

| A WEEKLY JOURNAL 0F PRACTICAL INF0RMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES. |
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| $\left.\begin{array}{c}\text { VoI XXXYV.-No. } \\ \text { [NEW SEREES.] }\end{array}\right]$ |

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## NEW RAILROAD DEPOT

We present herewith a view and a plan [see page 51] of the depot recently erected at Worcester, Mass., for the joint use of the Boston and Albany, the Norwich and Worcester, and the Providence and Worcester Railroads. The design, as will be seen in our engraving, is picturesque and effective, and the work is remarkably solid and substantial. We extract the following particulars from the Worcester Gazette:
"In the center of the front is the main passenger entrance to the building. About 15 feet from the entrance, and directly in front, is' a granite archway supported by double columns of granite. This is connected with the round part by a trussed roof, making three archways. The two at the sides are to be used as a driveway, thus enabling passengers to ar
rive and depart at all times without being exposed to the weather. On the outside of th round part a stationary aw. ning bas been built, which will cover a. wulk 10 feet wide, which is to be built under it. At the northwest corner of the building is a stone tower, the cap stone of which is $159 \frac{1}{3}$ feet from the ground. Above this rises a wooden extension feet from the ground. Above this rises a wooden extension
covered with slate, 40 feet in hight, and surmounted with a covered with slate, 40 feet in hight, and surmounted with a
rod and vane of 13 feet, making a total of $212 \frac{1}{2}$ feet. In the construction of the stone work of the building and tower, there were used 600,000 brick, 12,000 tuns of stone, and 3,000 barrels of lime and cement. Near the top of the stone work of the tower a large clock room has been built. It has not yet been decided what kind of a clock will be placed in it. A strong effort is being made to have one with an illuminated dial.
"The roofs of the two sections are each supported by eight heavy trusses one end resting on the wa'ls of the building, the other on the girders running over the heavy iron pillars placed through the center of the building. These two roofs are covered with slate, except a part of the two sides where they join in the center of the building. Over begins at the east and west ends of the bulding where it is begins at the east and west ends of the bulding where it is
about 3 feet wide, and ascends with a gentle slope to the
center of the building, where it is about one third the width of the building covered by the two roofs. This roof is made of concrete, and is built to catch the snow from the inner slopes of the two roofs, which would, but for this, slide down to the bottom of the pitch The two roofs are surmounted with ventilators running the entire length of each. On the top of each is an ornamental iron railing, while over the top of each arch is a large vane. The roofs of the ventilators are covered with 7,200 panes of glass, 12 by 34 inches in size, set in 360 sashes."

- The offices and waiting rooms are conveniently and handsomely fitted up, and the whole work reflects credit on the architects, Messrs. Ware and Van Brunt, of Boston, Mass. These gentleman, and Me. E. S. Philbrick, the engineer, have done their work under somedifficulty, as the uniformity of their design has been broken by the arrangemont of the side entrance for the Boston, Barre, and Gardner and the Nashua and Worcester Railroads. The Railroad Gazette, from whose pages we select the engravings, is our authority for stating that this unfortunate arrangement is due to the managers of these two railroads, who declined to accede to any other plan.
"Composito" Vessels for the Coast Survey.
There was recently launched at Baltimore, for the United States Coast Survey, a " composito" vessel-that is, a vessel built partly of iron and partly of wood. It appears that this vessel was built upon recommendation of Captain Patterson, of the Coast Survey, whose views on the subject are of interest in adding to our knowledge of the important questions affecting the shipbuilding trade. He says that experience has shown composito vessels to be more economical and more durable than vessels built either entirely of iron or entirely of wood, and that this is more especially the case in our Southern waters. In the composito hull, the frame and beams are of iron, and the planking of wood The waters of the Southern coast are found to seriously affect iron hulls, the Southern coast are found to seriously affect iron hulls,
so that after about eight years the iron fails. Five or six
years ago two small composito vessels were built for the Coast Survey, in Baltimore, and they have proved very successful; one of these, the Bibb, withstood the terrible cyclone which recently destroyed Indianola. She was subject to its full severity for ninety hours, but passed through it unscathed. In the period of nearly six years that they have been afloat, the repairs to these two schooners have not ex ceeded $\$ 600$. Subsequently anoiher composito schooner of 125 tuns was built, and afterwards a composito steamer of 200 tuns. Captain Patterson thinks that this class of vessels will in time be generally used, on account of their much greater durability than wooden vessels, which much more than balances the somewhat heavier first cost.

> Spontaneous Centennial Celebrations.

There is considerable significance in the hearty welcome about to be given in big and little towns all over the country to the Centennial year. Preparations are making in scores of cities, villages and hamlets for illuminations, processions, salutes, and other appropriate ceremonies, and we have ye to hear of one in which there has been the smallest difficulty as to the collection of necessary funds.
It is evident that the people every where are ready to second offorts for voluntary and spontaneous Centennial ceremonies so evident, indeed, that Congress can do the international exbibition no greater service than by declaring on the day of their reassembling that the exercises at Philadelphia shall be voluntary and not perfunctory. When Congress shall have said distinctly that no appropriation of government money shall be made to the exhibition, the people will not be slow to contribute every dollar needed for the proper conuct of the enterprise. So long, however, as the commis. sioners shall depend upon a government subsidy, they can expect little from the spontaneous enthusiasm of the people. This element of spontaneity is essential to the highest success of the exhibition, and there could be no surer way of destroying it than that for which the direct sponsors of the destroying it than that for which the direct sponsors of the
exhibition are mistakenly praying.-Nero York Evening Post.


THE UNION RAILROAD DEPOT, WORCESTER, MASS.

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## THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 4
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iiI. Lessons in mechanical drawing. -By Proprssor C. w. mac







## x. MISCELLANEEOSS,


COMBINED RATES

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WORKING MEN'S VISITS TO THE CENTENNIAL
According to present indications, the cost of living in Phila delphia during the Centennial is going to be high. It is but natural that the citizens will avail themselves of the golden opportunity offered by the immense influx of transient visi tors, and hold temporary accomodations at prices which wil severely tax the average purse. While this state of affairs
may not work as a hindrance to the visits of those living with may not work as a hindrance to the visits of those living with
in a moderate distance of Philadelphia, and who will there fore avoid heavy traveling expenses, it doubtless will be the means of keeping away a large number of others residing
in more distant parts of the country, and especially working
men, who will probably be the most appreciative visitors but whose funds to spare for the occasion will be closely limited. It seems to us that, of all classes which, it is ex stand first. We do not believe that any intelligent workman can examine the display without being improved thereman can examine the display without being improved there-
by, and that even the dullest individual will leave the by, and that even the dullest individual will leave the
grounds with his ideas widened and with some useful knowgrounds with his ideas widened and with some useful know-
ledge of the skill and progress of others, in at least his own $=$
The tendency of the present time is to dignify labor, to convince men that to work is not degrading, and that the educated worker with hands is the peer of the educated worker with brains. Mr. Gladstone in a recentadmirable address on Science and Art, says to working men : "Blend the beautiful with the useful, and the distinction between what is manual and what is mental will be lost, to the manifest gain of your class, to the unspeakable benefit of all." "Ennoble your work, and it will ennoble you" is the translation of the above into shorter terms: but to ennoble or improve work without edu cation is impossible; and in that subtle and most effectiv form of education which instructs by arousing the desire
strive and do likewise, the education afforded by the museum of art, and the exposition of other men's consummate skill, of art, and the exposition of other has been sadly lacking. With the Centennial, however, begins our greatest attempt to supply this need and by the Centennial is offered to working men of every cla3s such an opportunity to study and to emulate as no other exposition heretofore held has ever paralleled, even in point of magnitude. We need not argue further to show that what elevates and raises the working men likewise affects the whole community, and that, by benefiting the one, w indirectly, though none the less surely, benefit the other.
To come back to the practical side of the subject, it must beadmitted that, if excessive prices at Philadelphia are going to act as a prohibition to working men visiting the exposition and thus act as a bar to their acquiring the benefits referred to, then it is not only in the interest of the men themselves, but of those who directly gain by the work, to devise mean of avoiaing unnecessary expenses. And here we think is an opportunity for the unions and trade societies to come for ward and benefit their members. Some of the unions have large and influential memberships and possess considerable funds. A small tax would greatly augment the latter, and perhaps in this way a sum could be raised to put up and maintain buildings especially devoted to working men's ac commodation. These edifices need be but temporary struc tures on rented ground, and the charges for occupying them should be but slightly above actual cost of maintenance. If the large unions would each erect their own structures, and the small ones club together and build, all the trades would be represented, and working men of all classes would be provided for. For non-union men a slight extra cbarge, equal to the tax imposed on the society men, might be made, an thus in the end the unions, besides benefting all workmen would profit pecuniarily by the operation.
It would be a wise plan for large employers and societies to confer with railroads and other transportation companies and arrange special rates for transporting working men a prices below the reduced excursion tariff offered to the gen oral public, and to issue special working men's tickets, to be bought through employers and societies. In the same way he unions or any association of individuals may erect work men's accommodations and issue tickets for a certain number of days' board and lodging.
As regards the action of employers themselves, we pre sume that nearly all will see the benefit of affording thei men as much opportunity as possible to visit the Centennia Where it is out of the question to afford holidays sufficien for all to go, the privilege might be granted to the mos deserving, or held out as a reward for special effort. It
might be well for those who approve such a course to notify their men now that the two workmen in each depart ment of the works, for example, who should show the best record for attention to duty, etc., between the present time and, say, July 1, would then be furnished with tickets to and from Philadelphia, and lodging tickets while there, and given as many holidays as the employer might fix upon.- A repor from these men might be requested on their return, or they might be given to understand that each would be desired to explain before his comrades whatever be had seen of interest in their especial branch of trade. Another suggestion we have o make is that an employer should, when he is likewise an exhibitor, and displays some object which, like an engine or team pump, requires attention and care, instead of keeping ne man at that duty, if it be anywise possible, send a dif ferent one from the works every week, or every three days.
In this way a large number of working men may see the Exposition without the employer's incurring any considerabl oxpense.

## THEORY AND PRACTICE.

We published an article on page 8 of our current vol ume, in which we showed how the results obtained in prac tice, in regard to the effects of expansion of iron in bridges, did not agree with those of the theoretical calculations; and his is only one instance in which theory and practice ap pear to disagree. Some persons go so far as to assert tha they never agree, while others even say that they cannot
agree. We, however, maintain that they must invariably ccord, and that, if this is not apparent, the practice is de fective or the theory incomplete. This opinion is founded on an experience of many years, by carefully investigating all cases where such disagreement appeared to exist; and
our faith in theory has proved to be well founded in every case in which the theory was complete, and the practice, it
not perfect, at least of such a nature that the imperfections could be ascertained.
A case wherein an incomplete theory was taken as the
basis of a calculation is found in the article already mentioned, in regard to the effects of expansion of the iron in bridges. The data, on which the theoretical calculations was founded, were obtained from experiments concerning the expansion of metals by heat while the specimens were not under compression, and their contraction by cold when not under strain by extension. In order to use such data as the base for calculating the effects of expansion and contraction in iron structures, it will be necessary that the experi ments be repeated, and new coefficients of expansion and contraction be obtained by experiments in heating and cooling metals while under great strain ; in this way we may ultimately ascertain the law which modifies the figures now in use, which must be varied according to the compression or extension which is brought to bear on the expanding or con racting metals. Notwithstanding that this expansion and contraction are exceedingly powerful and able to overcome very great resistances, it cannot be maintained that such re sistances are without any influence on the amount of expan sion and contraction, and it is for the determination of these amounts, for different degrees of resistance, that new exper iments are required. This is only a single instance of the great work which yet has to be done by engineers in settling he data for calculations as to the strength of materials, cal culations on which depend the success, scientific as well as economical, of the labors of the many great men in the pro fession of civil engineering.

