetual irriga. tion. In the Gezira gar den is a magnificent col. lection of tropical trees palms of many kinds, ficue, cathartocarpus, mu sas, cycads, acacias and others too numerous to
mantion. Among the vast variety of climbing plants in this garden, the most notable is bougainvillea spectabilis, which grows with all the wild luxuriance of a wistara in our own country, and is annually covered with thousands of spikes of its lovely mauve colored bracts. In few countries is ve getation more rapid or luxuriant than in Egypt, if the irri gation is attended to ; consequently it takes but a few year to have a perfect garden.

## THE BOW AND STERN SCREW PROPELLET.

Mr. Robert Griffiths, of London, the well known screw propeller man, has lately made a discovery in the propulsion of vessels which, he thinks, is likely to effect a revolution in the economy of steam navigation. His plan is to inclose the propeller in tunnels, and to place one tunnel propeller in the bow and one in the stern. From practical trials mad with small models, he concludes and asserts that he obtain an improvement equal to nearly 50 per cent in the speed of the vessel, without increasing the power. At a recent meet
ing of the Royal United Service Institution, Mr. Griffiths gave an interesting account of the progress of screw navigation, from which we select the following
"It is generally admitted that barely 50 per cent of the power exerted by the engines is made available to propel the ship, by either screw, paddle wheels, or any other plan of propulsion which has yet been practically used, the other 50 per cent being lost in some way, to account for which there are a variety of opinions.
"I have for several years given up the idea that any fur ther improvements were to be realized by any further change in the configuration of the screw propeller, and conse


A MODERN EGYPTIAN VILLA AND GARDEN,
ly cne screw propelled the model, for since one screw propelled the model from, 58 feet to 60 feet in sixty seconds with 600 revolutions of the screw, and with the two screws tbe same pitch togetber, from 96 to 100 feet in the same me and with the same number of revolutions, there must, herefore, be at least 50 per cent more water pass through the tupnels in the same time, and the thrust given to the crew shafte must be in proportion to the quantity of water acted upon by the screws
" I had the mouth of the stern tunnel enlarged to the ex. ent of 50 per cent, and this enlargement came below the ould be an obstruction and cause a considerable agreeably surprised to find when I tried it that I had a gain of 20 per cent in speed. I had found by my experiments that, as the supply of water to the screw is diminished, the power re quired to revolve it it creases, and the speed of the ship diminishes

There are tbree im portant points to be considered in screw ships, namely, the propeller, the ship, and the engine. In the first there bas ber $n$ no improvements with regard to speed since 1840; secondly, with rc spect to the alips, the best types of ships were described by the old builders as having cod's head and mack erel's tail, the length equal to three to four times her beam, and no better sea ships have been built than our sailing frigates of former days; but since the intro duction of the screw the shipbuilder has been obliged to arrange his plan to suit the propeller, for experience has sbown the deeper the immersion the more effective the pro peller, and consequently steamships are now being made with an enormous draft of water in pro portion to the beam. The eel might now be taken for the type of modern crew ships, which are made in length ten to ourteen timps the beam; an had it not been for the introduction of iron for building ships, the craw would never have succeeded to the extent thas done. This great increase of length gives the shipbuilder no cbance of improving the form his ships, from a naval architectural point of view, which is not the case in my system, as hatever form or type the ship will be best for sailing will also be the best for the adoption of bow and stern acrews.

The great improvement in steamsbips during the last thirty years is to be found in the engines, from which about thre times which about
quently turned my attention to the mode of applying it; my cated power is obtained now, with the same consumption of first patent in this direction, obtainedin 1871, was for applying fuel than formerly, as well as other important improvea screw at the bow of the ship within a tunnel in combina ments that have been made in this deparment. tion with the screw at the stern in the ordinary way; I afterwards fourd very great advantages in having both the bow nd stern acrews in tunnels, for which I obtained a patent in 1872. I wes much surprieed to find when I doubled the ower by applying one portion to the bow screw and the other to the stern screw, each within a tunnel, the speed of the model increased nearly as the square root of the power, but if I doubled the power on either the bow or stern screws separately, the speed of the model in that case increased only as the cube root of the power. It is well known that the resistance to bodies propelled through the water varies as the equare of the speed, while the power required is as the cube. At last it occurred to me that this great advantage must be due to the increased quantity of water that was passed through the screws within the tunnels, when both were at work, over what was due in the same time when
"My attention was first drawn to the necessity of having bow and stern screws, on account of the danger attending the employment of ships of the enormous length in proportion to their beam ; for every sailor must be well aware that, hould an accident occur to the machinery in a heavy sea, or ould be but a poor chance of saving解
 chinery disabled, should get into a trough of the sea. I expected that the shipowners would have readily availed tem
eelves of my arrangement on account of the safety it offered selves of my arrangement on account of the safety it offered
to the ship and passengers, and also that the Admiralty would have seen and promptly recognized the advantage and safety it would have been to the 日hips of war. Now tbat the high price of coal is being felt by the shipowners they may be induced to consider whether it will not be to their interest, as well as for the protection of their passengers, to
adopt my system. In this paper I have confined myself to the advantages gained in speed or the saving of fuel by my system ; but I will briefly name eight other important advantages in connection with it. (1) Thorough protection to the propellers. (2) Smaller screws and engines only are required. (3) No vibration whatever is produced by the proquired. (3) No vibration whatever is produced by the pro-
pellers. (4) Ships so fitted can be stopped much pellers. (4) Ships so fitted can be stopped much ${ }_{2}$ sooner in
case of danger. (5, There will be no loss of speed through racing of the engines. (6) Greater facility for steering and maneuvering. (7) Areater safety through dividing the power. (8) Ship can carry more canvas, and sail better. To sum up the result of my experiments, I find that to obtain the advantages of my system the propellers must be placed in tunnels, by means of which an extra supply of solid water will be kept up to the propeller, which cannot be effected in open water, and the extra supply of water can be obtained by using the bow and stern screws together, or by single screw hips, either at the bow or stern tunnels, by having the tun nel mouths enlarged or bell-mouthed. It may be thought there would be a loss of speed through the friction of the water passing through the tunnefs when the ship is under canvas only, which, however, is not the case."
It is proper for us to add that Mr. Grifiths' conclusions appear to be based upon experiments with small models, which may have led to deceptive results as compared with trials upon ordinary vessels. The subject is one of interest and we sball notify any progress made by thorough and practical experiments.

## Skin Grafting.

Dr. R. J. Levis, of the Pennsylvania Hospital, gives, in the Medical Iimts, an interesting article on this subject. The operation of skin grafting, he says, is now conclusively accepted as one of the resources of surgery.
The utility of the transplantation of minute pieces of ekin, to granulating surfaces, has been demonstrated in a vast number of instances. It is admitted that, by creating cennumber of instances. ces, the rapidity of the healing process can be much inces, the rapidity of the healing process can be much in-
creased. Ulcers of a chronic character, which have obsticreased. Ulcers of a chronic character, which have obsti-
nately resisted cicatrization in a concentric direction, can be healed by the ingrafting of new centers of germination in the midst of the areas of ulceration. Experience has also shown that the procedure is applicable to plastic surgery in facilitating the cicatrization of surfaces denuded by gaping in the division of cicatrices, and in the sliding of flaps of integument.
Besides the increase in the rapidity of healing, due to extending the lines of cicatrizing edges, a decided and important physiological influence is exerted by the presence of the grafts on ulcerated surfaces. The surface of an indolent ulcer seems to be stimulated to renewed vital action, and the increased healing impulse even influences to active germination the peripheral limits of an ulcer in which granulation has long entirely ceased.
The utility of skin grafting has, in my observation, been in no instances more demonstratively shown than in cases of extensive denudation caused by destruction of skin, as in burns, and loss of large areas of integument from traumatic injuries. In the case of a man whose back was extensively charred at a lime kiln, while lying under the toxic influence of its emanations, the sloughing integument having left an immense area of ulceration over his dorsal and lumbar regions, the successful ingrafting of numerous minute pieces of skin healed the vast ulcer with astonishing rapidity. In an instance of the entire loss of the skin of a leg, caused by turated a stocking, the healing process was by the same procedure rendered as surprising and satisfactory.
It seems now probable that amputation, which, as a final It seems now probable that amputation, which, as a final
resource, is by surgical authority justified in certain cases of resource, is by surgical authority justifed in certain cases of
extensive ulcers of the leg which all expedients have failed to heal, may be substituted by the simple device of skin grafting.
All of the conditions essential to successful skin grafting I have not, after extended observaion, fally determined. The most favorable condition for the development of the grafts is certainly that of healthy, active granulation of an ulcer ; and the more nearly this st
er, as a rule, will be the success.
One of the beneficial claims for skin grafting is with re. One of the beneficial claims for skin grafting is with re.
ference to the avoidance of the eventual contraction which ference to the avoidance of the eventual contraction which
disfigures, deforms, and impairs motion after extensive loss of integument. Observation seems to show that where cutification is rapid from a number of skin forming centers, the resulting cicatrix is less violently contractile in its tendency. For successful skin grafting, it is simply essential that a minute portion of skin be removed from a sound part of the body of the patient, or from another individual, and placed on an ulcerated surface. It is customary to take the pieces to be transplanted from the patient's own skin; and I have generally chosen locations where the derma is thin, and not densely covered with cuticle, as on most of the front of the body, and, as a choice, from the inner surfaces of the arms and thighs. Grafts from the integuments of other individu als develop as readily, and I have frequently practiced removing them from limbs amputated for traumatic injuries, with apparently equal success. To avoid the possibility of conveying some form of specific infection by the process, it is cartainly, as a rule, most advisable to transplant only from the patient's own skin.
A graft of skin should merely consist of the simple struc tures of cutiole and derma, and should avoid the underlying fatty and connective tisaues. That even the whole thick ness of the derma is not essential is demonsitrated by the
fact that successful grafting has been effected by using mere scrapings of the cuticle, in which are contained some cells of the superficial or papillary layer of the derma; but the prac tice is uncertain, and has not practical merit. The thickness of the true skin on the front of the body, it should be borne n mind, does not average more than from a quarter to half a line, and this depth should never be exceeded in the removing of grafts.
The operation of removing the portions of skin for graft. ing may be done by a knife or scissors, cutting oft minute particles of the size to be used immediately in transplanting; or by taking a larger piece which is to be afterwards subdivided. I have adopted a method, first suggested to me by Dr. C. H. Thomas, of Philadelphia, which, for simplicity convenience, painlessness, and effectiveness, may well dislace all others.
It consists, as seen in the illustration, in merely penetra ing the cuticle with a very delicate sewing needle, elevating amall point, and shaving off the minute elevation of cuticle and upper stratum of derma with a very sharp knife. The same may be accomplished, but hardly in so perfect and painless manner, by using fine scissors for the excision of the portion transfixed.
The operation, if properly performed, should be free from eally painful sensation, and patients never object to its most requent repetition. I have frequently done it without more than a tint of discoloration from blood, and blood need never actually flow from the very minute woand.