## DRAWBRIDGE INCONSISTENCY.

It has always seemed to us that no one could stand by the reat bridges which span the Hudson river at Albany, and witness the immense fabrics slowly swing their huge draws opeu to admit the passage of some puffing little tug not a hundredth part of the size of the whole structure, without being struck with the incongruity, if not absurdity, of the proceeding. A passenger train may be delayed on each bayk f the river, and crossers innumerable may wait as patiently as they may on each approach of the bridge: all this is of ess consequence than the passage of a tow of slow canal oats, or of some solitary sloop or schooner. The Albany ridges are, however, but a sample of drawbridges in gene ral, and the question why draws should exist in a grea number of instances, or why should vessels have the righ of way, applies to the entire class. Once upon a time, when ailroads were not, and the principal traffic of mankind was one by water, it was important that the path of vessels carrying on commerce should not be barred. Public policy gave them a right of way over the stage coach, and bid the latter wait until the more important conveyance had passed The law recognized this, and courts in their decisions wisely sustained the law in its strict interpretation. But as the times changed the law did not, and justice, proverbialiy blindfold, was especially so in this regard, and entirel ailed to perceive that the railroad had supplanted not mere y the stage coach, but the freight vessels as well, and tha rapid transportation was and has been for some time pas the last thing expected by those who ship their goods via river schooner or canal. Consequently justice or law has tupidly persisted in making the railroad train at forty miles an hour give way to the sailing craft at four knots, that is te say, cars loaded with perishable freight perhaps, or impa tient passengers to whom time is money, or the fast mails of the public, must stand a longer or shorter time on the brit $k$ of a river and wait the passage of a schooner load of brick or lumber. Why? If there be any sound reason for the preference, we confess our inability to perceive it.
Nor is this all. Although it presumably may be supposed hat,for the protection of their own property,railroad compa ies will avail themselves of the most approved means of voiding disaster and accidents, the fact nevertheless re mains that,despite such means especially adapted to warning rains approaching drawbridges, trains have run headlong nto the open gulf again and again. On most roads engi eers are cautioned to bring their locomotives to a full stop a certain point just before reaching the bridge; but here is elay again, coupled with the probability of the rule, lik very other based on human fidelity or prudence, being lighted or neglected.
If a bridge barred a great harbor, like that of New York or example, or even a less port, where the commerce by water was of major importance, it would be wise to give ve els the right of way; but such a condition of affairs pract cally negatives the existence of a bridge as a means of cross ng, since the repeated interruptions to travel would speedily cause a resort to tunneling or other means, as a cheaper and far more convenient alternative. It is, therefore, very rare] that we find the railroads blocked by drawbridges for really important causes. In the case of Albany, no occan vessels a end so far up the river, and nothing larger than the regu ar river steamers for Troy have occasion to go under the bridges. On scores of railroads, there are draws which serve no more useful purpose than the admission of a chance schooner into some short arm or inlet. It would be a much better policy to abolish drawbridges altogether wherever the ondition of affairs is such that a steamer by knocking down her funnel, or sailing vessels by lowering their upper masts, an pass under: or else to alter the laws to conform to hose now in existence in Holland, which forbid any vessel approaching a drawbridge when a train is due. It is a very easy matter to house topgallant masts in large ships, or to wer topmasts in a fore and-after; as for dropping funnels, is done, by every penny steamer that plies along the Thames at London, dozens of times daily, Bridges without draws
moreover, are very much cheaper to build and maintain than hose with them; and in cases where the draw is unavoide ble, it is very much easier to signal and warn off a slow sail ing vessel, or even a steamer, than a lightning express train

## THE CENTENNIAL EXHIBITION.

The prospects of the Philadelphia Exhibition are so gloomy just now that its friends are filled with alarm. United Startes has been made to stimater, but there is a very widespread feeling across the Atlantic that exhibitions are widespread feeling across the Atlantic that exhibitions are the completion of the undertaking from a people who refuse to respond to the most pressing invitations for subscription. As a last resource, the Exhibition promoters are going to Congress for a vote of $\$ 1,500,000$, or, say, $£ 300,000$. The ap. plicants state very plainly that it is their last resort, having failed to get what they need from the people directly, and that without this aid their enterprise may be limited and delayed. There appears thus far to be no party feeling upon this measure, and probably there will be none. The want of money is, moreover, not the only trouble in store for the management.
It will be remembered that foreigners refused to send their goods to America, unless they were permitted to affix the prices at which they could be sold if admitted duty free. This point was conceded without much opposition at the time, but the native manufacturers now find that they cannot possibly compete with foreigners in price, and they are now beginning to utter indignant protests against the publication of any prices. In a word, the protectionists are afraid that the people of the United States will learn so much at the Exhibition that they will rise en masse and crush the party. Already it is rumored that, if the price rule is adhered to, many of the leading houses in the States will not exhibit, while, on the other hand, if the rule is broken, for eigners will not put in an appearance. Altogether things do not look well for the Centennial ; and if we may be allowed to use an expressive Yankeeism, it is not impossible that the whole thing may end in a gigantic 'fizzle' after all."—The En ginerer

Our esteemed cotemporary is evidently not posted in re spect to the "hard pan" of the Exposition. He does not re alize that all the buildings are nearly done, that all will be ready before they are actually wanted, that all the arrangements are complete to ensure the success of the Exhibition and that there is not the remotest possibility of its becoming a "great fizzle.
The Exhibition Company has, it is true, applied to Con gress for a grant of $\$ 1,500,000$, which, if allowed, will be a convenient plum for the managers, ought to augmen the greatness of the affair, and add to its renown. Bu whether the payment is granted or denied will not material ly affect the fact of the success of the Exhibition, since tha is already assured.
In applying for this grant, it has been necessary, we pre sume-it is always necessary in such cases-to make use of a little special pleading. Our cotemporary has probably a lowed his ideas of the state of the enterprise to be more af
fected by this pleading than by the astonishing magnitude fected by this pleading than by the astonishing magnitude
of the works and labors that have been actually realized, and which, as stated, place the final success of the Exhibi tion beyond question.
We regret that our British friends have thought it unad visable to take any very prominent part as exhibitors; bu we feel sure that they will fiock here in thousands as visitors, and we shall welcome them most cordially. We hope to surprise them by the extent and extraordinary novelty of the display. If good old England is not a great contributor her people, when they come, will find that her descendant have not been lacking, and that they have appreciated th glorious industrial lessons which she taught them in 1851

## bamboo as a source of paper stock

The steadily increasing demand for fiber for papermaking has driven our manufacturers to the ends of the earth in search of new fibers. Not a few have looked with longing eyes upon the wealth of raw material going to waste, the world over, in bamboo thickets; and many attempts have been made to convert such fiber economically into paper stock.
Mr. Thomas Routledge, a progressive papermaker, claims that the slow progress made with this plant has been due no to any inherent unfitness of the bamboo, but to the fact tha insufficient attention has been paid to age of material used
Like the asparagus plant, the bamboo is succulent and ten der when young, but rapidly becomes hard and woody with age. When mature, it is, as all know, exceedingly dense, and in most varieties the outer part is so hard and silicious that it will strike fire like fint. To convert stems at this stage into pulp, they must be subjected to long-continued boiling in strong solutions of caustic alkali, at high temperature, under a pressure of ten or eleven atmo
Mr. Routledge finds that these objections may be obviated, and the bamboo made to furnished excellent fiber cheaply imply by using the plant when young and green. Before the stems become indurated and woody, a very mild treat ment of alkaline baths, at atmospheric pressure, suffices to
dissolve the mucilaginous and extractive compounds comdissolve the mucilaginous and extractive compounds com-
bined with the tissues, so that the fibers may be readily sep bined with the tissues,
For many years Mr. Routledge has devoted much time to the investigation of new fibers for papermaking, testing both
known fibrous material; and he does not hesitate to say that no other fiber can approach the bamboo in economy of production, and very few if any in the quality of the stock it yields for the manufacture of paper. And it has the further advantage of being practically inexhaustible in quan tity. The bamboo is of extremely rapid growth, and it flourishes in every tropical country. Grown under favorable conditions of climate and soil, it excels every other plant in amount of available fiber to the acre, and there is no plant which requires so little care for its cultivation and continu ous production. The estimated yield is twenty times that of flex, hemp, jute, or cotton.
In view of the threatened exhaustion of the supply of es parto, owing to the greed of the native collectors, the utilization of the bamboo promises to be a great public advantage, even if the paper produced from it falls far short of Mr. Routledge's anticipations. The sample furnished-Mr. Routledge's pamphlet on" The Bamboo Considered as a PaperRoutledge's pamphlet on "The Bamboo Considered as a Paper-
Making Material" being printed on bamboo paper-shows it Making Material" being printed on bamboo paper-shows it
to be fully equal, indeed superior, to much of the common and cheap news paper in use. In fineness and strength it surpasses any made use of by our great dailies, and in colo all but the Herald. It has, however, the serious fault of semi transparency, the letterpress showing through.
As an essential point in the proposed plan of utilizing the bamboo for papermaking consists in the use of young and preferably freshly cut stems, it will be necessary to have the fiber prepared where the bamboo grows, thus adding a new industry to tropical regions.

## OUR WATER SUPPLY.

In 1870 the average daily consumption of water in New York city was $85,000,000$ gallons; in 1871, $87,000,000$ gal ons; in 1872, $90,000,000$ gallons; in 1873, 100,000,000 gal ons; in 1874, 102,000, $\mathbf{C 0 0}$ gallons; in 1875, 107,000,000. A the Croton aqueduct is now used to nearly its full capacity the demand for water threatens to exceed ere long th amount which the aqueduct can deliver.
About 340 square miles of territory are drained by the Croton river above the dam. On this area the rainfall is sut ficient to furnish an average daily supply of $300,000,000 \mathrm{gal}$ lons. The actual yield of the river is very much greater showing that many of the springs which supply its tributary treams are fed from without the Croton water shed. Cro ton lake, which covers some 400 acres, has a storage capacity f $500,003,000$ gallons. The old reservoir in Central Par olds $150,000,000$ gallons; the new reservoir, $1,000,000,000$ nd the distributing reservoir on Fifth avenue, about 20,000 000 gallons: making a total of about $1,670,000,000$ gallons $t$ or near the sources of the tributaries of Croton river, in utnam county, there are many small lakes, some of them of great depth, which have been converted into natural reser-
voirs by lowering their outlets. Of these, Lake Glenida voirs by lowering their outlets. Of these, Lake Glenida
overs 182 acres, and will supply $168,000,000$ gallons, when covers 182 acres, and will supply $168,000,000$ gallons, when eet will supply $396,000,000$, llons: Lake Mahopac, 603 acres, drawn down 3 feet will supply $584,000,000$ gallons Lake Kirk, 101 acres, lowered 20 feet will supply $528,000,000$ rallons; Lake Barrett, 70 acres, lowered 10 feet will supply 198,000, 000 gallons; Lake China, 50 acres, lowered 10 fee will supply over $182,000,000$ gallons: a total of over 2,000 000,000 gallons.
Besides these natural reservoirs, there is an artificial reser voir at Boyd's Corners having a storage capacity of 2,700 , 00,000 gallons, and an unfinished reservoir on the middl ranch of the Croton which will have a storage capacity of $4,000,000,000$ gallons. Thus the supply of storage wate mounts to the enormous quantity of nearly $6.000 .000,000$ gallons, to be increased by thenew reservoir to $10,000,000,000$ In 1868 there were 9 days when the daily flow of Croton River did not furnish a full supply of water for the city; in 1869, 80 days; in 1870, 107 days; in 1871, 35 days; in 1872 30 days; in 1873, 109 days; in 1874, 85 days; in 1875, 39 days.

## socentific and practical information.

the largest glass cylinder in the world.
Mr. Thomas Degnan, of the Union Glass Works in Somer ville, Mass., recently made an enormous glass cylindrica shade or cover for a statue which is to be exhibited at the Centennial. The process began by inserting a long hollow ron tube into the pot of molten glass, and by careful mani pulation about 75 lbs. of the latter was caused to adhere to the tube. This was then taken to a wooden mold of semicircular form, in which it was rolled a few times by thre men, and thus brought to a white heat. It was then taken to wooden cylinder plased beneath the floor of the factory nd after it was placed therein, Mr. Degnan began the wor fashioning the cylinder to its proper proportion, which h did by blowing through the iron tube and into the body of the glass; while at the same time, two men, guided by wave of his hand, raised and lowered the glowing cylinde gently but quickly until it came forth finished, and measure 5 feet in hight and 74 inches in circumference.
cleansing water mains.
It frequently happens in iron water mains that deposits of ust are formed, sufficiently thick to reduce materially th diameter of the pipe. To clean the interior, Mr. E. Dodds an English engineer, has lately devised a pipe scraper which operates as follows: The pipe is cut, the scraper is inerted, temporary joints are made, and the water is turned on at highest pressure, which drives the scraper on at great speed. In the first experiment, a distance of 300 yards of pipe was thoroughly cleansed in 2 minutes and 20 seconds,

Dr. Edward Smith, author of an excellent work on Foods," thinks that condensed milk is not a suitable food as a substitute for pure milk for infants. It is more fatten ing but less nourishing, and greatly reduces the child's pow er of resisting diseases. Dr. Smith states that children brought up on impure London-fed cows' milk will resist an attack of acute disease better than children fed on condensed milk.

## A NEW REFRIGERATOR CAR.

Very good success has been obtained in preserving grapes by means of a new refrigerator car which has been recently tested on the Union Pacific road. A fan blower attached to one of the axles forces air through ice, and the blast subse quently passes into the car through a perforated pipe at the bottom. After circulating among the fruit, the current re turns to the blower and is again cooled. The advantage is the uniform temperature of about $40^{\circ} \mathrm{Fah}$., which is maintained inside the car.

## JADE

A number of sales of Japanese and Chinese curiosities have recently taken place in this city, in which were included ob jects made of a material little seen in this part of the world, and about which little is here known. It is a precious stone, valuable not on account of its scarcity, because in China and Burmah large mines of it exist, but for the great difficulty encountered in cutting and carving it, necessitating an amount of patience and manual dexterity rarely found save among the inhabitants of the celestial kingdom. It is a silicate of alumina called jade, and is obtained in Tartary arious parts of China, and in the Mogoung districts of North Burmah. The true jade is hard enough to cut glass or quartz, and the most valuable pieces are of an intensely bright green hue, the ordinary material being pink and yel low. As many as 1,600 men are engaged in the jade mines of Burmah, and the substance is sometimes found in huge blocks, which three men can hardly move. The crude frag ments are cut by means of thin copper disks, used in con unction with fine silicious grit, composed of quartz and lit tle particles resembling ruby dust. The boring of earrings and bracelets is effected by a revolving cylinder tipped at the free end with the same silicious mixture. The Chin se, with their proverbial ingenuity, make an almost perfect mitation of jade out of rice, the quality of hardness alone being absent.