skin grafting.
The grafl is then immediately pushed from the point of the needle, and placed on the surface of the ulcer, the only care being to lay it with its epidermic surface upward. The graft need not be inserted into the granula.ing surface by making a wound for its reception, as has been advised and practiced, for such puncture allows a flow of blood that may levate the graft from contact with the granulations.
As simple adhesion of the
As simple adhesion of the graft is all that is desirable. I have sometimes, with large and actively secreting surfaces, allowed trem to be exposed to the desiccating influence of the atmosphere, so that the secretion may become viscid and hold the transplanted particles surely in position. To facili tate the same object of fixation after the grafte are deposited, I have occasionally allowed the ulcerated surface to re All ed unth they became to and the surface of ulceration be simply covered with a lided pressing, for protection from disturbinginfluences. For this purpose the ulcer may be covered with a piece of muslin, sa turated with oil or covered with cerate, or it may be merely protected with the waxed tissue paper, such as is extensively
used for general purposes of a dressing in the Pennsylvania Hospital.


## sein grafting.

On most ulcers the dressing need not be removed for two or three days after the operation; but when secretion is pro fuse, the ulcer may be washed daily by allowing a stream of water to flow over it, carefully avoiding the wiping of the surface with sponges or cloths, which may disturb the grafts. One of the earliest changes noticeable in the graft, after he first few days, is the detachment of its cuticle, which may occasionally be seen floating in the secretions of the ulcer, or it may be detached by a slight touch, leaving the true germinating material fixed in position. The graft, as it commences development as a germinal center, becomes so blend ed and identified with the granulations as to be for a time most lost sight of, its re-appearance becoming evident in a bluish or lilac tinted pellicle, which indicates the progress of cutification.
In regard to the size of grafts for transplanting, I have, in several instances, grafted by removing, from recently ampu tated limbs, pieces of skin measuring one third or one fourth of an inch square; but such large pieces are very likely to fail in retaining their vitality, and I have had much more satisfactory success with quite amall grafts; and for reas ready stated, this latter practioe is certainly the best.
The number and position of the grafts will vary in acco The number and position of the graits will vary in accord-
cers they may be distributed at short intervals, both centrally and near the periphery. Those near the circumference will stretch their granulations outward and stimulate the borders of the ulcer to activity; and with regard to the advantage of centrally located grafts, it will be well to remember their importance with reference to the difficulty often experienced in eventually healing the last of a chronic ulcer. A large ulcer, on which successful grafting has been performed, will soon present islets, from which cicatrization progresses in directions of the nearest healing points, until all are joined by an interlacement of newly formed tissue.

## NEW BOOKS AND PUBLICATIONS.

hand Book of the Locomotive, including the Construction and Management of Locomotive Engines and Boil, Philadelphia: Clations. By Stephen Roper, Engineer. 626 \& 628 Market street.
The author of this work very truly belleves that in a book, as in a clock,
any complication of its mactinery has a tendency to impair its usefuiness any complication of its machinery has a tendency to impair its usefulness
and affect its rellability. Hence, in preparing a book which is intended to and affect its rellability. Hence, in preparing a book which is intended to be a guide for the practical locomotive engineer, he avolds " mathematical
problems and entangling formule," and offers a pocket volume, full of inprobems and entanging formule," and ofrers a pocket volume, full of in-
formation, theoretical as well as practical, succinctly and clearly condensed. There are chapters on heat, combustion, water, air, gases, and steam; others on the construction of the locomotive and of its various parts, entered into with considerable detalls ; instructions for the care and management of bollers and engines, tables of strength of materials, and useful practical hints for the guldance of the engineer. In brief, the
voiume Is, as its name indicates, a hand book to which the locomotre chantc can turn for information regarding almost every branch of his trade. It is neatly illustrated and bound in morocco, in convenient pocket book form.
Inventiong Patented in England by Americana. [Complled from the Commissioners of Patents' Journal.]
From April 7 to April 13, 1874 , Inclusive. From April 7 to April 13, 1874, inclusive.
Eligotric Lient.-M. Day, Mansfeld, Ohio.
Food from Mile, -B, Smith, San Francisco, Cal.
Iron, Strile, and Fubnaoz - J. Henderson, New York city.
Metal Rolling Machine.-H. W. Hayden, Waterbury, Conn Oil STove.-J. H. Thorp, New York city.
Sole Screwing Mafini.-J. Mundellet al., Philadelphia, Pa
Watre Closet Babin.-J. Burbs, New York city, et al. Water Clobet babin.-J. Burns, New York city, et al.
Watre Mrter.-H. F. Read, Brooklyn, N. Y.
Water Meter.-J. S. Swan et al., Kanawha,

## zerent gamtiran and foreign getents.

## Jane D. Evans, Weat Chester, Pa., executriz of He

Jane D. Evans, West Chester, Pa., executrix of Henry s. Evans, de
ceased.-This is an improved ralliroad signal. so constructed that the ad vancing train will itself set the signals to indicate its approach and de parture. Two pairs of inclined bars are pivoted at the sides of one of the ralls in such positions that the free ends of sald inclines will be struck and pressed down by the wheels of the cars. Tae inner ends of the inclines of each pair are pivoted to opposite arms of a three armed lever, which is placed in a notch in the tie, with its third arm projecting downward. To a wheel formed upon the slanals, which are pivoted to the upper ends of two posts. Either of sald signals may be operated from the other, and
both set or both withdrawn at the same time. The three armed levers are both set or both withdrawn at the same time. The three armed levers are gasin rated to their former position, as soon as the pressure of the whee removed from the levers or inclines, by springs attached to thes.

## İmproved Rotary Harrow.

James W. Hanger and Joseph H. Ryan, Cliston, Mo.-This invention re lates to means for sdjusting the plvoted harrows, so as to cause one side
hereof to work deeperin the ground than the other ; also to a spring coneotion between the tongue and axle and a caster wheel, the same also upporting the driver's seat, whereby the weight of the driver effects little change in the pressure on the harrows in passing over rough ground, while ret exerting a constant spring leverage on the tongue; and lastly, to the eans of adjust

## Improved Steam Boileg.

Joseph Shackleton, Rahway, N. J.-This invention relates to an inprove ment on the improved steam bofler upon which the same inventor re-
celved a patent dated April 5, 1870. The water receptacle is provided with waterinduction pipe at the lower part, and a steam eduction pipe at the top. A system of plpes extende through in horizontal direction, and is arranged symmetrically to the horizontal axis of the sysiem in such a manner that an intermediate series of plpes is placed dlagonally between and sidewise of the adjoining sertes of plpes. Every two corresponding horizontal plpes are connected in vertical direction by elbows to form phe rectanglen, which extend gradually from the smallest innermost ther
to the larger eatermost serfes, each rectangle being placed in separate connection with the water receptacle. A horizontal plate is immediately below the appor pipas of the innermost rectangles, extending laterally to the fall width of the recoptacle, and causing the impinging of the fire eporean, to that it in devilated from its direct upward course toward the chimpay at the top of the furpoce and thrown sidewise, passing between and aroand the rertloal pipes toward the upper corner of the rectangles,
and theno along the top of the furnace to the chimney. The apper parts and thenof slong the top of the farnace to the chimney. The apper parts
of the pipe recteagles afe thereby fully brought into effective partictpa.
tiln thon, an
ised.
Improved Post Hole Digger.
James $W$. Thomsin, Portland Mills. Ind.-The pait hole diggers now
known to the public Chave the ends of the blade or the two blades known to the pubich have the ends of the blade or the two blades pressed
farther and farther apart until the lowest portion of the cat is reached, and leave a long slip on one side of the tool uncut, in which are often roots that bind the parts of earth together. This causes these old tools to stick, and to be raised with so much difflculty that they are thereby rendered impracticable in actual use. To avold this difflculty the ends of the tool are, in the present invention, caused to overlap each other,
so that they are only in line, and end to end at the bottom of cut, every so that they are only in line, and end to end at the bottom of cut, every
particle of the sides betng thoroughly exclsed, and the whole core coming out clean and without obstruction from the sides.

Preparing Transfers for Panel Sign Painting. Charles H. Gordon, Brooklyn, N. Y.-Paper is Arst covered with a coat
of starch, then calendered, and another coat applied, followed by a wash of gum arabic. The whole is next covered with a coating of clear white varnish. When the varnish is thoroughly dry it is dusted over with French chalk, and the letters or figures printed from the first plate with strong
clear varnish. Sald letters or figures are dusted with arst color, say gold clear varnish. Sald letters or figures are dusted with frst color, say gold
or red. When dry, and all superfuous color cleaned off, the foundation or red. When dry, and all superiluous color cleaned off, the foundation
for the next color is laid, say blue, asiog the same process as for the first color (printing in varnish), and so in each color, till the whole of the picture or sign is printed on the transferring medium. When quite dry a solld ground is printed, of white or color, which, when transferred to the panel, will form the groundwork or base of the picture, etc. After this
has stood some time to dry, but before it is quite dry, it is laid on a smoothis planed panel and passed through a machine, which causes the printed matter to adhere to the wood. It is afterward slightly damped and the paper removed, when the whole, groundwork, color printing, and varnish will be found transferred to the panel. Any and overy kind of printing, it is claimed, can be trested in the above mapder, ithografbic, letter press
or the anast ateel en raviga. or the daest ateel en ravtinga.