## N EXPLOBIV COPFER COMPOUND

It has long been known that acetylen copper is a very dan gerous explosive, detonating on the slightest percussion, and worse than all, forming spontaneously on the copper pipes formerly employed to convey illuminating gas.
Recently another salt of copper has been prepared, which orms, when mixed with chlorate of potash, an explosive which may be used to fill percussion caps, torpedoes, etc. To a solution of sulphate of copper is added enough hyposul phite of soda in solution to entirely destroy the blue color Tetrathionate of the suboxide of copper is formed, and dis solved in excess of hyposulphite of soda. To another por tion of the blue vitriol solution, aqua ammonia is added until the blue precipitate, at first formed, dissolves to a dark blue solution of ammonio-oxide of copper. The two solutions are now mixed ; and after long standing, a violet-colored salt crystalizes out of the beautiful blue liquor, and it is this sait which becomes explosive when mixed with chlorate of potash. The Polytechnisches Notizblatt, from which we obtain the above, does not state the composition of the violet salt bove referred to, or the probable reason of its explosive ness, whether due to the nitrogen imparted to it by the am monia, or to the large excess of sulphur, which latter sub stance, it is well known, when in a free state forms with
chlorate of potash a misture that detonates by percussion.

## deep red glass.

Pettenkofer, who analyzed the intense red glass used in antique mosaics, proposed to make it by fusing lead glass with about 9 per cent of oxide of copper and 3 per cent protosesquioxide of copper as a reducing agent. In this case, however, some of the lead is also reduced, giving a dark brown or black color to the glass, and hence Dr. Kayser employs borax as the flux. The following proportions are taken: Clean quartz sand, 60 parts; oxide of copper, 10 parts; protosesquioxide of iron, 3 parts; calcined borax, 10 parts; calcined soda, 10 parts. A high temperature should be employed during the fusing and reduction, and then it should be moderated to a dark red and kept there some time. When cold, the red glass will be covered with a thin layer of green copper glass.
ACTION OF PROTOCHLORIDE OF TIN ON CHLORATE OF POTASH.
When 2 parts by weight of stannous chloride and 1 part of potassic chlorate, both in powder, are triturated together in porcelain mortar, the mass becomes heated in a few minutes very strongly. Beside chloric acid, large quantities of vapor of water are given off, and a yellowish white residue remains, which, when dissolved in boiling water and allowed to cool, deposits hypochlorite of potassa in splendid brilliant crystals, while the supernatant opalescent, milky mother liquor contains oxychloride of tin.
tungstate of zinc as a white pigment
When a solution of tungstate of soda is mixed with a solution of some zinc salt, the tungstate of zinc is precipitated as a snow-white pigment, that covers well and is recommend do artísts that work in oil colors as deserving the prefer opce over all other white pigments.

## IMPROVED HAT-MAKING MACHINERY.

The manufacture of felt is a very simple process, and so ancient that it was probably in use long before textile materials, prepared by the comparatively complicated processes of spinning and weaving, were invented. Tradition states that St. Clemens, the patron saint of the hatters, put wool on his sandals to protect his feet, which had become sore by long marchess; and he found that, after a short time, the long marches; and he found that, after a short time, the
wool became felted together into a fabric. He commenced wool became felted together into a fabric. He commenced
making cloth by a similar process, and applied the mate. making cloth by a simi
rial to the manufacture rial to the manufacture of hats. But there is reason to believe that the capability, which scme kinds of hair and woo possess, of being felted, was known long befor St Clemens' time, as fel goods have been ver long in use in China, and the ancient Greeks and Romans unquestionably Romans unquest hats.
If the hair or wool is capable of being felted if it will adhere togethe when subjected to pres sure or friction, the pro cess is a very simple one An examination with microscope will at once tell if the hair is suited to the purpose: if th hair be smooth, consist ing of a single cylindriing of a single cylindri cal fiber, it cannot b felted at all ; but the hair of beavers, rabbits, hares, and some other animals possesses, on each princi pal fiber, points which project obliquely, as shown in Fig. 1. When a mass of such hair is moistened and subjected to heat, pressure will
cause the oblique fibers to entangle, and in a short time the hairs will be so intimately connected that a fabric equal in durability to a woven stuff will be formed.
The best hats are made of beaver hair, and hence the cheap silk imitations of the finer kinds are commonly called

Flg. 1.-HAIR OF A BEAVER, AS SEEN UNDER THE MICROSCOPE.
beavers; commoner qualities are made from the hair of otters, musk rats, and other small animals; and others, still inferior, are made from sheeps' wool, but this requires a treatment different from that for hair. Some kinds of hair, notably that of the hare, needs to be treated with a solution of the nitrate and chloride of mercury, and arsenic is applied to the skin before the hair is removed to better adapt the hair to the felting operation. A very excellent felt for hat-making purposes is made from the fur of a large species of water rat, seme What resembling an otter; it is a native of South America, and more than a million of the skins are
annually exported from that continent for the pur pose.
Originally hair was felted by being pressed to gether into a loosely adhering mass, and then suddenly plunged into hot water. The heat and mois ture caused the hair to curl slightly, and the oblique fibers to interlock and hold the mass to gether in a tough fabric, which was then laid on a flat surface and repeatedly rolled with a round stick ; it was then dipped again, and the rolling operation repeated. By this means a very solid sheet of felt was obtained, which, moreover, was quite plastic, and could be shapen over any smooth block, plastic, and could be shapen over any smooth block, and was therefore well adapted for use in making
hats. However, it was long since found that this hats. However, it was long since found that this
process was tedious and expensive, and it has been process was tedious and expensive, and it has been
abandoned in all countries where the hat manufacabandoned in all countries where the hat manufac England, France, and Germany. In these coun tries, where the trade is one of great extent and value, very expensive and elaborate machinery is employed ; and the method now in. use in the fac tories was originated by MM. Laville and Crespin hatters of Paris, France. It consists mainly in mixing the hair in a series of large boxes communi cating with each other. The hair is first conveyed on an endless belt of cloth to a cylinder, provided with fans, and rapidly revolved in the first box, in the sides of which are placed glass windows, through the sides of which are placed glass windows, through
which the hair can be seen kept in violent commo which the hair can be seen kept in violent commo
tion by the wind from the cylinder fans. The fine hairs soon adhere together, and the coarser, which are unsuited for felting, fall in a drawer in the bottom of the box, from which they are readily removed. The mass of finer hair is then placed on a felting machine, called in French une batisseuse. This is done by women, as shown in our Fig. 2, who spread the hair on an endless belt of linen, T, by
which it is carried forward to a pair of rollers, $V$, which deliver the hair to a large rotary brush placed in the lower part of the case, A. The action of this brush is peculiar, and it forces the hair through the end of the case, $A$, in which is a long perpendicular slit, in front of which stands a cone, C , made either of sheet copper perforated with holes, or of fine wire gauze, and covered with a cloth which is kept moist. The cone is revolved by a vertical axis, and the air is exhausted from its interior, through the box-shaped base
 After the hat is thus made, it needs to be shaped, dyed and finished, the last operation consisting of polishing, iron ing, and trimming. The polishing is done on a machine presented in our Fig. 3, the conical felt being drawn ove metal form and manipulated till it fits tightly. The edg brim is then worked into shape, and trimmed to the pro per dimensions; the hat is then placed on a rapidly rotating lock, $F$, and a wire brush is pressed against it to remove superfluous hair. Pumicestone is applied to smooth the fab ric, and sealskin to produce a polish. The lower side of the brim is finished by put ting the hat, inverted in a hollow form, the rim resting on a projec tion. The loose hair is removed by an air blast, through pipes, $T$, by which the hat is $k \in p$ free from dust, etc., Although this system somewhat varied and improved, is in use in this country, the hat making operations hav never been exhibited is any of our industrial ex positions. The proces was shown in Paris, in 1867, and in Vienna, in 1873, and was in each case a very interesting and attractive display finished hats bein placed before the spec placed before the spec
tators in 15 or 20 min tators in 15 or 20 min utes s of the commence ment of the operation Good practice, however requires much more time, as the dyeing and subss quent drying are slow processes; and if the felt be hurriedly made, it will not possess much durability. If any
Fig. 2.- Hatrer's Felr-making machine.
tbrough the slit in case, $\mathbf{A}$, is attracted to the cone by the of our hat manufacturers have sufficient enterprise to exhibit suction; and the revolution of the cone on its axis soon causes the system at the approaching Centennial Exposition, they it to be uniformly covered with a fine felted fabric. The will be likely to interesta very large proportion of the mil slit can be closed with a sliding board, by manipulating which the operator is enabled to direct the stream of hair to any desired zone on the conical mold, as shown in the engraving; by this means, any part of the fabric can be made thinner or thicker than the rest. While the right hand of the operator is thus occupied, the left hand is applied to the felt to ascertain its thickness and uniformity; and when the cone is sufficiently and equally covered, the pneumatic action is stopped, and the felt is covered with a wet cloth, or, better, a tightly fitting copper cone, similar to the one within the felt. The cones and the felt are then taken away together, and plunged into a bath of hot acid, which (as before described) causes the hair to become so coherent that it may


Fig. 3.-HAT \#\#MOLDING AND SHAPING MACHINERY
safely be lifted away from the molds. But the felt requires to
be made still more dense, which is done by a mechanical probe made still more dense, which is done by a mechanical process, a kind of kneading being performed upon it by wooden blocks in a machine. This not only condenses the fibers, but causes the cone to diminish in size, till it is sometimes less than one third of its original dimensions.

A Sensible Christmas Present
The Studebaker Brothers Manufacturing Company, of South Bend, Ind., deserve credit for a very sensible as well as generous proceeding. Just before Cbristmas, they printed a little circular which was distribated among the seven hun dred employees of the concern, and which reads as follows. " In view of the approaching New Year and the coming Centennial anniversary, it is our desire to present to each of you copy of some weekly paper (such as you may select) for the ear 1876 The year itself will be a memorable one, and ful of inciaents and interest to you all. We feel also that it will tend to encourage in many of you an increased desire for information, and will be altogether better appreciated by you than the ordinary gift of a Christmas turkey, to be eaten and forgotten." Of course the workmen took advantage of this lib eral offer, and as one resalt a club of new sub scribers appears on the rolls of the Scientific American.
The company suggests that we may approve this course. We do, cordially; we wish more employers would adopt the same plan. We have repeatedly advocated it, and pointed out that em ployers can do their workmen no better service than to render accessible to then the means of self-education and improvement. This benefits the men directly, for it gives them information both instructive and valuable, and at the same time indirectly, though none the less surely, b $\in$ n fits the givers themselves. Half the strikes and labor troubles between employer and employees have for their basis an ignorant unreasoning spiri existing among the latter. Open up the avenues of knowledge; put in the men's way the news papers, whereby, under the guise of self-enter tainment, they are really educating themselves and, our word for it, there will be very much less heard of obstinate controversies and uprisings. To give a man a newspaper which keeps him posted as to the progress of his fellow beings, which tells him of new ideas and thoughts, is to ift him superior to his dull routine of every day work. By so doing, you give him something to think about, something which carries his mind far beyond the narrow horizon of his every day existence, and perhaps leads him to the development of new and useful ideas engendered in his wn brain. Employers will find money thus expended well laid out; and certainly, viewed as a ift alone, none could be suggested as more appropriate than one which confers a benefit on the recipient every week in the year.
Witi four weights of respectively $1 \mathrm{lb} ., 3,9$, and 27 Ibs any number of lbs. from 1 to 40 may be weighed.

THE KNOWLES HORIZONTAL MINING PUMP. An accidental interchange of the engravings illustrating
and that its use would be productive of a very large saving o street car companies. He also states that the weight of the machi

The Type Writer.
At a recent meeting of the Society of Arts, London, a machine was exhibited, intended to enable persons to write machine was exhibited, intended to enable persons to write, or rather print, withou using a pen. The Jour nal of the Society of Arts says:
The machine in appear ance somewhat resembles an ordinary sewing machine, being mounted on a stand of the size and appearance of a sewing machine stand. In front there is a keyboard with the letters of the alphabet, numerals, etc., upon it; and on pressing one of the keys, a small lever bearing the corresponding letter is caused to strike against a ribbon saturated against a ribbon saturated which prep which the paper is hel on a roller. Each letter strikes in the same spot

## THE KNOWLES HORIZONTAL MINING PUMP

 cal column without certi ing shocks or pounds of any description. Full details regarding the mavufacture and trial tests of these excellent machines are given in the article above mentioned.
## STEAM HORSE FOR STREET RAILWAYS.

Mr. S. R. Mathewson, of Gilroy, Santa Clara county, Cal has recently devised a new motor for street cars, an illustra tion of which is given herewith. The following description, by the inventor, will explain its operation: "The design is to make a machine resembling a horse in form, so as not to frighten the horses on the streets. To this end the form shown is chosen. The motive power is steam, generated in a tubular boiler of from four to five horse power, located inside of the horse and forward of the cab. This drives a rotary engine of my own patenting, which is geared to the driving shaft of the machine. I also propose the use of gas as fuel, so as to do away with smoke fuel, so as to do a in with smoke. The steam is condensed in cold water carried in a tank of sufficient capacity on top of the cab. Gas is compressed in suitable tanks to a pressure of from 80 to 100 lbs. per square inch, and is used as fuel. The boiler is so constructed as to receive a supply of hot air to ferd the flame, the gases from which, after passing around the boiler. are conducted around the engine to prevent loss by condensation. The water is forced into the boiler from the condersed steam chamber. The engine is provided with a brake capable of stopping the apparatus within a space of twenty feet, while under a speed of eight miles per hour."