Edwin C. Gould, Bridgeport, Conn.-A Machine In the middale part of the frame it so arranged that one of its revolut. ons will oecclliate a seoond shaft. To the lat ter are attached two pairs of arms projectung from its opposite sides. To the ends of each palr of arms 18 at.
tached a striker, the edges of which, when the shatt rocks or oscllates, tached a striker, the edges of whtch, when the saft rocks or oscllates,
sirike againat the under slde of the cloth as it pasees from the flock box or sifter to the roller. The striker bars should strike the cloth in as neariy a perpendicular direction as posible, and the effect of thetr action lis to
straighten tre fock, spread 1 evenly over the cloth, and at the esme time
 knock off the surplus fock. The oscillating striker renders annecessary
the roliter by which, In the original machine, the flock was preseed down upon the cloth, and produces a better article than when sald roller was
used. used

Improved Brick Machine.
John S. Derby, Leavenworth, Kas.-This invention consists of a rotary brick press with radial molds, which turn in a mold ring supported on a bricks are molded in the ordinary menner and placed into the molds, and undergo successively the operatious of pressing by means of an upper and
lower press board, worked by suitable hand lever power, of cutting off to lower press board, worked by suitable hand lever power, of cutting off to size. and of smoothing the upper surface. The lower press board of each
mold is then carried up by means of its silding pliton and spring top, in connection with the hand lever, so that the bricks may be removed, and the board, by passing under stift bruahes, be cleaned, with the top of the mold, from sand and other impurities. The contact of the spring top with a projecting pin releases the lower press board, and carries it back into
position for recelving a new brick. A shield or casing of the upper press position for recelving a new brick. A shield or casing of the upper press
board retains the clay theretn, while sultable adjusting devices regulate board retains the clay theretn, while sultable
the size to which the bricks have to be pressed.

Improved Brake and Rest for Carts.
Jardine, Westchester, Pa.-This invention con
William C. Jardine, Westchester, Pa .-This invention consists in arran ging, on an ordinary tilting cart or dray, a brake and rest. so that when a
cart is propelled down an incline the brake will kold and eheck the speed and at the same time the front part of the body of the cart will be sup-
ported and the body retained in a horizontal position, thas relleving the welgnt

Improved Billiard Table Leveler.
Lyman A. Hunt, North Adams, Mass., assignor to himself and Sylvester N. Gardner, Troy, N. Y.-Tbis invention consista of an inverted metal cap
resting on the floor, with an oval-headed screw screwing up and down in a nole in the vertical axis of said cup, and carrying on its head a disk an which the table leg rests. The disk has a socket in the center of the under side, in which the head of the screw fits to keep ald disk from Jarring off.
Each leg belng provided with a toot, the sorews are turned elther way, as required, bla a wrench applied to the head to ralse or lower the table, and thus ad

Dwight Hitchoock, New York citre Protector. or more of which are used, according to the required hight of the probent outward to form a ward to form a hall-round transverse groove. In this way are formed sockets to lecelve the wires, the arms of the loops or bends of which over-
lap or interweave with each other. Upon one end of each strap is formed a small tongue, whlih fits into a short transverse slot, formed in sald straps near their other ends. Holes are also made in the straps, in such
positions as to colncte with each other when the ends are overiapped, to recelve a short bolt, which is secured in place by a nut screwed upon it. The oater arm of the last wire loop at each end of the straps overlaps the
last arm of the loop at the other ends of the sald straps. This construclast arm of the loop at the other ends of the sald straps. This construc-
tion enables the protectors to be opened out flat for conventence in packing for storage or transportation, and to be conveniently placed around the trees when required.

Improved Wash Boiler.
William Kolb and Mathlas Kolb, New York city.-A partition wall divides each other, whlle their upper parts only do so by means of a valve. After the boller has been filled with soap suds up to the grate, it is set over the fre. As soon as steam forms, the suds will be forced out of one compart.
ment into the other and through the wash. When nearly all the water has ment into the other and through the wash. When nearly all the water has
been forced out of the first compartment, a buoy connected with the valve will no longer be supported; the valve will, therefore, open, the steam the suds have risen so high theren that they float the buoy, the valve will be closed again, and the conflined steam will again force the suds out of the compartment, and a continuous clrculation will thus be malntalued.

Improved Felt Cleaner for Paper Machines. George Dunn and Robert McAlpine, Lee, Mass.-This invention conslat machine, for cleaning it, mainly on the under side, of the matters collect ing upon and adhering in the progress of the work, by suction continuously applied to the felt while in the performance of its function. It also consists of a perforated jet plpe, in combination with the felt and the
pump, also for cleaning the felt, but more particularly its apper side, by egular work of the machine ; also, without removing the felt for washing, as is required in some cases, and it is also designed, by acting continuously on the felt while it it at work, to keep it clean and in ils best atate at all time
Improved Steam Boiler.
Nicolas D. Harvey, New Orleans, La. -The sides of the fire flue, back of the bridge wall, or the back ends of the bollers, are jacketed, and the mud dram is connected therewith. In this arrangement the feed water is
pumped into the jacket, and not direotly into the boller. Before the feed water enters the boller it is heated to the bolling temperature, and the sediment is deposited in the jacket, and readlly finds its way to the mud drum, and is blown off. The water in the bofler is, therefore, kept comparatively pure
lmproved Water Feeder for Locomotive Tenders. Mirabeau N. Lynn, New Albany, Ind.-The first part of this iuvention
consists of a jointed arrangement of the spout, of pecular construction, to adapt it for swinging laterally to the well in the tender, In case the latter does not stand directly in front of the spout, and thus save the adjust-
ing of the tender so exactly as is now required, and which is diffcult to do. The second part of the invention consists of a float open to the water below, and closed to the air at the top, with a plpe to admitt air to the surface of the water in the interior space, so that the water will not be pre
vented by atmospher:c pressure from flowing out through the spout when the surface is inclosed airtight by a strong cover of ice. $\mathbf{A}$ description and illustration of this device will be found on page 102 volume XXVIII.,
this journal.

Improved Kevolving Swing.
Willam A. Lowery, John A. J. Lowery, and William W. Lowery, Salem, Ind.- The latter is arranged in a stepat the bjttom, and a bearing at the top, to be revolved for carrying the seats around. The guys, for support--
ing the outer ends of the arms, are connected at the upper end with tre top of the shaft by a cap, to revolve with the shaft, so that the latter is rotated by horse power, communlcated to a

Improved Cutlory Handle.
George A. Seaver, New York city, and John C. Miligan, soath Orange,
N. J.-This invention conaists of two ooncaro-convex pleces of sheet metal, with fat margtias, combined with the tang of a knife, fork, of other article, to form a handle. The pleces are placed on one alde of the tang,
with the convex side out ward, and secured by lapalng the edges of one pressing them together, thus maklig a atrong and turable handle, with the requildte amount of swell, out of thin sheet metal.

John R. McConnell, Improverioo, Iowa.- The bent axle arm may be moved ap and down to adjust the machine to run level. The furrow wheel works between the rear part of the mold board and the land side of the plow, and
its lower 1tt lower side anpports the downward presure of the plow, and thus dytn.
18hes the friction, and consequently the draft. The dratt bar and beam are made of such a length that the furrow may be turned by the rear plow juat in the rear of the furrow wheel. The rear plow may be readly adyusted to take more or less land, as may be destred; and by saltable mechantem,
governed by a hand lever, the plows may be ratsed from the ground, or ad. governed by a hand lever, the plows may b
juated to any destred depth in the ground.

Improved spindle.
Willam G. Bartley, Rochester, MInn., aseignor to himself and Anson B
 recelve the oll which drips from the bolster bearing above allo, hole through the pulley to conduct the ofl down, and also a tube on the under side of the puller, extending down the spindie for some distance, to conuct the oll which dripg from the boister rail down to the step, and pre ton is deefigned for the atndies of jacks, mies, and other apter thon 18 destig
machinerr.

Improved Fender for Vehiclen.
Washington Bryant, Batesyile, Ark.-This invention is an 1 mproved de vice for keeplng the wheels of a wagon free from mad, to prevent it from
logsing the brakes or loadting down the wheels. The tivention consitata the arrangement of scrapers attached to extenslons of the rear ends of ounds, with the wheels or a wagon. They extend along the inner side of
he wheel to the pertphery of the inner end of the hub, so as to scrape both he wheel to the pertphery of the tin
t and the felly, and also the spokes.