The inventor points out that the engineer could easily control the machine, and also collect fares and perform other duties usually done by conductors. He claims that per fifteen hours, that it may be very cheaply constructed, $\left\lvert\, \begin{aligned} & \text { Post Office, San Francisco, Cal. }\end{aligned}\right.$
the cost of running the apparatus will not exceed one dollar (P. O. Box 110), or Levi Doane, Esq., San Francisco General |itself into sulphuric acid, may by the least pressure be re


MATHEWSON'S STEAM HORSE FOR STREET RAILWAYS. paper moves a space forward after each letter, so that it vided, and suitable devices arranged for attaching cars. appears on the paper in its proper place. The mechanism is A signal bell is fixed above the horse's head; and a lan- very simple, the levers carrying the letters being actuated by tern in front serves as a head light to give warning of its a similar arrangement to that of a piano, and strung on approach, when the machine is running on dark strects at night
itself into sulph duced to powder. M. Girard, after a series of elaborate ex


PLAN OF THE UNION RAILROAD DEPOT, WORCESTER, MASS.-[See first page.]
periments, concludes that this transformation is due to the fixation of an equivalent of water by the cellulose, and he has produced the hydrate synthetically. It is a white sube stance, very easily pulverized. M. Girard considers that this hydration of cellulose plays an important part in the economy of nature, and that the production of rotten wood ulmine, and ulmic acid is always preceded by that of th newly discovered hydrate.

## The Manufacture of Saltpeter.

The niter beds of Chili yield an inexhaustible supply of nitrate of soda or Chili saltpeter, but this compound is, un fortunately, unsuited for most of the purposes to which its analogue and near relative, nitrate of potash or common saltpeter, is employed in the arts,and especially in the manufacture of gunpowder. The immense deposits of potash salts at Stassfurt and Kaluss furnish the means of convert ing the inexpensive nitrate of soda into the highly impor tant nitrate of potash. The following description of a salt peter manufactory at Semmering, near Vienna, as given by S. Pick, will prove interesting as anexample of the contriv ances usually employed and the magnitude of the operations.

1. Raw materials: Chloride of potassium from Kaluss and Stassfurt, containing not less than 80 per cent of the salt, is employed. That from Kaluss is very pure and perfectly free from magnesium salts; it is also better to work, because it is not calcined so hard, while the Stassfurt salt often comes in hard lumps which are difficult to decompose. The poorest quality of Chili saltpeter contains 93 per cent nitrate of soda; generally the guaranteed 95 per cent is all there. It is kept in a magazine lined with asphalt, the flor of which has an inclination toward one side of 1 in 100 . Along this side is a
gutter, likewise covered with asphalt, which leads to a vat, gutter, likewise covered with asphalt, which leads to a vat,
where the lye is collected that drains from the saltpeter, and which is more abundant in winter. The sacks, from which this salt has been poured out, still contain 2.2 to 3.3 lbs . each of salt, and are washed out in vats connected with each other like a Shanks' apparatus, four constituting a battery. As soon as thelye, which is of a dark brown color, marks $42^{\circ}$ B., or $1 \cdot 41$ specific gravity, it goes into the factory.
2. The manufacture: The factory is so arranged that the liquids shall flow down automatically as much as possible; hence the reservoirs for water and lye are at the top, somewhat lower down are the dissolving vats and refining and what lower down are the dissolving vats and refining and
evaporating vessels, then follow the salt filters, the crystalizing pans, and the basins for lyes, from which they are ing pans, and the basins for lyes, from which they are
pumped into the highost reservoir again. These basins are pumped into the highest reservoir again. These basins are
on the ground. The room where the crystalization takes on the ground. The room where the crystalization takes
place is also covered with asphalt, so that what spatters over can easily be collected.
The decomposition of the chloride of potassium and nitrate of soda is conducted in round cast iron vessels, 8 feet 4 inches in diameter and 6 feet 8 inches deep. They are corered with strong cast iron lids made of three segments and bolted together. A man hole in the lid, which can be closed, permits of the introduction of the raw material and lyes. From another opening a tube $6 \frac{1}{t}$ inches in diameter carries off the vapor, and conveys it under the double bottom of the mother liquor reservoir. Through the middle of the lid passes the shaft of the stirrer, which consists of three horizontal arms. The heat is communicated by a stout coil of copper steam pipe $2 \frac{1}{8}$ inches diameter, making 8 windings quite near the sides and representing a heating surface of $107 \frac{1}{2}$ square feet. The joints are made tight with red red lead or plates of copper, caoutchouc, paper pulp, and lead lute last but a little while. To draw off the solution with the chloride of sodium formed,there is a cock of 4 inches opening, which can be blown out by means of a small steam cock attached near the top. Beside rhis, there are two open 1 inch steam pipes, opening into the bottom of the kettle on opposite sides, which serve to blow out the last portions of the salt and liquor at the end of the operation; and also, if the stirrers get fast and will not move in consequence of putting in theraw material too rapidly, they help to set it in motion. In case the heating worm requires repairs, the soution can be heated with direct steam from these pipes These dissolving vessels are also employed for evapo
the lyes, and the course of the operation is as follows:
The lyes, and the course of the operation is as follows:
The apparatus is filled with lye which is evaporated to
$50^{\circ}$ B. ( 1.53 specitic gravity.) During this time much $50^{\circ} \mathrm{B}$. ( 1.53 speciic gravity.) During this time much
chloride of sodium separates, and the lye, as soon as it bechloride of sodium separates, and the lye, as soon as it be-
comes concentrated, begins to foam, but this is easily avoided by putting in some oil. When the lye has about reached the required concentration, and has fallen to the level of the first or second worm, decomposition takes place. The crude material is brought to the top of the apparatus, by means of a rolling chair, in iron tilting carts and emptied into it through the man hole. The Chili saltpeter is put in first and then the chloride of potassium. It must be put in gradually, because, if it is thrown in too rapidly, it stops the stirrer. From $\mathrm{G}, 600$ to $7,700 \mathrm{lbs}$. of nitrate of soda and the equivalent quantity of chloride of potassium are decomposed in one operation. After putting in the crude material
it is boiled for half an hour : then the total contents of the it is boiled for half an hour: then the total contents of the
boiler are drawn off into the filters belonging to each disboiler are drawn off into the filters belonging to each dis-
solving vessel. These are wrought iron vessels, 8 feet 4 inches square and 5 feet 4 inches deep. At the deepest point each has a discharge cock 3 inches in diameter, which has, like that in the dissolving vessel, a steam cock attached. About 4 inches from the bottom is a wooden bottom pierced with holes and covered with linen. It rests on strips of iron riveted to the sides. In the space between the two bottoms the wash water hot. The solution remains in this filter 2 or 8 hours; the salt settles to the bottom, and the solution flows off clear into the crystalizing vessels; it has now a
density of 1.63 ,or $56^{\circ}$ B.,at a temperature of $203^{\circ} \mathrm{Fah}$. The salt which remalns in the filter, and which still contains 12 to 20 per cent nitrate of potash,is next covered with lye from the dissolving vessel, which is filled with mother liquor and
heated. In a short timeit is drawn off, amd has a density of $48^{\circ}$ to $50^{\circ}$ B., and is run with the other solution directly into the crystalizing vessels. For still further washing the salt, which still contains 6 to 8 per cent of saltpeter, those lyes are used which were obtained by the previous operation of washing the salt with water. These lyes are collected in a receiver which stands at the same hight as the reservoir
for mother liquor. In the reservoir is a 6 inch copper pipe for mother liquor. In the reservoir is a 6 inch copper pipe which conveys exhaust steam from the engine and raises the temperature to $176^{\circ}$ Fah., and thus produces a not inconsiderable evaporation and separation of chloride of sodium in this reservoir are received all the lyes which are saturated density of $25^{\circ}$ to $30^{\circ} \mathrm{B}$. As a rule the salt is washed twice with this, and after the second washing it has a density of $35^{\circ}$ B., and is put with the mother liquor for evaporation, After washing with weak lye,the salt still contains 4.5 per cent of saltpeter. This residue of saltpeter is removed by rinsing it two or three times with hot water, and the solutions thus obtained are collected in the reservoir above described. After the second of these washings, the remaining salt is heaped up to drain ; the dry salt is then removed from the filter, and the remaining inconsiderable wet residue goes through again with the next batch. The salt when finished contains 0.6 to 0.9 per cent nitrate of potash,say 6.5 per cent saltpeter and 6.5 per cent water. It is stored in a magazine lined with asphalt, where a good deal of liquor runs off and is collected in a buried reservoir. On account of the large amount of nitrate of potash, it is worked over, so that a considerable part of the saltpeter which was not washed out of the salt is recovered. The author found from 7 to 13 per nat in this liquor
The solution of saltpeter,made from chloride of potassium and Chili saltpeter, flows, through half round wrought iron gutters provided with sieves, into the crystalizing vessels. They are all provided with mechanical stirrers of two differont constructions, part round and part quadrangular.
The quadrangular reservoirs, tormerly used for another purpose, vary from 8 feet 4 inches to 12 feet 8 inches in width and 10 feet 8 inches to 24 feet 7 inches in length; and they are 2 feet 7 inches deep. They are provided with pendulum stirrers, making about 12 oscillations per minute. These have the advant :ge of requiring but very little force, but need n attendant, say one man for all the vessels, to remore the altpeter attached to the sides of the vessels. It is also unavoidable that, on the bottom, where it is impossible to remove it, a solid crust of saltpeter should form, which does not permit the mother liquor to run through
The round crystalizing pans are of wrought iron, 13 feet 5 inches in diameter and 2 feet 10 inches deep, and the bot toms are fastened by sunken rivets. They are provided with stirrers atttached to an upright shaft.
When cold, the mother liquor is drawn off; ;it flows,through cast iron gutters united by flanges, into an iron reservoir placed lower down, from which it is pumped into the reservoir on the top floor for evaporation. This reservoir is not heated by the escaping steam from the dissolving vessels alone, but also by the exhaust steam of the engine after it has passed through the lye used to wash the salt. The cold nother liquor should properly have a density of only $35^{\circ}$ B.; usually it stands at $37^{\circ}$ to $38^{\circ}$, especially in summer. Thi is because of the chloride of magnesium in the Stassfurt chloride of potassium, which sollects in the mother liquor and increases its density, and also because a small excess of
Chili saltpeter is used to make the decomposition easier. One hundred volumes of mother liquor contains :

Nitrate of potash. Chloride of sodium Sulphate of soda. Chioride of mag. Nitrate of soda.
Iodide of sodium $\begin{array}{r}29 \cdot 40 \\ 25.72 \\ 1.31 \\ 210 \\ \hline\end{array}$ $25 \cdot 5$ 14.2
106 106
620
106 19.6

No. 1, a mother liquor of specific gravity 1.348 at $66^{\circ}$; No. , a mother liquor of specific gravity 1.395 at $542^{\circ}$; No. 3 , a mother liquor through which about $11,000,000$ lbs. of Chili altpeter had gone.
The crude saltpeter which crystalizes from solution still contains a considerable amount of chloride of sodium, from which it must be freed befcre refining. This is done by washing it with the lye resulting from rinsing the refined saltpeter, and which is likewise collected in a reservoir. After washing, it still contains 0.8 to 2 per cent of common salt. Recently his salt was dried and put on the market as a fertilizer; but notwithstanding its usefulness as such, its comparatively high price prevents it making a rapid inroad.
In order to free it entirely from chloride of sodium, it is refined. This takes place in one of the dissolving vessels, which is used exclusively for this purpose, the solvent being he wash liquor of the refined saltpeter. A solution is made of a density of $50^{\circ}$ or $51^{\circ} \mathrm{B}$.,hot. This solution runsthrough the filter belonging to this dissolving apparatus, remains here two hours,and runs perfectly clear into the crystalizing vessels. As these are of iron, the saltpeter that crystalizes
out of them has a yellow appearance; to prevent this 3 t out of them has a yellow appearance; to prevent this $3 \frac{1}{2}$
ounces ultramarine suspended in water is mixed in the solution with each $10,000 \mathrm{lbs}$. of saltpeter. When cold, the mother liquor is drawn off, and may either be used to wash he crude saltpeter or evaporated as occasion requires.
The saltpeter that crystalizes out of this contains from $\frac{1}{}$ to $\frac{7}{4}$ of one per cent of common salt. A small amount,in solid lumps, adheres to the teeth of the stirring wheel; this is
picked out and again refined, while the rest of the saltpeter is thrown on the adjacent fllters and covered with water These filters are of wrought iron lined with thin sheet cop per, 5 feet high and $8 \frac{1}{2}$ feet long, have perforated double ottoms covered with linen cloth, and are provided with a discharge cock. The first rinsing is made in this way the cock is closed, and enough water run in to completely cover the saltpeter; after a few hours, the lye is run of clean, and a second washing with a little water suffices to ender the saltpeter perfectly free from chlorine. The wash $\operatorname{lng}$ is stopped as soon as the wash water shows a density of $10^{\circ}$ to $11^{\circ} \mathrm{B}$. The crystalization of the refined saltpeter takes place exclusively in the round pans above described, and from 10,000 to $11,000 \mathrm{lbs}$. of saltpeter is crystalized at once.
When liquor no longer drips from the saltpeter in the filters, it is dried, and then contains from 2 to 3 per cent of water. The drying vessel is a circular pan, 8 feet 6 inches in diameter and 10 inches deep. The cast iron bottom is planed on the upper surface and cast hollow with steam channels through it for heating it. The dried material is taken out through a hole in the bottom 6 inches square, which is usually closed by a slide. In the center of the drying pan is an upright shart, protected by a ring from contact with the saltpeter to be dried. This carries a series of knives which are pressed against the bottom by means of springs; it also has a scraper, movable vertically to push the dried saltpeter towards the discharge hole ; and finally there is a conical iron roller, covered with sheet copper,in a frame that turns with the shaft. This roller is to crush the larger balls of saltpeter.
When the saltpeter is ready for drying, it is conveyed in a tilting cart to the drying Rans and dumped into them, while the stirrer is set in motion, the discharge slide closed,and the scraping plate raised up. The stirring knives, by their motion, spread the saltpeter evenly over the heated bottom,and at the same time prevent its burning, while the heavy rollers crush lumps that are caked together. When the saltpeter is perfectly dry, the discharge hole is opened a little way and the saltpeter falls slowly through into a shaking sieve, through which the powder alone falls into a wooden box, whence it is transferred by a copper spiral into a wooden trough, and is then carried by an endless chain elevator to the top floor and emptied into barrels. When the drying pans are almost empty, the slide is opened pll the way, and the scraping plate let down so as to sweep the remainder of the saltpeter to the opening. It is impossible to entirely prevent its burning fast and forming crusts, and hence, every 10 or 12 hours, all the burnt saltpeter must be pounded loose. It breaks off readily in large plates. This apparatus, which is also employed in Stassfurt for drying chloride of potassium, has a large capacity; the four pans will easily dry 33,000 lbs. in 24 hours.
Besides this powdered saltpeter, it is also made in sticks, but only in small quantities. Its uses are very limited; it is principally in demand by metal workers, who think its crystaline form a guarantee of its purity.
Refined Chili saltpeter is also made in large quantities and is chiefly employed for pickling meat; it is mostly in large crystals. For this purpose Chili saltpeter is dissolved in the apparatus used for refining other saltpeter, to a concentration of $44^{\circ}$ to $45^{\circ}$ B., then filtered and crystalized in covered vessels protected on the sides from cooling. As the Cbili saltpeter is, besides, very pure, the mother liquor can fre. quently be used for fresh solution.-Polytechnisches Journal.