Improved Graining Roller.
Cutcago,
II.
This is an timproved
Willami H. Burns, chicago, ill.-This is an improved roller for transfer con the natural grainling of any desired wood to a wood or other surface, hon enabling roller grating to be applied It places where the ordinary grainning roller cannot be used.' To this end, $t 1$ is made with a shoulder a

Thomas M. Allen, Macon, Gmproved Plow.
Thomas M. Allen, Macon, Ga. -This invention is an improvement in the liass of plows whose standards and the braces therefor are made ad juata. hall enter and ran in the ground. The plow plate may be deteched whe deatred, and the beam, standard, and brace may be readily adjusted to une the plow to work deeper or shallower, as may be destred.
Improved Machine for Making Gear Wheel Patterns. Joseph L. Hewes, Newark, N. J.-By this invention, it is proposed to do
the fitting of the rim, the teeth, and the finishing of the tecth of pat all the fiting of the rim, the teeth, and the finishing of the tetth of pat-
tern wheels by mechanical devices, and thus to secure exact uniformity tern wheels by mechanical devices, and thus to secure exact uniformity
of shape and dimensions for spectal work, but largely economize in time of shape and dimensions for spectal work, but largely economize in time
and labor as well. The wheel rim of an ordinary gear cutting machine is and labor as well. The wheel rim of an ordinary gear cutting machine is
fitted with teeth on the arbor whereon the wheels to bave teeth cat in the grooves ; then, in place of the sllde carrying the gear cutter, a sllde applied having a saw capable of adjustment, so as to saw the face of the rim for dovetall grooves. With the same sawing apparatus, but with several different interchangeable cutters and an adjusta ble clampholder for holing the blocks of which the teeth are to be formed, mounted on the mandrel for holding the rim to have the grooves cat in it, said rim being
removed, are fitted the teeth with tenons for the groovas of the rim, so that all are fintehed expeditiously and allke.

Improved Printing Press.
Riason B. Cooper, Monticello, N. Y.-One of two toggle jotnted arms is plvoted to the stationary type bed, and the other is mounted on a support,
which is movable in slots in the frame toward and from the stationary plvot of the Arst, and springs are attached to draw it up toward sald sta
tlonary plvot. This movable support is connected with arms which tionary plvot. This movable support is connected with arms which carry the platen. The arms are connected at their joint by a yoke and connecting
rod with the foot treadle for forcing the treadle up to the type bed by pressing the foot treadle down, which slldes the support away from the bed, and, at the same time. brings down the joint so that the powerful action of the arms comes into use when the platen comes to the bed. By
connecting the toggle jointed arms to the platen arms by the movable apport, greater movement is obtained with arms of a given length than

Improved Preat
Improved Pressure Regulator for Fluids.
Harmon S. Young and Willism H. Berger, Danville, Pa.-The object of
this invedtion is to regulate the fow of gas or other fuids in conducting pipes, and consista in valves applifed to gas or other fiulds in conducting different areas, and so located within a shell or case with reference to its Inlet and outlet orfifces as to rise or fall, according as the pressure of the
fuid varies below or abcve a given number of pounds to the fnch. The ressure is determined at wall by a tem of the valves.

Improved Percolator.
Laurent Dursse, Grafton, w. Va. Wis invention relates to glass perco lators used in the preparation of medicines, and consists in novel means
which enable the tendency to a too rapid evaporation to be entirely Improved Attachments to Carpenters': Squares. carpenter's square of novel structure. One great object of this device to enable a true dlameter to be obtained by almply placing the legs so that ach is tangential to a circle with the bisecting arm in place; and another enable different radial linas to be made from the same center, withou any change in the adjustment of the instrument, but by simply pivoting

## Improved Middlings Purifier

Joseph E. Gardner, ing midaings, and conse and $\begin{aligned} & \text { the case, and having a spout comblined with an inclined revolving clot }\end{aligned}$ bolt with subjacent conveyer chamber.

Improved Self Corking Bottle.
Henry Miller and Thomas Miller, Pittsburgh, Pa.-This invention relates 0 an improvement in soda and other self stoppered bottles. Hitherto cific gravity as to require the bottle to be inverted in order to be alled. In this invention the stopper is of less specific gravity than liguids, which is also constructed in a pecullar manner, conducing to strength and proViding a suit
discharged.
John R. Crockithproved Bcaffold Clemp
John R. Crockett, Obo, Tex.-This invention consists of a clevis which is
laced around the apright post of the scaffold, secured by a bolt, and provided with a eentral curved projecting part, to which the supporting plece of the jolsta is hung by means of a loop. The supporting plece is secured to the main pos' by an arm with a forked sharpened end. Whlle a forward
projecting U -shaped arm takes up the joist, presaing the forked end atrong. Into the post by the weight upon the joist.

Improved Car Starter.
Willam T. Beekman, P provements in car starters of the class in which the draft is applied to
a sepment pivoted on the axie, and so arranged as to be connected therewith by a pawl and ratchet when moring backward. The improvement consists in the comblnation and arrangement of a draft bar of pecullar sides of the whoels, so that they may take ap no oxtra apace but project
apward into the same box with the wheelf. It conolats. also, in stops


Improved Saw Jointor.
George S. Prince, Weat sallebury, N. H. -A short aite as long as the radus of the saw, has a crotched end adspted to rea on the saw arbor. It also has cllps attached to the edges to form guldes late has a head on the outer end in wit atscrews, so that the points of the teeth of the saw may be caused to ro againat the sides and be filed off to dress them all to the same length,
 It may be adjuated, while screws are so arranged with the head that the ale mas be adjuated higher or lower on elther side, or at elther end, ac

Improved Book and Mieet
Jullus E. Uliber, Porl Huron, Mich., aselgnor to himself and Frederick I Merryman, same place. - $\boldsymbol{A}$ sector shaped plate is hinged by tit back stril ngle, own, as required. The mastc rest t is ploteded to the lower end of the pllde or other be turned agaln under any angle to the sllde. The maste, book or other arttcle which is Intended to be used or exhibted on the stand,
is placed on the reat. and the same then aduasted in the exact position

Improved Press for Hay, Cotton, etc.
Improved Preas for Hay, Cotton, etc.
Christopher J . FIndiay and David D. Cralig, Macon. Ga.-This inventio consists in providing the tube or nut of a press follower with stmple re-
ceaseí and a single ball in each recess, the whole series of recesses and sills betng arche follower screw, and also in combling, with the flanges of the tube and ut, contcal rolls and a top-apertured and stde-notched ring.

Improved Furnace Grate Bar.
William C. Wren and Willam Meyrick, Jeddo, Pa.-This invention con porting bar extending across the furnace, by short transverse plates, which sustain the heat so far above the supporting bar that it is kept compara
tively cool, and ts not, therefore, llable to be warped, bent, or burnt, or to crack; and the bars which are subject to the heat, betig, made in shor pices, do not strain the supporting bars. The short bars break joints at
the meeting ende, to prevent a straight open space across the whole; also the meeting ends, to prevent a straight open space across
to gulde the rake used by the fireman in cleaning the fire.

Improved Rocker for Cradles, etc.
Wendell Wright, Phooncis, N. Y.-The object of this invention is to con vert at will a rocking cradle or chair into a standing crib or standing chair : when the rocker is in use, are turned inward, so that they do not in an mannerinteriere with the rocker.
Willam C. Bell, Orange Court Cultivating Plow.
William C. Bell, Orange Court House, Va -This is an improved plow fo
cultivating tobacco, corn, and other crops planted in hllls or rows, so con cultivating tobacco, corn, and other crops planted in hills or rows, so con
structed as to cut up and destroy grass, weeds, bricrs, etc., which may be growing among the plants, and which will allow the parts subject to wear to be readily detached and replaced by new ones, or by others better位
Improved Lamp Holder.
James Telfer, L'ance, Mich.-An arm of S shape is screwed directly into he standard of a sewing machine. The arm swings in tis socket in every The base part of the holder the provided with downwardeextending feed The base part of the holder is provided with downwardeaxtending fee
on which the lamp holder rests when screwed off, forming a neat base for the lamp, without requiring the taking out of the latter, which is retaine on the holder by band springs, which enclose the lamp armly until spread or taking the same out for refilling, cleaning, etc. By means of a shad

Erasmus H. Donaldson Stacesparvester Rake.
 rakes, made in two parts or halves, which are placed upon the opposite coss bar, and have cross heads formed upon their outer ends, which, whe the said rods are pushed outward, catch upon the shanks of the rakes, and ald said rakes extended whlle sweeping the graln across the platforin.
As the gavel is swept into the recelving trough or upon the ground, the as the gavel is swept into the recelving trough or upon the ground, the
akes are released by the inward movement of the rods. Suitable mechan sm is provided to withdraw the catch rods to release the rakes at the pro through which the rake heads sweep, starts a ilttle above the level of the cutter bar, passes below the same, and rises, at its inner end, above the
drive wheel, and with its end is connected a trough to recelve the gas rom wheel, and with its end is connected a trough to recelve the gave tached to the outer end of the platform, to prevent the rakes from swing. end of the platform.

Improved Shipper Lever
Isacac F. Hoyt. Glenville, Conn., assignor to himseif snd J. R. Pilling, o ointed to the main portion, and provided with a curved extenaton the joint in a slot in the other portion. This raises the spring catch out of the notches of the quadrant bar, when the handle, after being taken in
hand by the operator, is tarned into line with the principal part of the
lever.
Improved Feed Water Heater.
Robert O'Nelll, Negaunee, Mich.-The casing is divided into four sec Flisnges projeet of which the water is taken for the supply of the boller The heating plates. The plates are provided with a series of tubes, through
then which the water passes in descending from one section to an Jther. Thes tubes are about three fourths of an inch in diameter, and each plate is pro ilded with a large number of them, so that the water is divided and ez. dabsorbing the heat thereof.
Improved Sulky Cultivator.
Ephraim Ives, Pleasant hin, ind.-This invention relates to an arrange ment of means for adjusting the plows toward and from each other, and for
locking a plivoted portion of the frame. In this way the driver has complete control over bis plows, so that he can guide them in plowing crooked
rowa, in avolding irregular hills, and in plowing closer to or farther from he plants, as circumstances may require. The wheels and axie may be adwelght may balance the machine.

Improved Ratchet Drill.
ntion consists of a sleeve on the upper part of the drill spindle or stock, with a screw cap and a
collar, so formed that when the feed sorew is adjusted to its bearing at the apper end it can be bound fast to the sleeve. The latter extends down to rising on another toothed wheel on the drill stock and geared with it by a ittle shaft and two plnions. The wheel of the sleeve has a few more canses the feedscrew to turnslowerthan the spindle does,and thus slowly to crew out of it and feed the drill. The pawl of the handle acts on the whee of the spindle for turning it. By loosening the screw cap at the top of tne sleeve,the screw is fre
drill and releasing it.

Improved Reversible Plow.
John P. Dexheimer, Lawrenceburgh, Ind.- The pivots of an extension nold board are fixed in bearing brackets, one of which is arranged to silde It at any dealred point. The mold board may thas be oxtended more or
lest to regulate theturntig of the furrow, as may be desifed fer differe nt later to regulate
drida of rork.

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ind Best Boller Feeder in the market. W. L. Chase $\& ~$ nd Best Boller Feeder in the market. W. L. Chase \&
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iccated Vegetablea, Shelf Papers, and all applicatlon where absorption $\begin{aligned} & \text { s to be resisted. Samples on appl1- } \\ & \text { cation. Crump's Label Press, } 75 \text { Fulton St.. New York. }\end{aligned}$. For descriptive circulars, and terms to fames H. White, Newark, N. J., Manufacturer of Sheet Emerson's Patent Inserted Toothed Saws,
nd Saw Swage. See occasional advertisement on out. Ide page. Send Postal Card for CIrculir and Price List.
emerson, Ford \& Co., Beaver Falls, Pa.

B. W. F. is informed that an American gal on contains 231 cublc inches ; an English impertal gal. or black enamel on iron on p. 208, vol. 26..-P. S., who
skt questions as to roofng, etc., should send hit name ad address.-H. E. J. Ehould consult our acvertising C. is Incomprehesinible.- W.H. . . Wfil find directlons
for making inegar on p. 58, vol. 30. Solld opodelooc
 Asphaltum varnish is described on p. 233, vol. 26. For
painting on glasp, see p. 123, yol. 30.-T. F. will find d1-
 $3^{3}$, vol. 26.-J.' '1. B. will find a recipe for jet black ink p. 203, vol. 29.-S. A. M. will find directions for ma-
ing marking ink on p. 251, vol. 29.-For whitewash, see W. F. H. asks: 1. How can I find the veloWhat percentage of power do overshot wheels us
ally yiteld? A. From fity to seventy five per cent. 3 aly yleld? A. From firty to seventy-ive pel
con you give me a rule for laying out bevel ge
You will find it in any treatise on mill work.
A.M. B. says : 1. In vol. 30, No. 12, you he wind. B. says that this is against common cense.
Can ou explain it? A. You will find the matter clearly axplained on p. 176, vol
ifting power of au engine of 4 horse power? A. It
ould be able to lift 132,000 lbs. one foot high in a min. ould be able to lift 132,000 lbs. one foot high in a min-
te.
In our answer to L. E. I., in the Scientific In our answer to L. E. I., in the ScIENTIFIC
AMEBIIAN for Aprll 4, 1844. the sentence that " port area
one half that of the pliston" should read: " port area ne half that
from one twentifth to one fifteenth the area of the plsG. A. B says: We use two kinds of brake
hees on our cars, one of wood, the other of ron. My riend says that the iron ones are the best, for thereason that he can screw down brakes as hard as ne pleases
with the iron shoes, and the wheel will scarcely ever orce expended will canse the whel to sllde contrary, say that the wooden one is the best, for it is
the one whichretards the revolving of the wheel most With the least expenditure of "elbow grease;" we do general usage, but which will stop a train in a given time with the least power expended by the brakeman.
Who is right? A. The friction between the wheel and he wooden shoe would ordinarily be greater for the ame pressure. than when the fron shoe was used. 2 .
Whatgumcan get which will dissolve in alcohol and after drying be again soluble in water? A. We do not
G. W. M. asks: About how deep will cast or wronght iron rast, if exposed to all weathers? A.
Experments have not been very extended, bat it is will rust about 1-16 of an inch deep in 25 years.
S. H. D. asks: Why is it that a common the boller, will not take hot water but will take cold
water? A. The vapor formed by the hot water creates
G. R. B. asks: Is the weight or pressure apon the valves of a a teeam eng tine the e area of the ports or
opening whlch are covered by the valves multipled by openings whtch are covered by the valves multiphled by
the pressure per square inch, and are the valves balanced When the ports or openings are not covered by them IL short, is the theory of no port, no pressure, correct
and do the rules whtch apply to the figuring of thewelght or pressure on the valves of an engine also apply to the
pressure upon the plston packing? In other words can he rings of the so. called steam plston packings be set to its own welght and the unbalanced pressure of the steam onit. Thus, if an equal area is pressed on top
and bottom of the valve, all the pressure will be taken and bottom of the valve, all the pressure will be taken packing ringe are set out by steam presure
W. C. M. asks: 1. Is tallow the best thing
or lubricating an engine cylinder? Is there anything that will improve it for the purpose? A. Some prefer
oif. 2. How can I bleach tallow without injuring it?
H. W. says: 1. We attribute to Newton ep disco to the amount. Molecules repel each other according
 covery by declaring the law of gravitation to de a prin
ciple inherent in matter. In the same sense, is there not also an opposite law of repulsion which is a princi-
ple tuherent in matter? A. No. 3. I suppose it may be side that gravitation an an at phe, but an effect of force. In this view of the case, is of force ? A. No. 4. Do or can astronomers explain he theoryents of cosmical bodies satisfactorily upon petal and the centrifugal forces, or do they offer any basis which ignores the existence of a law, a princtple or an effect, of repulsion which is independent of the
above named forces? A. The moon falls toward the arth one twentleth of an inch every second, instead
of going off at a tangent. See Loomis' "Treatise on As. ronomy " 5. If the earth amings around the sun ${ }^{\Delta 8}$ orbit predetermined only by its momentum, its centri-
cugal, and its centripetal force, why is it that, when its orbit is once disturbed or varied, as it has been thou sands of times by the planet Mars, for example, that the
variation does not remaln a permanency?
[A. Where two bodies have exactly commensurate orblts, the orbt of the smaller body is entirely changed. Hence the gap
in Saturn's ring has been caused by one of its satellites. In Saturn's ring has been caused by one of its satellites
In the formation of a solar system, only those orbits urvive which are incommensurate with each other. hurled back into the depths of measureless space. What
is the power which operates with such irresistible certalnty? Can their eccentric orblts possibly be referre every known mechanical supposition opposed to such a theory? A. All bodies move with their greatest velo-
cities at the perihellon passages. Hence their ability to set awayagain. 7. But all orbits of all cosmical bodie are like those of comets, namely, they have an ellipsold-
al form of revolution. Does not this indicate the idea that the laws which compel them to retain thetr orbits are in all cases the same as those affecting cometary rev. theory of a principle of repulsion has already been ad nounced. It remains to ascertain how this law or prin some light substance, dried pith is as good as any. Let
one of thesie be surcharged with electrictty, and it will with the the olber. Let liw with each other a short time, long enough for their
electrieal condition to become equalized, and thes will repel eacn other. Now suppose the sun to be a highly charged
uncharged body, it foliows that the comet will be drawn toward the sun by electrical attraction. It 18 true that
the comet will be drawn by the force of the attraction of gravitation also and will be governed by its centri fugal force, but the electrical attraction will supple ment these forces. Arriving oear the sun, the electrical
condition of the comet becomes changed by reason of condition of the comet becomes changed by ieason of
ts proximity, and hence is repelled just as one pill ball is repelled by the other when the condition of the two has become equalized. It is proper to say here tha
while many varlous phenomena of electrical action are recognized, yet the whole subject of electrictity, its
ccnnection with heat motion, the contraction or expansin of bodiesby heat or from other cauaes, its deve.
opment by motion or from contiguity of bodies, it short. the whole theory of the correlation of forces, can hardly be sald to be understood, and in many respects is
halting and unsatisfactory. Whether the sun is surrounded by what mas be called an atmosphere of elec outermost planet, or whether the electrical condition of cosmical bodies is excited by their expansion by hea When they arrive at their points of elosest proximity to the sun (which appears improbable), one hing is cer
tain, which is that there is a law or princtple or effect of repulsion which is a necessary law, and which defnes those circular boundasies in space which the worlds may not overpass. A. Electrical forces appear to play
a very subordinate part in Nature. Stars are seen to collis cordance with the law of gravitation. The motes in sunbeam, the shining noctiluza milliaris in the sea, or
Brownan movements of minute particles under the $\pi 1$ 1roccope, may
colating stars
E. B. W. asks: 1. What is the rule for findthe area of the circular sector, bounded by the same arc, diminished by the triangular portion of the sector 2. Also of an ellipse? A. The area of an ellipse is equal
to 0.7854 times the long diameter multipled by the short ulate whe through an opening in the bottom of a vessel? A. The motion is given to it by the spiral form of the hole, o
the postion of the hole in reference to the poition of the hole in reference to the center of
the vessel. 4. Whatistine best recent work on sarvesing
tand best.
T. G. asks: 1. How can I solder or brawe
two pleces of brasi together steam tight? A. Seep 251, vol. 28. 2. What is the best thing to remove
scale from a boller? A. Try puting about two ounce of muriate of ammonis in the boller twice a week. what books books, or is practice alone sufficlent? If not books. Begln with Bourne's "Catechism of the Steam
Eugine." 4. What ts the best pat Euglne." 4. What
A. See p. 295 , rol.
C. R. asks: 1. How can I make a good ce
nent fur flling air neles in cast iroo ? I waut tome
 ze and shape ? A. Gene is no dragin elther case.
D. B. S. says: 1. In a lecture on electricity, plece of money was placed in a saucer of liquid that
ooked like water, and a person could have it if he could pick it out. In one band was to be placed a ball connec-
dith the wire of a battery, which did not have any fecton the person untll the other hand touct ed the itquid, when that hand would immedtately fly upward ably water. 2 Why did the effect the liqula? A. Th water in the basin was connected with the other pole of ine battery, bo that, on touching it, a violent shock wa given to the system, with the result you descitbe. ${ }^{3 .}$
Are caoutchouc and gutta percha the same? A. No. 4. WIll a bell give the same volume of sound if struck on
the outside that it will when struck on the inside, the ow betng equal in both cases? A. Depends upon the M. asks: 1. Do you think I can master methan books? Whose work would be the best on draft tna? A. You can learn a great deal from a book,
but there are many thinge that a drafteman should kDow that can only be acquired by expertence. We can re propeller make more turns,other things belng the si $m e$ in runuing againgit the tide than in going with it ? A.
We would like some good evidence that this is a fact
M. W. H. asks: 1. Will vegetable or any oon as the alcohol gets below $32^{\circ}$ Fah.? A. When the
mperature of the alcohol sinks below the freezing onpt of the substances contained in it, they will freeze. Why does a telescope magnify if we look thrcu h h
rom the big end at anything close to the litile end,
whlle, when looking at angthing to it sma!ler? A. In the former case the rays proceeding
from the object glass enter the eye as a diverging beam 3. It there such a thing as a stngle plass telescope, or
thing that can be used as a telescope? A. A single 4. Will nitro-glyceri gether, or does tt have to be stirred together and left to
stand for a whlle? What are the proportions of chem stand for a while? What are the proportions of chem-
cally pure nitric acid, sulphuric actd, and glycerin, by
M. M. asks : 1. Where gas from the city works can be bought for ${ }^{83}$ per thousand fect, would it
be economy to generate hydrogen by the action of sul be economy to generate hydrogen by the action of sul.
pharicactd at 3 cents per lo. upon iron turningsat 1 cent per lb, , and give it luminosity by passing through a If these ingures represented the enilre expense of the manufacture, it would be. 2. What is the cheapes out expensive apparatus? A. The oxygen compantes use chlorate of potash heated in iron pots. The sim phicity of the plant employed and the purity of the ga 3. air through a fiame of tiluminating gas nyon a plece o chalis of suffictent intensity to use as an illuminating
J. H. says: I have two coal shafts, both for upcast. I am using for a ventulating power, at the to the furnace I bave the upcast elevated 45 ree the level of the down cast; both shafts are of the eame
size, $7 \times 14$ feet. If I make the mouth of the downcast 18 feetsquare in place of ix14 and bring it down to the egular size at 18 feet down the sbaft, which Ithink weight or pressure of air in that shaft, and be any help G. E. D. asks: How can I make sensitized Ide downwards) on a bath of 1 oz. nitrate of silver in 18 oz. distilled water: add a few drops of ctiric acid to ad dry in a dark room.
E. D. B. asks: 1. Are the grounds of cameos iful green ones? If so, by what means? A. No. The ifferent colors belong to the various strata of the
tone. 2. What work on geometry has a full descrip on of the curves of the fourth order? I have heard bat, by the use of the ciscoid, an angle could be trisec
ed ; 18 this so? A. In treatises on the calculus. The scold is a curve of the third order. It is described in een a supposed metallic base of hydrogen discovered, is any such supposition entertained by Sclence? A. fsts; bat so far as we know, no such metallic base bas made from the stone lapis lazuli? If dot, what is the e 18 a
D. B. asks: 1. Where is the proper place
holta portable englne to a boller, on the side or on op? A. Either place will do, if the bolier is properiy bolted to the side of the boller, using a single crank? A. Yes, if well proportioned. 3. I bave a portable en-
gine, cylluder $5 \times 10$ inches and speed 120 revolutions er minute; the frebox is 20$\rangle \times x 19 y / 1$ inches, with 32 flues haust blast, contractid to $\frac{y}{2}$ an inch, in a stack 8 inches
In diameter and 17 feet high, The pressure is $\$ 0$ or 40 s. Would it be more economical to lengthen the bollould not recommend this change.
C. O. asks: 1. What is the difference be aween the actual and nominal power of a steam engine?
A. Actual power depends upon actual conditions under hich the engine works. Nominal horse power is ob
tained froma assumed conditions. 2. What would be the ower of an engine that has 36 inches stroke, 16 luches ameted of co bser, and cient data. See article on "Indieating steam En
 haif the power lost by the crank in convering rection near into circular motion? A. No.