## Recent Balloon Aecent.

MM. Albert and Gaston Tissandier made a balloon ascent from Paris lately, and after a three hours' trip alighted near Illiers, about six miles from Paris. At 800 meters above the ground they entered a solid stratum of cloud 700 meters thick, the temperature being four degrees (centigrade) below zero. At 1,500 meters altitude they passed through a succession of ice crystals, a galaxy of little hexagonal stars, which danced round the car and sparkled in the sun. These did not exist in the lower stratum of cloud, but were suspended in the atmosphere over an expanse from 150 to 200 meters thick. The temperature here was at zero, and higher still it was at six degrees, the masses of white cloud below appearing like Alpine glaciers. Cumulì clouds were perat about 2,300 meters altitude, bua aeronauts did not go bigher than 1,700 meters, about 1 mile.

## The Dutch Exhibit at Philadelphia.

The Dutch Government will show at the Centennial Exhibition a collective model illustrating the progress made by Holland in hydraulicengineering, and consisting of groups of models of the principal great reclamation and other works undertaken by the State. Among them will be shown the Haarlem drainage, the new canal, the Dordrecht steel bridge, the Kuilenberg railway, a new steam pump, copper models of sluices, relief map of the Zuyder Zee, etc. The objects are now being shown to the public before being packed for America.
Southern States Agricultural and Industrial Ex-position.-We have received a copy of the rules and premium list for this exhibition, which is to be opened in New Orleans on February 26, to remain open for ten days. The classes of goods in which competition is invited are very merous.

THE artesian well at the Collier White Lead Works, St. Louis, Mo, has attained a depth of over 700 feet, nearly all of which depth has been through limestone. The drift is ang and assed hrough but little of either sandstone or chert. The boring commenced in the lower Archimedean limestone.

## PRACTICAL MECHANIRM. <br> bY JOMRUA ROBR

Nubim XL.
lining out a double eye.
After measuring the dimensions of a double eye to ascertain if there is, upon the outline, surplus metal sufficient to permit of its clearing up all over, we apply an $L$ square upon the outside surfaces, and a $T$ square, with the blade between the jaws, to test if the inside and outside faces are at about a right angle to each other, or if the marking will have to be thrown to one side of the work to accommodate a want of truth in the latter. Presuming that, as is usually

the case, the work is reasonably near to being true, we proceed as follows: Placing the double eye upon the marking. off table, as shown in Fig. 192, we block up the stem end with the pieces of wood, $B$, so that the horizontal faces of the work will stand about true with the surface of the ta ble, the manner of testing the same being shown in Fig. 193, A representing the marking-off table, and $B$ the scribing block, with the needle placed so that the point of the

ent end barely touches the surface of the work. The ope ration is to move the scribing block from end to end of the work and on both sides of it, packing it up until the upper surface is level, and taking care, if the work does not lie level and steady upon the table, to insert wedges in the necessary places so that the work will lie firmly and not move during the operation of marking. If there are projections upon the face of the work which rests upon the table, as is the case in our double eye, it is necessary to pass the scribing block along the under as well as the upper surface of the work; and if the two vary much, we may choose the one that is most true with the other surfaces of the work and set it true; or if, in such case, there would not be enough metal to clean up the work on both sides, we must divide the difference between the two. We then put between the jaws of the double eye, the center piece, $C$, and find the center of the jaws, as shown by $D$; then, setting a pair of compasses to half the required width between the jaws, we scribe upon both the jaws the segments of a circle, $E$ and $F$, using $D$ as a center; then opening the compasses to allow for the requisite thickness of each jaw, we mark the seg ments of a circle, $G$ and $H$; and again setting the compasses to the requisite thickness of hub, we mark the segments of

a circle, I and J. We now take a scribing block, and, setting the point just to intersect the extreme diameter in each case we draw the lines, $K$ and $L, M$ and $N$, and $O$ and $P$, thus defining the widths and thicknesses of the jaws and hubs We then set the scriber point even with the center, $D$, and then draw the line, $\mathbf{S}$ S, whioh should run a long way up the stem of the double eye, because the shortness of the other lines, running parallel to it, renders it difficult to set the
work true by them, and $S S$ is made long to supply the deficiency. After setting the compasses to half the required thickness of the stem, we mark, using the line, $S$ S, as a center, the segments of a circle, $Q$ and $R$, and from them mark the lines, $T$ and $U$, which define the required thickness of the stem or rod of the double eye. Our next operation will be to mark off the hole and the circle of the hub, which is done as shown in Fig. 194. Setting the eye upon the marking-off table, A, we wedge it upright, as shown in the marking-off table, A, we wedge it upright, as shown in
view 1, by the wedges, B;applying the blade of an L square to set the line, $\mathcal{S} S$ (in view 2), true by, we mark off on each side of the double eye the center of the boss or eye, and side of the double eye the center of the boss or eye, and
from that mark off the circles, $V$ and $W$, denoting the from that mark off the circles, $V$ and $W$, denoting the
finished sizes of the hole and the eye; then setting the scrifinished sizes of the hole and the eye; then setting the scri-
bing block needle point even with the center from which the bing block needle point even with the center from which the
circles, $V$ and $W$, were struck, we mark on the center piece, circles, $V$ and $W$, were struck,
(shown in view 2) the line, $X$.
(shown in view 2) the line, X .
We have now to complete the marking-off of the face shown in view 2, Fig. 194, which could not have been done before, because there was nothing determinate wherefrom to mark off the half circle of the outline between the jaws. Placing the double eye upon the table, as shownin Fig. 195

and blocking it up so that it lays level with the face of the marking-off table, and with the face that has been marked off uppermost, we insert between the jaws the center piece, B. We next mark from the center, C , the requisite distance of the crown of the curve, between the jaws, thus obtaining the center mark, $D$, from the center, $C$; and setting the compasses to half the required width between the jaws, we use D as a center, and mark upon the centerpiece, B, the center E, and strike the half circle, F F, which completes the mark ing between the jaws. Our next procedure is to mark off the segments of circles, $G, G$, which are struck from the centers, $H, H$, respectively. Then taking the block of wood, I, which should stand at about the same hight from the 1, which should stand at about the same hight from the
marking-off table as does the body of the double eye, and marking-off table as does the body of the double eye, and
setting the compass to the required radius, we rest one point setting the compass to the required radius, we rest one poin
on the circle, $G$, at about the point, $J$, we strike the mark, K ; then placing one leg of the compasses at about the point, L , we strike the line, M , the junction of the lines, K and M , forming the location of the center from which the segment of a circle, $N$, is marked. Placing the block of wood, $I$, on the other side of the double eye, we repeat this latter operation, and the marking on that face is complete.
After defining the outline of our work by light center punch marks, we pass it to the machinist's hands to be turned and cut down to the lines, after which we place it upon the marking-off table in the position shown in Fig 196, A representing the table. At each side of the double

eye we place a center piece, B, and mark thereon the cente of the hole with the compass callipers. We then find the center of the shank, $C$, and, wedging that end up with wood as shown, we set the needle of the scribing block even with the center of the hole, and so adjust the double eye with wedges that the needle point will strike the center of the hole marked on B, on each side, and also the center, $C$, where. upon we may mark the line, $D$; then setting the compasses to the requisite distance, we mark from the center, C , the segments of circles, E and F , and from the center, $G$, the segments of circles, $H$ and I : and resetting the double eye so that the needle point of the scribing block will intersect the extreme outline of $H$ and $E$, we draw the line, $J$; re eating the operation on the under side we produce th ine K , and the operation is complete. The curves $L \mathrm{~L}$,

Fig. 197. are made to a gage, such as shown in Fig. 197; it is made of sheet iron about one six teenth of an inch thick the outline being carefully marked out and filed up neatly , the corner, A, being made the necessary sweep, and the hole, B, being used to hang the gage up by. It is well to have an assortment of such gages for use in lining out, as well as for use as guider to the machinist in cut

When a double eye is forged separate from the rod, the in tention being to weld it to its rod after the finishing is com plete, which method is adopted for ease in handling the double eye, and because it can then be operated upon in a small lathe or shaping machine, the end of the cut on the stem should be beveled off, as shown at A, in Fig. 198, and

not left square, as denoted by the dotted lines at $B$, because if the corner be left square, the jar of the blows given in welding the double eye to its rod would cause the metal to bend in the neck, C, and the resetting with the blacksmith's flatter would be liable to jar the eyes or jaws of the double eye out of true one with the other. Furthermore, if the body of the rod is intended to be forged down to the finished size, and either left rough or merely ground and polished by the grindstone and emery wheel, leaving the corner sharp (as shown at B) would cause the forging to leave a mark round the body of the stem, at C, giving it the appearance of being cracked.
To assist the operator in marking out, the centers from which all curves and circles on detail drawings are struck should have a small circle in red ink marked around them, and a dotted red line marked from the center to the circle or seg ment of 'circle struck from it, as shown in Fig. 195. If the double eye is, however, intended to have an offset, as shown

in Fig. 199, we draw from the centers, $C$ and $D$, the line, $A$ and setting the compasses to the amount of the offset, we draw the segment of a circle, $E$, using the line, A, as a cen ter; and from the extremity of that segment, we draw with the scribing block the line, B, which will represent the center line of the stem of the double eye, the rest of the opera tion being as shown in Fig. 192, and described in the accom panying explanation, from the point at which the line, $\mathbf{S} \mathbf{S}$, in that figure was drawn.

## Rising in the world.

Experience continually contradicts the notion that a poo young man cannot rise. If we look over the list of rich men, we find that nearly all of them began life worth little or nothing. To any person familiar with the millionaires of the United States, a score of examples will occur. On the other hand, the sons of rich men, who began life with the capital which so many poor young men covet, frequently die beggars. It would probably not be going too far to say that a large majority of such moneyed individuals either fail out right or gradually eat up the capital with which they right or gradually eat
commenced their career.
And the reason is plain. Brought up in expensive habits And the reason is plain. Brought up in expensive habits,
they spend entirely too much. Educated with high notions of personal importance, they will not, as they phrase it, stoop to hard work. Is it astonishing, therefore, that they are passed in the race of life by others with less capital origin ally, but more energy, thrift, and industry? For these vir tues, after all, are worth more than money. They make money, in fact. Nay, after it is made, they enable the poss essor to keep it, which most rich men pronounce to be more difficult than the making. The young man who begins life with a resolution always to lay by part of his income is sure even without extraordinary ability, gradually to acquire a sufficiency, especially as habits of economy, which the resolution renders necessary, will make that a competence for him which would be quite insufficient for an extravagan person. It is really what we save, more than what we make which leads us to fortune. He who enlarges his expense as fast as his earnings increase must always be poor, no mat ter what his abilities. And content may be had on compar atively little. It is not in luxurious living that men find rea happiness.
The Belgian Moniteur Industriel says that an engineer having a piece of very hard bronze of large diameter to turn in he lathe, could not succeed in cutting it with a tool of any kind or temper, until he kept the tools constantly moistened with petroleum, when they cut with readiness. He says, that by using a mixture of petroleum and spirits of turpentine, stee with a straw.colored temper can be worked perfectly well he experiment certainly can be easily tried, say in turning chilled car wheels.