S. A. R. asks: In making steam connections
using the giobe valive, which ena ot the valve should be be placed next the steam pressure? A. It 18 generally
placed so that the pressure 18 on top of the valve. some engines, bowever, prefer to arrange titin the other
 of Paris mold? A. It may be caused by tmparites, or
by tnaumfelent vent in the mold. 2. What kind of ant1-
 turned black and would not melt. A. You probably hav filled it with water, and then putin a cork with just
enough lead on it to make it elnk very slowly. I then connected a force pump to the bottle, supposing tha
when the pressure became great enough the cork would When the pressure became great enough the cork would
rise to the eurface. I put 35 lbs. pressure on the bottle,
but the cork stayed down. I then took off enough lead but the cork stayed down. It then took of enough lead
so that to would just loat; then when the pressure was put on, the cork went down and would come up when I
lessened the pressure. A. When the pressure was in-
creased, the air in the cork was compressed, and sumf. creased, the air in the cork was compressed, and suff ure was taken off, the air expanded and forced out the
H.S. H. asks: If a quantity of air be compressed to halk its bulk, what pressure will it exer
against the sidees of a vessel ? By wat rule of proporgoverned? A. It the temperature inversely as the 1408 th power of the volume.
T. W. M. asks: Can you tellme of a cheap
and simple method of reproducing manuscript music? A. Write it of lithographic transfer paper, have
R. U. asks: How is phosphor bronze made A. Phosphor bronze te made by adding a small portion of phosphorus to common bronze or gan metal. The
latter is composed of 90 parts of copper, and 10 parts or less of tin. To this, from 6 to 10 per cent of phosphor is added, to make phosphor bronze.
C. R. asks: How can I make French polish,
 of finnnel with pollsh, stretch a clean linen rag over the
fannal, appply one drop of Hinseed ofl to the linen, and
rub in a crculardirection
rub in a circulardirection.
P. H. B. asks: What kind of roof will a
composition, said to be composed of French asphaltum, composition, sald to be composed of French aspailaum
hydraulic cement, salt, coal, tar. and sand (of such consistence as to be easily kpread with a plasterer's
trowel upon paper felting make? What tit the differ.
ence between Freach and American aspaltun? What is and what are the uses of an oll called deaz ofl, sald to be mixed with carbolic actd for disinfecting purposes?
A. There is no aspbalt called French asphaltum as distinguished in any pecnilis qualty from any other as-
phalt. The comblnation of ingredients specifled by you is useless for the purpose indicated, as the salt would
destroy its eflliciency by continually attracting molsture destroy its effliclency by continually attracting moisture
from the atmosphere. Dead oll is the last that comes to dry well in such a composition. A great deal of the material complaine:d of is sold to be put on by the pur-
chaser, and unless properly latd is not likely to give chaser, and unless properly latd is not likely to give
satisfaction; cases have occurred, we are informed,
where the material has been sent out with the plainest directions, and where, nevertheless, the preparation o
felting, etc., bas been laid with the upper side down thusexposing to the weather a surface never intende
A. D. B. asks: Will copper wire, which is covered with cotion and then with itho thicknesses of it may be used. 2 have a coll which is too small, the covering of the wire
of the primary of which 1 m worn off in some places, 㚙d
the secondary coll has been cut in several places. Can the secondary coll has been cut in several places. Ca
I mend the ine wire, and, with more added to it, use it
for the one I wish to make? A. There is no reason why for the one I wish to make? A. There is no reason why
the wire should not answer when properly jolned. 3. Is it necessary to put layers of olled pllik or other ingulator
between the layers, it being covered with cotton? A. The ofled silk will perfect the insulation.
$\xrightarrow[\text { Auttars made of ? }]{\text { A. }}$ A. Well seasoned pine is frequently
C. G. asks for a recipe for making furniture
pollsh. A. Take pale raw linseed oll 10 oze., lac varnlsh and wood spirit each 5 ozs. Mix well, and it 1 s ready for
use. This is a reviver for French polished wood. C. R., and Mrs. G. W. P. ask: 1. How can I will stand the weather? A. Put a very little blue black
in ordinary whitewash. 2. How can I make a dark brown color for the same purpose? 2. Use
ocher in whitewash, to the sha':e required.
A. H. W. G. asks for a recipe for turner's
cement, for bolding small articles in the lathe. A. Take Burgundy pitch 2 lbs., resin 2 lbs., yellow. सax 2 ozs. dried whiting 2 lbs.; melt and mix.
D. E. R. asks: How can I put a fine polish on wainu
or 4 pleces of sandarac, each the size of a waluut, add 1
pint pint boiled on, and boni together Yor 1 hour. While
coollig, add 1 dram Venice turpentine, and it too thick,
a little ofl of turpentine also. Apply all over; and after a few hours, rab it off.
G. F. F. asks: What is the best thing to
use in cleaning silver plated goods? A. Prepared chank
in cold water: apply with a plate brush, chamols in cold water: apply with a plate brush,chamols leather
or soft woolen rag.
$\underset{\text { many other correspondents ask for farther particulars }}{\text { Mr. E. Kireersky, }}$ many other correspondents ask for further particulars
as to burning brick with petroleum, described on p. 5 s
of our current volume. Will our "Old Subscriber" of our current volu
send us the detalls?
J. S. G. asks: 1, Has the exhaust steam of
high pressure engine ever been used as a source of power? A. Yes. In the compound engine, its expan-
sive power is utilized. In other inventions, it is used
to to runa aecond. bolling polnt. ted? A. See pp.116, 394, rol. 25.
C. R. McC. asks: I. Can water be raised and 1,600 feet distance through $*$ plpe with a strong spring and 21 feet of fall from springhead to ram? Would such a pltuation afford a reasonable eupply of
water for ad welling and barn, by using the most im. proved ram? A. You can make a good ram answer the
purpose, if yeu have plenty of water in the spring. A purpose, if yeu have plenty of water in the spring. A
manuracturer will give you instructions as to the
proper size of pipes.
C. F. B. says:
by atove, which I wish to ventilate by leading a regiss. ter into an air passage between the boarding and plas-
tering. Where should the register be put, at the top or ers, one at the top and one at the bottom.
 dipplng them in the molten metal or by electrictity Would it prevent them corroding without injuring the
emper? I have succeeded in tinning a few without emper? I Ihave succeeded in tinning a few without in
uring their writing qualites, with a comman soldering ron, with the ald of muriate of zinc. A. Steel pens plated with dif
P. H. W. asks : 1. What is tin foil, such as
used for wrapplng tobacco, composed of? A. An an lysis of a plece of tobacco tin foll in our possession Seven other samples obtained from different sources bad the same composition. 2. What are storm glasses, Indicating changes in the atmosphere in advar ce of
storm, wind, etc., flled with? A. See p. 123 , vol. 29 . J. W. B. says: I. I wish to make a Rhum-
korfinduction cofl.
i have 10,000
feet of No. 32 silk overed wire for the secondary coll. Of what size and feet No. 12 copper wire, sllk-covered and varntshed
with shellac in alcohel. 2. What should be the diameter of the fron core? What should be the length of the
cofl? A. A bundle, 1 inch in dlameter and 1 foot long, No. 16 soft iron wire. S. What amount of surface best to make it of? A. 50 square feet of tin foll and 50 square feet of paper soaked in melted parafin is the
best known. 4. What is the best material for the ends of the coll? A. Glass or hard rabber. 5. About what
ength of spark will I be able to get from a coll of that ngth of spark willil be able to get from a coll of that
ize? A. If carefully drawn, pure copper wire is used well fasulated with paraffln or shellac, you will get a
apark 1 inch through air, with two cells of Grove's bat park. 1 Inch through air, with two cellis of Grove's bat-
tery. . What is used for poltshing black rubber with? . French oolisk. 7. Do you think I could make a defects? A. Yep;it is better to have less metal around
he secondary conl. 8. What book on electrictly and magnetism do you think the best?
A, Noad's is a good ork.
W. H. B. asks: : Is there any quick way of pound microscope will magnify? A. For sclentific purposes, it is generally determined experimentally by
means of a micrometer. If you can find the foci of the object glass and the eyeplece, the magnifying power of
each can be determined approximately by dividing 10 by he focal distance. The magnifying power of the mi-
roscope is equal to the product of the two magnifying W.
M. M. S. asks: 1. What load will a thim Wheels betng three feet and one half in hight? A. We
ree not familiar with wagons of that kind. 2. What is he largest sized cube that can be cut from a glo
whose diameter is 12 inches? A. One having a fsce about 6.93 inches square. The rule is to multiply the
radius of the sphere by 1.1556 , to tind an edge of the M. \& S. ask: What is best to use on chills
. o prevent blowing? A. You do not send sufflelent de-
talls to ena ble ns to give you any information. Matters of this kind are best learned by experience. They may was asked how he mized hls colors, snd replied "with brains." We have seen it stated, however, that it is a
good plan to cover the mold with a mixture of red lead L. T. W. asks: 1. Will you give me the $f$ heating surface in cylinder and flue bollers? A. Heating surface of cylinder boiler in square feet $=8 \cdot 1415 \times$
radius in feet $x$ length. Heating surface of flue boiler in radius in feet $\times$ length. Heating surface of flue boiler in
square feet $=8.1416 \times$ radius of shell in feet $\times$ length in feet $3 \cdot 1416 \times$ twice the number of flues $\times$ radius of flues in eet $\times$ length, of flues in feet. 2 . How do you estimate can give you no deflinte rula. sg. How can I compute ee area in square inches of a square fire box? A. The
rea is equal to the product of the length and breadth, supposing the surface to be flattened out. 4. How many ther words, if a high pressare be converted into a low ressure engine, how would you estimate the added horse power? A. It would increase the mean pressare In a certaln ratio, and the horse power
tio, other conditions being the same.
J. B. asks: Can a concavo-convex lens, $1 \frac{1}{2}$
aches in diameter, be made to throw a focus $\frac{1}{3}$ Inch in diameter at a distance of 48 inches? A. The foca mage of a star is a bright point. :The dlameter of the
mage compared with that of the object is proportional mage compared with that of the object is proportional A. S. says: 1. We put steam from a small ongine into a cank ior supplying the boners, likewise ricating. Will it hart our bollers or cause them to scale? We use terra japonica as a bofler purge, and
find it very effective in removing scale. A. The ofl will not injare the boilers, unless you use a very large
quantity. . When you speak of heating surface (in calculatig horse power), do you mean anct the parts ex-
posed to the action of the fire or heat, such as the tube back end of boller, and all below the brick work ?
All this surface is ordinarily counted. Some perso owever,do not estimate all. 3. Is there any means of nding where there is water for a well without digging
or it? A. If the soll is not rocky, you can mite bor ings with very ittile trouble. 4. Does a broad belt on a
pulley cause more friction if only the same iwelght be pulley cause more friction if only the same iwelght be
appled, as a narrow one? A. No. 5. What is the best material for preserving belts and keeping them in work
ing condition? A. Castor ofl is often recommended.
E. S. W. asks: What is the amount of re the air at a given rate, say 100 feet per second? When
the veloctty 18 equal to that at which air will flow into acuum, is the resistance equal to our atmosphere Does much depend upon the shape of the body? What
reiliable experiments have been made, and where cat rel lable experiments bave been made, and where can
the results be found ? A. Experiments on this subject are far from complete. A resume of the most important 18 given in ine Encyclopadia Britannica, and the rule is deduced that the resistance of the alr to the mo.
tion of a plane surface, in grains per square foot, is
equal to 16 times the aquare of the velocits in feet second. A sphere does not encounter more than one fourth the resistance that would be opposed to the
tion of a plane surface with the same cross section.
P. O. T. asks. How can I estimate the
amount of tanntc aclid in bark, leav es, and roots of dif. mount of tannic acta tn bark, leav es, and roots of dirr.
ferent kinis? A. By preciptating the tannin with promeasuring the preciptate.
L. W. E. asks: How many gallons of water re required, per horse power, to run a small englne tor
day? A. From 50 to 75 gallons per day of 10 hours. C. G. C. says: I am running an eight horse
engine with coal. The turnace has a poor draft ; would the pipe referred to in a recent issue of your paper, to
throw steam drect from bofler to stack, be of any use? tack. Would it be of any use to reduce thesize of the exhaust nozzle? It is large, I think 1 is inchesin diam-
eter. How small shall we make it? A. Generally, the xhaust can be arranged to make enough draft
G. E. S. asks: Will a tin boiler, 2 feet long enough to rua an engine cylinder 5 inches stroke and 3
J. T. and others: Foaming in boilers is esseam room, and too heavy firing.
W. S.W. says: 1. In your issue of March 14,
he statement 1s made that the combustion of 1 lb . o1 work of 300 herse power during the same time. work of 300 horse power daring the same time. A. The
work repreesented by 300 horse power is the same as that required to ralse $9,900,000 \mathrm{lbs}$. 1 foot high in a min. ate. Now every unit of heat produced by the'combus.
ton of coal, ifit could be converted into work, woalc be capable of rasising 772 lbs. 1 foot high, so that the 300 horse poper of heat required for antac total heat of combustion of ordinary coal exceeds this. 2. Have not theory and practice shown us that $2 x / 1$ lbs. consumption of coal to the horse power per hour is a
very favorable result? A. The large ocean steamert very favorable result? A. The large ocean steamert
at present consume about $2 / 3$ lbs. of coal per hour per
W.W.B.asks: 1 . Will a gun with a long barhings betng equal, probably one will shoot with a much precision at the other. 2. What was the name of the first newspaper printed in the world, and where was
it published? A. The first periodical newspaper whose not dispated; was pubished at London,Ma3 called The Weekly Nevos. 3. Where was the first ballood voyage made, and who made it ? A. At Paris, Novem-
ber 21, 17883. by Platre de Rozier, and the Marquis d'Arandes. 4. How much does the atanosphere surrounding
he earth welga? A. About $11,000,000,000,000,000,0001 \mathrm{bs}$.

COMMUNICATIONS RECEIVED.
The Editor of the Scientific American cknowledges, with much pleasure, the re ceipt of original papers and contributions upon the following subjects :
On a Theory of the Sense of Smell. By D. E. G.

On laying out Teeth of Gears. By H. I. C
On a Museum of Natural History. By G. L.

On the Cause of the Tides. By W.M. D.
On Steam on the Southern Rivers. By W. S

On Drying Lumber. By H. R.T.
On a Boiler Explosion. By A.
On Hydrogen. By V. P
On Modern Telegraphy. By G. L
On the Keely Motor. By D. D. P.
Also enquiries and answers from the follow-
ing:
C. W. Y.-D. E.
W. W. H.-R. H.

Correspondents whose inquiries fall to appear should
 that, for good reasons, the Editor declines th
address of the writer should always be given.
Correspondents in different parts of the country ask :
Who makes ax helves and similar wooden articles?
Who sells electric gas-lighting apparatus? Who makes cotton seed hullers and Hnters? Who makes a wood engraver's ruling machine? Makers of the above arti cles will probably promote their interesta
ing, in reply, in the soirntrioto Amerioas.
Several correspondents request us to pabish replies
to their enautries about the patentabluty of thetr 1 t . ventlons, etc. Such exquiries will only be ansered by letter, and the parties should give their addresses.
Correspondents who write to ask the address of certain manufacturers, or where specifled articles are to be had,
also those haviug goods for sale, or who want to find partners, should send with their communnications an the head the head of "Business and
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|  | EogIne, rotary, T. S. L. La FranceEnglie, rotary |
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| es supporter, C. West (r) $\qquad$ |  |

## Pipe, composition, J. S. Patric. Planter, C. D. Wrison ............

Planter, potato, W. C
Plow, J. M. Tingley
Plow, J. M. Tingley..
Pump, B. W. Felthou
Pump, steam mining, A. N. Roger
Pump, valve box arr angement, w. J. ..........
Pump val ve, steam, J. A. Hagan...........
Pump valve, steam,
Punch, P. S. Gabrio
Punch, P. S. Gabrio................
Purifer, middllngs, H. S. Jewell.
Purifar, middllngs, R. Royer.
Rallway rall joint, J. M. Clem
Rallwas \&, collistons upon, Ryder \& Piemond.. Rallways of snow. clearlog, S. G
Rake, horse hay, W. S. Archer.. G. Smith

Reffector, C. M. Murch...
Refector, C. M. M. Murch.
Refgetig connection, H .