The Hon. George Bancroft told a reporter of the Philadel phia Item recently that the coming Centennial Exhibition would in every rempect excel any international exhibition over before given. He thinks it will drive away hard time and encourage immigration to an astonishing extent

## IMPROVED COTTON PLANTER.

In the annered engraving is represented an improved cot ton planter, which plants two rows at a time in drills, distributing the seed in the same manner as a grain drill distributes grain. The rows may be made three, three and a half, or four feet apart at pleasure. The drill teeth for planting cotton are easily replanting cotton are caslivator
moved, and as many cultiver teeth substituted as to fill th teeth subsicuted the lattor of any required the latter of any require form, thus converting the machine into an efficient cultiva tor. The teeth preferred by the inventor are of his own construction, and can be se either to run shallow and jus shave the top of the ground or to penetrate to a depth of six or eight inches. Ordinarily one horse is able to draw the machine. When deep cultiva ting is to be done, a pole may ting is to be done, a pole may may be ttached By horse may be attached. By leaving out one or two of the middle teeth, two horses may be used in cultivating young cotton or corn, by straddling the row.
A general view of the im plement in use is given in Fig 1. Fig. 2 represents the im provement in the hopper, de signed to facilitate the plant ing of cotton seed, which, from its fibrous covering, it is difficult to cause to descend through ordinary passages. Within the ordinary passages. Within the
hopper are swinging plates or hopper are swinging plates or
diaphragms, $\Delta$, which are pidiaphragms, $\mathbf{A}$, which are pi-
voted to bars at the top and voted to bars at the top and
extend nearly to the bottom. extend nearly to the bottom.
$B$ is a reciprocating stirrer rod provided with pins or teeth, C ,
which project upward into the hopper. The object of these pins is to facilitate the working down of the seed. The stirrer rod is hung in stirrups in the lower ends of pendent bars, D. By means of the cam arrangement, E , on the wheels, phragms, A Ther rod, B, is vibrated, and also the dia ph giternate is, by the later, given an alternate vibrating action from end to end of the receptacle, this movement increasing in intensity toward the bot tom, at which point the ends of the plates have the greatest

## Ifig. 2


swinging motion. The seed is thus freely delivered; and when mixed with fertilizers, its distribution is in no wise hindered.
Patented October 28, 1873 For further particulars, relative to rights to manufacture, etc., address the inventor, Mr . Pierpont Seymour, East Bloomfield, Ontario county, N. Y.

## IMPROVED VISE.

The vise is one of the oldest and most familiar tools extant, and has been the subject of great numbers of patents The following is a description of one of the best improvements on this indispensable appliance. A vise, to attain and retain a position as a standard with mechanics, must supply the following qualifications: Strength to allow of chipping or filing the work without a possibility of the vise break. ing; the inertia of the anvil should be sufficient to absorb the effect of blows; the jaws should move parallel and freely, and should be arranged in such a manner as to get the whole power of the screw ; sll parts should be durable; and lastly, the tool should be furnished cheaply.
The accompanying engraving represents an excellent form of vise devised by Mr. H. B. Smith, one of the earliest and most successful patentees of woodworking machinery. An inspection of the engraving will show how the foregoing requirements are supplied. The jaws are steel-faced by welding, and massive strength and inertia are secured by a proper and plentiful use of metal. The motion is direct, and all
surfaces exposed to sliding friction are chilled, thus gain- killing the fish outright; but occasionally the animal is not ing parallel action, durability, and increased strength. The sufficiently hard hit, and its capture is not so easily effected, chill is shown by the mottled appearance, seen on the as it dashes away at a tremendous speed, dragging the beam, and is one of the principal improvements claimed. steamer after it Cheapness is secured by special machinery, which engbles


## SEYMOUR'S COTTON PLANTER.

the vises to be quickly and economically made. The ma ty, N. J. [See advertisement on inside page]

## Whale artillery.

On a small island opposite to the town of Wadso, in the extreme north of Norway, there exists an establishment the like of which is probably not to be met with in any part of the world Its most appropriate designation would be, perhaps, a slaughter yard for whales; and Mr. Foyn, its pro prietor, conducts the business of capturing and cutting up the monsters in a manner peculiarly his own. Instead of fitting out the usual sized vessels, intended to make long voyages and bring home only the most useful parts of the animal, Mr. Foyn employs small-one hundred and fifty to one hundred and eighty tons-screw steamers, shoots his fish with a cannon, han them back, one by one as they with a canon, an the are captured, to the shable Whe the fishing grounds are within essy reach of the latter, the steamers, as
a rule, secure and return with a prize within twelve hours' a rule, secure and return with a prize within twelve hours
time. With respect to the cannon employed, it is a gun having a chamber about four feet long; this is mounted on the forecastle of the vessel, and, being very accurately balanced, can be easily moved to allow an exact aim to be taken. The projectile in use consists of a long iron bolt, having at its extreme end four harpoons, bound round with a line so as to be flat, and close to the harpoons a five or six pounder shell. As soon as the steamer has approached sufficiently near to the fish-and whales off that part of the coast are not over shy, allowing a vessel to come within shot-the bolt is fired off, and, if well dir cted, penetrates deeply into the flesh and blubber of the animal. The whale then naturally rushes off at a furious pace, thinking thus to elude his pursuers. Unfortunately for him, however, no step could be more suicidal, for the effect of his rapid movement is to make the bolt slip back a little, thus setting free the four harpoons from the lines, and. by means of a mechanical arrangement, causing a shell to explode. This generally proves the coup de grace


Pedentrian Training. Pedestrianism, as an athletic exercise, has become deservedly popular. There is no course of gymnastics so well calculated to develope a large number of muscles, or to produce so bene ficial an effect upon the system There is a right way and a wrong way of walking-the one bene ficial, the otber negative in it result. What the right way is, a writer in an English contem porary tells us in the follow lowing:
The body must be held erect with head well thrown back the movement of the legs mus be from the hip down ward, and the body should be carried mo tionless. The arms should b swung well forward in harmony with the legs, and the elbow should, when in front, be nearly on a level and at almost righ angles with the chin, the hands being open and extended. The leg should be brought well round from the hip, and the heel deposited on the ground in line with the rear foot, so as to leave your footmarks pretty leave your footmarks pretty
nearly in a line. But above all things hold your head up and the body erect.
Stitches and other kindred annoyances are common in learn ing to walk, but the beginner would do well to walk it off, and never ease if he is seized with distress. To do so is to throw away the pace he has ac quired from the commencement of his walk, and to knock all the regularity out of his stride.

POTIN'S GALVANO-ELECTRIC BATH.
The bath is blue slate, grooved and bedded in with red ead, and cramped up with iron cramps or nuts and bolts; i should stand on a wooden cradle either of elm or oak, and be protected by matchboarding all round; the floor should be tiled if on the basement, and covered with zinc if above. a is a board with holes to raise or lower the zinc plate; it is

grooved at the sides, and entersinto the slate at the bottom of the bath by two iron pegs. $b$ is a zinc plate; $c$ a copper wire; $d$ a flannel cushion for the head; $e$ is a three inch web bing to support the head or nape of the neck; $f$ is a handle $g$ hot and cold water taps with gutta percha tubing attached $h$ is a coil resting on the board; $i$ is a copper wire in connection with carbon ; $j$ is a chain to lift up the plug; $k$ is an acid and zinc cylinder, etc., which can be fitted up outside of the bath if there is room; $l$ is the carbon.

## Scientific Surveys.

The Secretary of the Interior, in his an nual report, says: The results of the geo logical and geographical survey of the Territories, conducted during the past session by Messrs. Hayden and Powell, under the direction of this department, will, it is believed, equal in interest and importance those of any previous year. The survey, under F. V. Hayden, continued its labors of the two preceding years in the Territory of Colorado. The survey of the soutbern and southwestern portions of Colorado has and con been completed. The total area surveyed which were rugged. The exploration of which were rugged. The exploration of the remarkable pre-historic ruins of South ern Colorado, glimpses of which were obtained the preceding season, was continued with great success. The surver under J. W. Powell continued the labors of the pre ceding year in the Territory of Utah. Near ly 10,000 square miles of country were sur vejed during the'season just closed

## THE GARDENS AT SCHONBRUNN

The gardens at Schönbrunn, the Emperor of Austria's palace, situated about $1 \frac{1}{4}$ miles from Vienna, are renowned for their extent and beauty, and also for their completeness, the bo tanical collection being one of the finest in the world. They also contain a large and important menagerie, and a system of waterworks and fountains. We give herewith a view of gardens, selected from the English Garden; and a cor rcspondent accompanies it with the following remarks:
'The creation of ornamental gardens in all parts of Europe, and, in fact, throughout the world, is becoming a matter of ommon occurrence. Not only are privategardens, of great mportance in an artistic point of view, being formed, but also public parks and gardens of great extent; and this is calling into requisition the highest talent at command in that department of horticultural art. In the gardens of the Château of Schönbrunn, cropped masses of trees serve as grand walls of verdure, in which niches are cut for statu ary ; and one of these artificial avenues, that represented in the illustration, leads to the beautiful spring Schöne Brun. nen, from which the name of the original castle was derived. The spring is now enclosed in an elaborately wrought marble framework, and the center of the basin is decorated with statuary, after the manner emp!oyed at Versailles. The gloriette, a temple displaying a colonnade, is seen in the dis tance, rising above several lofty walls of foliage, in front of each of which are shrubs of lower statare, which are left to assume their natural growth; and the contrast between the trimmed and the untrimmed forms is far from displeas ing. The magnificent gardens attached to the Cbâteau Schönbrunn, from the great hight of the vast walls of verdure above alluded to, the profusion of statuary, and other decora tive objects, so placed as to produce the best possible effect, tive objects, so placed as to produce the best possible effect,
form grand models of the formal style of treatment, and are form grand models of the formal style of treatment, and are
well worthy of the careful study and earnest attention of well worthy of the careful study and earnest attention of
every practitioner of the art of decorative gardening on a every practiti

Electric Pile in Serquioxide of Iron.
This apparatus is contained in a square glass jar. The pile is composed of a prism of charcoal which contains sesquioxideof iron in its pores, and a small rod of amalgamated zinc. The latter passes through the stopper, to the unde surface of which is fixed the charcoal. A solution of am monium chlo ride is used as the exciting fluid. The reactions are the same as in Léclanché's couple, in which oxide o manganese is used. When the circuit is closed, the chloride of ammonium attacks the zinc, forming a double chloride of zinc and ammonium. The latter, on being set at liberty, decomposes the sesquioxide of iron, carrying off a part of its oxygen and forming free ammonia, which disappears by evaporation. This pile ceases to act so long as the circuit remains open. Its durability and force are large. Its electromotive power is as 12 to 10 of the sulphate of copper bat
tery, and it is thus well adapted for industrial purposes. Th nventors are MM. Clamond and Gaiffé, and it is manufac tured by the latter gentleman.

## The Chilian Exhibition.

The annual festivities in commemoration of the National Independence of Chili have this year commenced with the formal opening of the International Exbibition at Santiago The ceremony of inauguration was held in the beautiful park in front of the main building, the guests assembling in spacious and ornamental pavilion erected for the occasion. Passing through the vestibule, the first impression on enter ing the central hall is a little disappointing. The interior is spacious, but rather cold in its decoration. It is 150 feet in length, about 60 feet broad, and 50 fett in hight: it is wel lighted, and, had it been filled with more artistic manufac ures, would have formed the center of attraction. Th pace, however, is devoted exclusively to Germen goods, nd the show is decidedly and the show is decidedly poor and wanting in effect. A rophy of leather in an oak case breaks the vista down th entre; on either side are pianos and some organs, and
further on are glass cases containing toys, and ornamented further on are glass cases centaining toys, and ornamented above by bird cages. There is hardly time to examine the objects exhibited in the remoter parts of the hall, but a glance towards the sides shows that, beyond the toys and other bazaar-like articles, are displays of goods from German manufacturers which will compete with Shetfield, Birming am, and other industries. In the south gallery are display of needlework and embroidery by the pupils of variou charitable institutions. And beyond there is a splendid col lection of Chilian mineralogy, prepared by Señor Domeyko, who has been indefatigable in his efforts. The excellence of the classification and display causes the visitor to be imme iately impressed with the variety and richness of the min aral products distributed throughout the republic. In the ame gallery is exhibited a collection of all the native woods with a description of their properties and uses. In the quad rangle, under an iron roof, the educational apparatus is dis played, which includes the exhibition of the College of agriculture, and the space is filled with working models of farming machinery, skeletons and diagrams of animals, and cognate aids to instruction. In the quadrangle on the corre ponding side are objects from San Salvador and Brazil The machinery annexe is of corrugated iron with the sides open, in length 500 feet, and about 60 feet across. A centra platform over the revolving shafting passes from one end of the building to the other, and enables visitors to inspect the archinery working below. The machines exhibited are multifarious: the sawing mills of the Canadian Watercours Company attract a good deal of attention. Mining, hauling pumping, pressing, and farming machinery occupies the whole of the space. At the end of this building is an annexe belonging to Messrs. Robey \& Co., where they exhibit agri-
cultural machinery, and further to the west is the machinery of Ransome, Sims, \& Co. Crossing over the grounds to the eastern side, we come upon the annexe of Messrs. Rose-Innes \& Co., similar to the building on the west, but closed at the sides. This is the only part of the exhibition which is absolutely completed. On entering we come into a large room ornamented with trophies of steel tools and manufactured articles. A fine stand of plated goods of James Diron Sons, of Sheffield, is prominent; beyond, a stand of Rod gers' cutlery, crucibles of the Plumbago Crucible Company and articles of dozens of other well known English makers attract the attention. Side by side with the English tools of Firth and others are those of the Douglas Axe Company and ther American makers. Two small doors lead into the ma hinery department, and here again the display is represen ative from the number of English manufactures brough together. Here are the ponderous thrashing machines of Clayton, Shuttleworth \& Co., and near stands a Pitt' thrasher, less substantial, but much more easily moved. Besides the agricultural machinery, there are mining pumps, sawing machinery, and presses, all in full work; four or ive small steam engines are under steam, besides the on driving the central shafting. Emerging at the further end we come upon a small model of a mineral line, with a tiny train making the ascent of a very steep incline, carrying with it the operator in the car. The line bas a center cogged rail, and the locomotive an extra cog wheel to supplement the ordinary driving wheels when a severe gradient has to bo passed. The model is exhibited by Clark \& Co., the con essionnaires of the Transandine Railway, which is to connect Valparaiso with Buenos Ayres; and the last annexe is occupied by English and American machinery imported by that firm

German Exhibition in 1878.
An exhibition of somewhat unusual character will be opened in Berlin in 1878, the plans for it being already under discussion by an executive committee. Its object being to how Germans what Germans can do, and therefore in what points head can be made against foreign competition, the whole arrangewents will be strictly national. The exhibition will be classified in twenty-one groups, and prizes will be awarded in medals distinguished as for production, manu facture, commerce, art, science and education. Workmen's models will also be issued.