Rosiler and harrow, w. J. Morgan .....
Rule, combination, c. H. Hardy
Sad iron heater. W. Fr
Sandal, rubber, J. H. Bentley.
Saw, W. H. Bent ley
Saw, cl rcular, W. P.
Saw grinding machine, W. Dreyer Saw handle, Murray \& Winterb
Saw mill, gang, G. W. Nichols Saw mills, feed roll for, T. N. Egery.
Saw mills, log turner for, L. P. Gllb

Saw swaging machine, w. Glue
saw toble, F. H. and C. N. Hanna.
Sawing machine, circular, o. A. Dean
awink machine, wood, J. L. Forker
screw driver, W. S. Kyle
crews, making chuck, w. Alisen.....
Separator, graln, E. H. Oshor
Sewing machine, J. and R. Blake..
Sewing machine cabinet, B. F. Loomis
Sewing machine clutch, Blake \& Davis..........
Sewing machine needie setter, H. H. V. Lilley Sewing maehine presser foot, O. Brewster. Sewing machine tension, R. Blake Shaft coupling, W. J. Silver....
Shingles, riving,
D. Shankland
Shingles, riving, D . Shankland
SLitp ${ }^{\prime}$ bottome, coatng fron, s .
Ships' bottoms, coating tron, S. Williams
Skewer extractor, H. D. Boss ...
 Snow scraper, w. Thompeon
Snow plow,G.C. Thomas
Soldering fron, G. R. Smith.
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Valve for steam pumps, J. A. Hagan. Valve, steam silde, J. Youngman Vehtcle axle, C. M. Murch..
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Vehtcle hub, P. B. Watson...
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Vehicle wheel, R. M. Buchanan.
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Vehicle wheel hub, J. V.
Veneers, cutting, w. Ellis.
Violin attachment, C. F. Albert...... Washing machine, J. B. and w. H. Cleveland
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Water closet tank, J. Griflths. Waterprooo compound, J. G. Hale Water wheel, T. N. Egery
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Windmill, Rue \& Mann..
Window screen, c. May
Wire, stralghtening, F. W. Mallet...
Wrench, adjustable plpe,

## Wrench, adjustable pipe, Wrench, plpe, A. Collis. Wrist covering spring re

APPLICATIONS FOR EXTENSION Applications have been duly flled and are now pending
for the extension of the following Letters Patent. Hear ings upon the respective applice
29,137.-CAr Couch.-W. A. Brown. July
2,162 -Prown 29,162-PLow.-L. Greene. July 1 . 29,180--Hoisting Apparatus.-J. Lemman. July 1.
29.212.-SPRING Hinger.-A. Acker. July 1 . 29.212.-Spring Hinge.-A. Acker. July 1.
29,264.-Boat Lowring.-W. Flowers et al. July 8.

EXTENSIONS GRANTED. 27,898.-REfleotor.-I. P. Frink. In two divisions. DISCLAIMER
47,113.-MAEIN Bolts.- w. J. Lewis. DESIGNS PATENTED 7,365.-Tia Sex.-J. Jepson, West Merlden, Conn.
 7,376.-TzA SET.-D. C. Wilcox, Weest Merlden, Conn.
7,977.-SPOON HANDLE.-B.D.Beiderha

##  330.-Pioturi Framp.-M.J. Rice, Boston, Mass. ,381--Wrather Vane.-A. Simon, Jersey City, N. J. <br> TRADE MARKS REGISTERED <br> 1,716.-BRAIDB. $\operatorname{trO}$.-Arnold et al., New York city. 1,71s.-Liquors.-E. C. Hazard \& Co., New York city. 1,719.-Frrtilizer.-J. Horner, Jr., Baltimore, Md. 1,719.-Fretilizer.-J. Horner, Jr., Baltimore, Md. 1,20.-Petrolevm Product.-E. F. Houghton \& C Philadelphia, Pa. <br>  1,722.-Gin.-Rtchardson et all., Cinclnnat1, O 1,723.-HATs.-S. Shethar \& Co., New York city. <br>  <br> sCHEDULE OF PATENT FEES. On each Caveat...... <br>  On appeal to Examiners-in-Chtef <br> On appeal to Commissioner On application for Reissue. <br> On application for Extenaion of Patent <br> On granting the Extensio On fillng a Disclaimer... <br> On filng a Disclaimer.................... On an application for Design (3X years On application for Design (7 years). On application for Dealgn (14 years) <br> CANADIAN PATENTS.

Libt of Patents Granted in Canada, April 15 to April 17, 1874.
3,294.-J. H. Thorp, Chicago, Cook county, III., U. I. Portable barglar alarms, called " Thorp’s Revolving
Bell and Taper Lighting Burglar Alarm." April 15,1874. Bell and Taper Lighting Burglar Alarm." Aprint, N.
, 2 295.-T. K. Knapp, Dansille, Liviggton count, N.T. Knife and scl ssors sharpener combined,calied "Knapp
Knife and Sclssors St arpener Comblned." April 15 , 1874.
$3,296 .-T$.

Improvements in mops, called "Knapp's Improved Improvements in men
Mop." April 15, 1874.
,297.-T. Piper, Hamilton, Wentworth county, Ont.
Improvements in clutching devices for driving sewing r.achnes, called "Piper's Improved Clutching Device for Driving Sewing Machines." April 16, 1874.
s.298.-R. Porter, Bothwell, Kent county, Ont. Machine or auger for boring pumps and other tubing, calle
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301. - H. Mackinnon, Toronto, York county, Ont. Im provements on coal oll cooking
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302.-I. Birks and J. C. Jouffray, Montreal, P. Q. Com position of matter, to wit, an eff ervescent drink, called
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zenge shaplng Machine." A pril 16, 1874.
304.-C. R. Shelton, New Haven, New Haven counts Conn., U. S. Improvements on driving whips, called "Shelton's Driving Whip." April 16, 1874.
305.-R. pros-R. G. Litlle, Halifax, Hallfax county, N. s. Im provements in chara,
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lisher - Thomson, Hamilton, Wentworth connty, Ont. agricultural Implements, called "Thomson's Exte slon Swivel." April 16, 1874.
son.-G. Boucher de Boncher
rangement simple et faclle autant quebec, Pur et commod d'attacher une corde et de sortir de la fenêtre d'un
étage superieur, pour descendre en cas d'incende, sans etre expose à ae frotter aux asperites du mur o a se hurter aux salies (Ne mote mot using a rope and hook to escape by windows or other openings ot any builaings in case of fire, called "Crochet Projec teur.") A prill 16, 1874.
308.-D. D. Tennant, Yonge 'township, Leeds county
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sis.-I. G. Covey, St. John's, N. B. Improvements coals.-I. G. Covey, St. John's. N. B. Improvements on lamp stoves, called "Covey's Lamp Stove" coal oll lamp
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s,314.-C. B. Pettengill, Hebron, Oxford county, Me.,
U. S. Improvements on kitchen implements, called "Berry's Kitchen Implement." Aprll 16, 1874. 3,st5.-W. A. White, Toronto, Ont., assignee of J. F
Ross, same place. Clothes bracket, called "'The Do Ross, same place. Clothes bracket, called "The Do
ble Bracket Clothes Dryer." April 16, 1874 . 3,316.-E. A. Smith and E. H. Robertu, Toronto, York
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,317. I. B. C
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on boot facks , called " The Parker Adjustable Booton boot jacks, called "The Parker Adjustable BootHamition, Wentworth county, Ont. Defice for antting stripa of cloth, raga, selvage, etc., for rag carpets, called "The Ladies' Favorite Rag Carpet Joiner."
April 16, 1374. April 16, 1874.
3, $221 .-A$. . F. Burnham, Borough of York, York county
Pa, called "N. F. Burnham's 1874 Turbine Water Wheel.
A pril 16, 874 .
mentifne, Indiana, Indana coonty, fa. Improve April 16, 1874.
s23-A. Smeaton, Quebec, P. Q. Improvements on Square." Apill 16, 1868.
,324.-M.Day,Jr., Mansfleld, Richland county. Imprevements in electric 11ghts. Aprill 16, 1874.
$3,925 .-$ J. H. Bean and W. H. Fisher, Cinc
,s25.-J. H. Bean and W. H. Fisher, Cincinnati, O., U.s machines, called "Bean’s Hemmer Attachments for Sewing Machines." April 17, 1874.
3.326.-R. Mackenzie, Montreal, P. Q., assignee of W. Perry, Jr., same place. Improvements on machine for making splral pri 17, 1874 Machine." April 17, 1874
Eng. Improvements on th rashing machines, called "Wilder's Improved Thrashing Machine." April 17, 3,928-R. H. Brown, J. M. Caller, and W. A. Perkins,
Salem, Essex county, Mass.; J. A. Enos, Peabody,
Essex county, Mass.; and O.C. Smith, Ipswich, Easex Essex, county, Mass;; and o. C. Smith, Ipswich, Essex
county, Mass. Improvements on leather-dressing ma county, Mass. Improvements on leather-dressing maa
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