Exhaustion of the Soll by Apple Trees.
The author calculates that,in a life of sixty years, an apple ree removes from the soil 60 lbs. of nitrogen, equal to 11500 lbs . of farmyard dung. To maintain the soil in condition, therefore, about 175 lbs. of dung oughc to be annually given per tree during the fifty years that it is in bearing.M. I. Pierre.


OHEESE AND CIDER MAKING AND LARD RENDERING
Continuing our series of abstracts from Knight's "New Mechanical Dictionary,"* we give herewith illustrated descriptions of various apparatus used in the operations named in the above heading. The necessity for preserving a certain temperature in

CHEESE vats
has given rise to numerous devices, among which may be
cited that illustrated at $A$, in Fig. 1. The vat is here semicylindrical and double walled, water being contained between the shells. Under the vat is a furnace, $B$, for heating the water, the smoke escaping by chimney, C. D is a damper for regulating the heat applied to the water, and said heat is equalized by a coil of circulating pipes connecting the water space at the center and ends of the vat. To aid in drawing off the water and whey, and discharging the curd, the machine is set on eccentrics at E. The wire frame shown cuts the curd into small blocks and sweeps it from the inner surface of the receptacle. The vat used in making Parmesan cheese in Italy is also represented in Fig. 1. It is a copper caldron slung from a crane over a conical fire place. In this the milk is heated and coagulated, and, withoutremoving, is broken by a stick having cross wires. The curd is then again heated, taken out, Fig 2

drained, salted, pressed, and in forty days is moved to the cheese loft.
In Fig. 2 the pan is hinged to the vat and rests upon pins within it. The contents are warmed by a furnace beneath, and the whey is draw off by a strainer. Adjustable legs permit the inclination of the vat.
Fig. 3 represents two
CHEESE PRESSES,
the upper one of which is constructed of iron. The hoop containing the curd is placed $n$ the bottom plate, $A$, and the upper plate, B, is made to descend upon it. On the axis, C, of the wheel, $D$, there is a pinion of eight teeth which works in a rack, R. On the axis, E, there is an other pinion of eight teeth which actsin the wheel, D, of twenty-four teeth. This axis, $E$, may be turned by the crank handle, $H$, three turns of which will make the rack descend through a space equal to eight of its teeth. In this way the plate, B, may be lowered to touch the cheese, and to commence the pressure; but when the latter becomes considerable, the second method of acting upon the rack is resorted to. On the axis, E, besides the pinion beforementioned, there is a fixed ratchet wheel, $F$; the lever, $I$ which embraces $F$, is also placed on this axis, but turns freely round it. A pawl, turning on the pin, may be made to engage in the notches of the ratchet wheel, F. By means of this arrangement, when I is raised up and the pawl engaged in $F$, the axis and its pinion will be turned round with great power on depressing the end, I, of the lever; and by alternately raising and depressing $I$, any degree of pressure required may be given to the oheese, and continued by the suspended oheese, and
weight, $W$.
The pneumatic cheese press, B, shown in the lower part of the same figure, consists of a stand about three feet high, on the top of which is a metallic vessel, $a$, forming a hoop for the curd. This vessel has a loose corrugated bottom covered with wire cloth. The bottom of the vessel communicates by a pipe, $c$, with a re ceiver, $d$, which is exhausted of air by

air fing Tank. air pump, $b$, and pipe, $e$. The curd being salted and placed a cloth in the vessel, $a$, the pump is worked, and the pressure of the atmosphere drives the whey down through the curd, and collects it in the receiver, whence it is discharged by the faucet, $f$. Another form of press, shown in Fig. 4, *Published in numbers by Mesers. Hurd \& Houghton, New 1 ork city.
southwest of England, has a cylindrical stone, weighing one or two tuns, and rotating in an annular trough of masonry. The axis of the stone is connected by arms to a sweep, which is pivoted on a central post, and revolved by a horse. In some cases the central space forms compartments for hold
ing apples. The cider mill, $b$, used in the south of France ing apples. The cider mill, $b$, nsed in the south of France,
has a platform of boards framed together, and is travered has a platform of boards framed together, and is traversed
Involves the use of the toggle, as the leverage increases as
the platen descends. The weight is suspended by a chain which runs over the pulley on the end of the long arm of the toggle. A hand lever operates the screw for quick movements. A variety of

CIDER MILLS
is given in Fig. 5. The common cider mill, $a$, used in the

neath
former.
are vats in whic
Fig 5.

LARD TANKS
hooked to a rotating efe in the center of the platform, and is swept around by manual power, crushing the fruit in its page apron which carries the pomace between two pressing roll- tion will be international concerts on a grand scale. The ers, and a wire screen through which the juice rans. $d$ has abbe Liszt has promised to play.
alternate grinding portions, and a double-headed piston which presses the pomace against the ends of the box alternately;
one end of the box is filling while the other is pressing. one end of the box is filling while the other is pressing. $e$ grinder and presser which a hoop with a screw. A hoop filled with grindings is pushed from below the hopper to be-

fats are cooked to obtain them free from watery matters and membrane. We give three forms of the apparatus in Fig. 6. Everett's tank (left lower part of figure) has a digester containing the fat, which is surrounded by an outer shell constituting a hot water and steam space, to which it is connected by stayrods, which unite the water space at bottom with the team space at top, and pass through the ertical flues, A B The vapors from the vertical fues, $A$. digester, charged with odors and organic matter, pass through a pipe at the top of the apparatus into a superheating coil over the furnace, into which they are finally discharged to be consumed. A spiral flue surrounds the outer case of the boiler.
Broadnax's apparatus consists of an exterior casing, in which the digester (which may be of the form shown either in the upper or lower part of the figure) is placed. In the first it is stationary, and consists of an inner and outer shell, beween which and through the flues in the ner one, $A$, the heat circulates The nner one, A A, the heat circulates, The rom le rom shelf to sholf, and is strained hrough the perforated battom, C, whence it is drawn off. The furnace has an inclined flue at each side, through which the products of combustion pass to and around the digester. Gases from the latter are delivered into the furnace. This may be effected as shown in the upper figure by an air pump, J, and condenser, K , by which the gases are forced through a cylinder, heated by grate, P. In the cylinder the watery particles are condensed by a series of plates, $i j$, and densed by a series of plates, $i j$, and drawn off by a pipe. The dry vapor ascends through another pipe, to assist in heating the furnace. In the lower figure the perforated digester, $G$, is mounted on trunnions and rotated by a crank. The oil exuding is strained through the diaphragm, E, and the gasea pass through the pipe, $i$, to the furnace. $H$ is the charging manhole, situated on the top of the apparatus.

## Inventor of the Piano.

The mill, $c$, has a grinding wheel and concave, and an of colebrating, next May, the centenary of Cristofori, the

## THE NATURE OF THE NEWLY DISCOVERED FORCE

## by georgam. beard, m. d.

In my letters to the Tribune and in my lecture before the Polytechnic Club, I advanced a theory of the force recently discovered by Mr. Edison, that might perhaps ally it to elec tricity, though not to any known form, and account for its non-polarity and other phenomena exhibited by it. This theory I suggested and used merely as a temporary working hypothesis. At the present time, the weight of evidence in my mind is in favor of the theory that this is a radiant force, somewhare between light and heat on the one hand and mag. netism and electricity on the other, with some of the features of all these forces. Experiments of the following kind are of themselves powerful arguments in favor of this theory:
When the wire conducting the force from the battery to the dark box is divided in the air, and the ends are separated even a sixteenth of an inch, no spark appears in the dark box. Lay these ends of the wire on a semi-conductor, a wood, and the force will pass when they are separated a moderate distance. Place small pieces of tinfoil about
these ends as they are suspended in the air, and the force these ends as they are suspended in the air, and the force
now passes one inch or perhaps several inches through the air. Place pieces of tinfoil of larger surface about these ends, and separate them a wider distance, and the force will yet pass. Make the surfaces of tinfoil larger still, until they are a foot square or more, and the force will travel several feet through the air. Prepare three large pieces of tinfoil, place one piece on each end of the divided wire suspended as before, and the other piece about equidistant between them and still the spark may be seen (though faintly and irregularly) in the dark box. The force must jump from the piece of tinfoil at one end of the wire to the middle piece, which acts as a kind of resting place, and thence to the piece at the other end of the wire. The spark has been obtained (though with difficulty, and only after very nice adjustment of the pencil points in the dark box) after having passed through four pieces of tinfoil, the distance from the first piece to the last being eight feet. The highest tension statical electricity, as generated by Holtz' machine, could not do this; and electricity prefers to pass by points. Through experiments of this kind we have learnt one important law of this force, namely, that it prefers to pass through surfaces; and the larger the surface, the better it passes through any bad conductor, at least within certain limits.
Phenomena of the kind here described suggest magnetism more than induction or dynamical electricity: but this force does not respond to the test of magnetism, the power to at tract iron; and moreover it exhibits phenomena that do no belong to magnetism. It is attracted by iron and other met als, as conductors, but it does not itself attract iron.
The points which favor the radiant theory of this force may be thus recapitulated:

1. It does not respond to any of the physical tests of electricity, except the spark.
2. It produces no perceptible or demonstrable physiological effects, like electricity
3. It is not resisted by non-conductors as air, water, glass, rubber, and paraffin, to the same degree as electricity.
4. It gives no evidence, in any of its phenomena, of polarity.
5. It passes through non-conductors, as air, rubber, glass, tc, most readily by large surfaces at the terminals, while lectricity prefers to pass by points.
6. It diminishes in strength with the distance from the battery, possibly in some definite ratio, although that is not yet demonstrated
Any form of electricity giving a spark like the spark of this force would respond to some of the physical tests of electricity, would produce readily perceptible physiological effects, would be powerfully resisted by the air, and would in all its phenomena suggest polarity, even if rapidly re. versed.
Again, the four facts regarded by me as favoring the the ory that this forceis allied to electricity, are, when severely analyzed, not so convincing as ther might at first appear. The spark of this force resembles the spark of dynamical electricity; but so also does the spark produced by combustion. The velocity of this force is great, but so also is that of light. This force is best conducted by metals; but so also is heat. This force is resisted somewhat by non-conductors, but so also is heat, and both to a less degree than electricity.
If it be, as I have suggested, a kind of electricity which, after the manner of the shuttle, returns to its source by rapid forward and backward movements, it would yet be electricity under very different conditions from those under which we are wont to consider it, and would be practically a new force. The more I experiment in this department, and the more closely I reflect on the results of experiments, the farther I seem to be driven from the electrical toward the radiant theory of this force; and there would appear to be no ready escape from the conclusion that we have here something radically different from what has lefore been observed by Science. The relation of this force to the other forces may be thus represented
Light, Heat . . . New Force . . . . . . Magnetism, Electricity.
The above would represent Mr. Edison's theory of a radiant force, nearer to light and heat than to magnetism or electricity.
The theory I have suggested would bring the force nearer to magnetism and olectricity than to light or heat, as follows: Light, Heat . . . . . . New Force . . . Magnetism, Electricity. The discovery that broad surfacem at the terminals are ne-
cessary to conduct this force through non-conducting solid bodies, as glass, rubber, paraffin, otc, was made but a fow nights ago. That the force passed through air when larg by Mr. Edison's experiments and by my own. A large sur ace of tinfoil ( $6 \times 6$ or $12 \times 12$ inches) was connected with one ad of the divided wire, and laid on a table. Over thi were placed broad pieces of hard rubber, glass, or paraffin and on the top of these was placed a similar piece of tinfoi connected with the other end of the divided wire, through
which the force was to be conducted to the dark box. In which the force was to be conducted to the dark box. In his way, it was proved that the force could pass an inch in hickness, $t$ of an inch of hard rubber, $\ddagger$ of an inch of solid parafin, and 5 layers of paraffin paper. When the surfaces at the ends of the wire were reduced in size, or when the tinfoil at one end was removed, the force passed less easily When the tinfoil at both ends was removed, and only a few nches of fine wire constituted the surface, the force passed but through thinner resistance. When only the terminal of the wires were applied to the resisting body, the force would not pass at all, or but a very short distance. The forc passed through 8 inches of water, and was apparently but
little diminished even when the surface at the terminals was ittle diminished even whe
but an inch of fine wire.

Usefal Rectpes for the Shop, the Household. and the Farm.
A new compound for polishing and cleaning metals is com posed of 1 oz carbonate of ammonia dissolved in 4 ozs water ; with this is mixed 16 ozs. Paris white. A moistened sponge is dipped in the powder, and rubbed lightly over the surface of the metal, after which the powder is dusted off leaving a fine brilliant luster.
A new alloy for bell metal is proposed, which does not tar nish, is less liable to crack, gives a better sound,and is much lighter in weight than the alloy usually employed for the purpose. It is prepared as follows: Nickel 1 lb . and copper purpose. It is prepared as follows: Nickel 1 lb . and copper
6 lbs . are melted and cooled. Add zinc 2 lbs ., aluminum $\frac{1}{2}$ oz. Melt and cool. Melt again, and finally add $\frac{1}{2}$ oz. quick alver and 6 lbs. melted copper
A very beautiful application of electro-metallurgy is to pply a coat of silver by electro deposition on natural leaves and flowers. By this means very delicate ornaments are pro duced, since the precise form and texture of the natural leaf are produced under the thin silver film.
Lemons can be preserved by varnishing them with a solu ion of shellac in alcohol. The skin of shellac formed is easily removed by rubbing the fruit in the hands.
J. Q. R. B. says; Varnish made with alcohol will get dull and spongy by the evaporation of the alcohol, which leaves water in the varnish, as all commercial alcohol contains water. Take thin sheet gelatin, cut it in strips, and put it in the varnish; it will absorb most of the water, and the varnish can be used clear and bright till the last drop. The gelatin will get quite soft; it can then be taken and dried, and used again. "I have used this plan for the last two years in photographic varnish, and have never had to throw away one drop.
There is no simpler remedy for preventing cider growing sour than mustard seed. After the cider has fermented and reached the desired palatable condition, put 1 pint mustard seed to a barrel of cider, and bung tight.

## DECISIONS OF THE COURTS

United States Circuit Court--- District of New Jersey [In equity-Before Nixon, J.]





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## NEW BOOKS AND PUBLICATIONS.

aing aurium, or Noises in the Ears. By Laurence Turnbuil, Ph. G., M.D., Physician to the Eye and Ear Department of the Howard Hospital, Philadelphia, Pa., etc. Second Edition with Cases. Philadelphia, Pa.: J. B. Lippincott \& Co.
Dr. Turnbull sends us a very readable and interesting pamphlet on a very
common and little understood malady. He shows that notses in the ears are the effects of causes widely different, and that sometimes the sounds are merely hallucinations, produced by abnormal action of the cerebral organs. Many remarkable instances of tinnitus are cited, and serve to render the book of value to the medical profession.
Bridges and Tunnel Centrre. By John B. McMaster. Price 50 cents. New York city: D. Van Nostrane, 23 Murray street.
arety Valves. By R. H. Buel, C. E. Price 50 cents. New York fety Valves. By R. H. Buel, C. E. Price
city: D. Van Nostrand, 23 Murray street.
city : D. Van Nostrand, 23 Murray street. These two excellent volumes are Nos. 20 and 21 of Mr. Van Nostrand's
Sclence Series. The work on safety valves 1 sespectally commendable for its clearness and accuracy, and such a work, judging from our multtudinous correspondence, has long been needed in our workshops and fac torles.

Mass.: Publighed
Maf Mute. By W. B. Swett. Marblehead, Mass.: Published by the Author
An interesting and well written accoun or some journeys and adventure In the White Mountains, the profts from the sale of
the author to the beneat of his brethren in affliction.
he Origin of Life and Species, a New Theory. By J. B. Pool. Price 10 cents. Pittsfleld, Mass.: W. H. Phillips.
 The Grocer. Volume I, No. 1. Published Weekly. Subscription \$2 a year. New York cits: The Grocer Publishing Company 163 Chambers street.

## A tonand original articles.

The Illustrated Annual Register of Rural affairs foh 1876. With 170 Engravings. Price 30 cents. Albany, N. Y. Jather Tucker and Son.
nied by a calendar and much useful information,
Aurora brazileira is the name of a new monthly sclentifc and mechanical periodical, pubilshed in the Portuguese language by Mr. J. C Alves Lima, at Syracuse, N. $\mathbf{Y}$. The Journal is intended principally for and the Portuguese-speaking population of Sotween the Unlted States numer Puiperse-speaking population of south America. The firs of articles. The subscription price, 10,000 rets, is somewhat startiug unless one apprectates the minute unit of
the total into $\$ 5.45$ United States currency.

Inventions Patented in England by americnns.
(Compiled from the Commissioners of Patents, Journal.) From December 3 to December 16. 1875. inclusive Artificial leather.-A. W. Pope (of Boston, Mabs.), London, Eng.
Boot Sewing Maohine.-D. Mills (of Brooklyn, N. Y.), Abton, Eng. Boot Sewing Mainne. -D. Mmis oringookiyn,
 Clothes Horse, etc.-C. T. Rowe, Brooklyn, N. Y.
Grinding Bare.-S. r. Thompson et al., Portsmouth, N. H. Gbinding Bare--S. R. Thompson et al., P
Look Nut, eto.-P. M. F. Cazin, Colorado



Repeating Firi abm.-B. b. Hotchkibs, Paris, France.

## (xecent (Ameticau and forcigu watents.

## NEW HOUSEHOLD ARTICLES.

IMPROVED CLOTHES LINE PROP.
Christian C. Schwaner, Winterset, Iowa-The upper ends of the prop pieces are slotted for the purpose of forming a groove, for re
taining the clothes line, which is stretched across the props in any suitable manner. The legs of props may be spread to bring the line down to the convenient altitude for fastening the clothes thereon. improved sad iron.
Albert L. Parcelle, Oneonta, N. Y.-The handle is provided with one rigid hooked standard and one jointed standard, the hook terminating the lower part of the latter. The hooks enter eyes on the
back of the iron, and are bound by moving a cam on the jointed back of th
standard.

Sillery Cove, gnd Maurice
Maurice Walsh, Sillery Cove, and Maurice Ahearn, Ottawa, Can-
ada.-This device includes a knife frame, provided with a project-ada.-This device includes a knife frame, provided with a projecting arm engaging in the notch or fork of the pivoted swinging gage piece, for lifting the same out of the way. to allow a removal of the gage out of the way for dropping the slice in the basket or other receptacle. The invention has been entered for exhibition at the Centennial.

IMPROVED PROCESS OF PRESERVING FRUIT.
John F. Bagsford, New York city.-This invention consists in
prepsring fruit by mixing water and starch with the fruit when in preps ring fruit by mixing water and starch with the fruit when in
the form of preserves. The seeds, pits, or stems are removed, and the form of preserves. The seeds, pits, or stems are removed, and
the fruit is put in a kettle, and sugar added, according to the tartthe fruit is put in a kettle, and sugar added, according to the tart-
ness of the fruit. The fruit and sugar are then boiled for fifteen ness of the fruit. The frut and sugarare of the preserved fruit is added ore quart of water, and the whole is brought to a boil. An ounce of starch is then added to each quart of the diluted fruit, the starch being first wet in enough cold water to reduce it to a thin paste. The mixture is then stirred for two or three minutes, to
thoroughly mix it, the stirring being continued until the foam disthoroughly mix it, the stirring being continued until
appears. The fruit is then ready for use when cold.

## new mechanical and engineering inventions.

improved paper drying machine.
Culver S. Clark, New York city.-This inventor aims to provide for paper manufacturers an improved machine for drying sized and bly arranged casings, through which the continuous sheet of paper is conveyed by feeding and carrying cylinders made of open rods, to expose the paper at top and bottom sides to hotair drafts thrown
thereon from blowers or fans in the same direction in which the thereon from blowers or fans in the same direction in which the paper is traveling. The continuous action of the air blasts on both
sides of the wet paper traveling through the casing produces the even and uniform drying of the same. The air blasts also assist the easy forward motion of the paper over the carrying cylinders, and prevent any sticking of the paper thereon.
improved safety and relief valve
John William Melling, Birkett Bank, Wigan, Eng.-In ordinary John Wiliam Melling, Birkett Bank, Wigan, Eng.-In ordinary
safety valves, the lift, and consequently the orifice for the escape of steam, is very limited, more particularly with bigh pressures.
The present invention aims to obviate this defect by making the valve and seat with two faces, and by exposing only a part of the area of the valve to the pressare of the steam when the valve is
closed. When the blowing-off point is reached and the valve is closed. When the blowing-off point is reached and the valve is
slightly raised, the steam escapes in the ordinary way through one of the faces, and is admitted under the other face, thus acting on a greater area. The steam that is admitted under the second portion greater area. The steam that is admitted under the second po
of the valve is allowed to escape through a hole in the valve.
improved gage attachment to wood boring machines. George S. Hudson, Ellisburg, N. Y.-This is an improved gage, which is adjusted upon the bed of an ordinary horizontal boring machine into the exact position to the bit required by the work. A block slides in either direction from the center of the back piece
of the table, through whose central aperture the bit passes, pand is of the table, through whose central aperture the bit passes, and is held in positinn by a double spring pawl, which engages either ad-
justable lugs or rack teeth, according as the holes are to be made at irregular or variable distance from each other. The stuff is fed in accurate manner to the bit or auger, and thereby a superior at a saving of time and labor obtained.

IMPROVED SAW GUMMER.
John W. Parker and Thomas Parker, Chicago, Ill.-This is an improvement in the class of gummers whose cutter shaft bearing is adjustable in a slotted way, which is in turn adjustable around a fixed axis located on a lo wer portion of a circular frame that is
provided with clamps to adapt it for attachment to a saw blade. provided with clamps to adapt it for attachment to a saw blade. The feed of the consistsin means for automa cally interrupting the feed of the cutter shaft and pr
same simultaneously with its rotation
improved vibrating propeller.
John D. Cornell, Jersey City, N. J.-This inventor proposes two frames, located under and partly in the bottom of the vessel be frames, located under and partly in the bottom of the vessel becranks. The paddles swing up nearly horizontal, and move partly edgewise agaiost the water when going forward, and swing down vertically and move sidewise against it when going back. This is claimed to give the necessary area of propelling sirface, with much
improved lining for maching bearings.
Lebbeus W. Lathrop and Theodore A. Weber, New York city. This is an anti-friction cloth, either canvas, silk, or any other ing of anti-friction material composed of graphite and sugar, and the sheets so covered are passed between compressing rolls, the upper one of which is heated sufficiently to soften and spread out, and at the same time condense and unite the compound, and press it on or into the sheets to effect the req
are then used as linings for bearings.

IMPROVED UPRIGHT TUBULAR BOILER
Nathan C. Heaton, New York city, assignor to Ward B Snyder, same place.- This relates mainly to a cap for an interior boiler and its casing, which cap is attached by a screw-threaded flange. An
illustration of the boiler will be found on page 371, volume XXXIII. improved valve indicator.
John S. Wallace, Brettland, 0.-This inventor proposes a stem steam chest, and carrying a pointer along an indicator scale, by which to set the valve without opening the steam chest.
improved adding machine.
Dennis L. R. Butt, Pilot Point, Texas.-This is an ingenious comments of which sums in simple or compound addition may be quickly calculated.
improved ratlroad rail.
George H. Mayer, Jr., Shamokin, Pa.-This relates to an improved rallway rail that may be relaid without drawing a single spike It consists of a base rail with top rail resting on a square seat at the side, and overlapping the curved top of the same, to be retained thereon by fastening bolts and nuts.
improved flock- washing machine.
Asa C. Bussell, Great Barrington, Mass., assignor to Parley A Russell, same place, and Clinton H. Blake, New York city.-This is an apparatus for separating the flock from the water as it escapes from the washer, and preserving the flock, while allowing the water to flow away. It is formed of an outer box, made with an open top, and provided with a discharge opening at its bottom.
There is an inner box, made smaller than the outer box, with open bottom and top, supported with its lower edge a little above the bottom, and its upper edge a little above the top of the said outer box, having the space between it and the outer box at one end separated from the spaces between the sides of said boxes. There is also a screen a
of the washer.
improved machine for finishing horseshoe nails. Harry A. Wills, Chicago, III, assignor to Julia A. Wills, same Hace, and Lucy S. Kingsiand, Burlington, V.-In order to return the sheared blanks from the shearir $g$ die into the carrier again, to be afterward carried to poict-beveliog dies to be beveled, a pusher
or follower is provided, in connection with the sheariog die, which follows close behind the punch when it withdraws, and pushes the nail immediately after it is sheared back into the notch of the car rier. In order to prevent the blanks from turuing in the trimming die, or while moving from or back into the carrier, another new
feature is added in the shape of a little vibrating guider, with a feature is added in the shape of a little vibrating guider, with a slot on the under side. so arranged that, just before the blank
comes to rest in front of the shearing dies, the head will pass into comes to rest in front of the shearing dies, the head will pass into

IMPROVED SCREW CUTTING DIE.
Virginius J. Reece, Greenfield, Mass.-This invention consists of a die which has a spreading pin inserted at the split part of the cir the die to bear at right angles on the pin. The one adjusting screw and pin takes the place of four set screws heretofore used, so that the number of screws and die holders
cost for die stock and die diminished.
improved horseshoe calking vise.
William Weaver, Greenwich, N. Y.-This relates mainly to a new arrangement of a cam, which connects with a treadle and serves
to lock the vise. The invention is strong and simple in constructo lock the vise. The invention is strong and simple in construc

## NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

improved whiffletree fastening
Hannibal R. Jackson, La Fayette, Ind., assignor to himself and fastening the whiffletree of vehicles to the double tree; and it con sists in a plate having a rearwardly opening T-shaped groove, with enlarged end, in combination with a second plate attached to the whiffletree, having a pivot provided with a head. improved fire place.
Robert Thompson, Stapleton, N.Y.-A forward-projecting angu lar part or shelf of the wall, made of bricks or metal plates, forms, in connection with the front wall, an air chamber,which is supplied
with cold air by suitable air flues from the outside. The apex of the with cold air by suitable air flues from the outside. The apex of the
angular rear wal is below the angle of the fire wall, and approaches angular rear wall is below the angle of the fire wall, and approaches
close to the same, so as to form a narrow air flue, that cor nects the lower part with the upper part of the air chamber, and throws, by he lower incline

## NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

## improved bag fastener.

 Charles W. Harvey, Waterloo, Iowa.-The invention relates to amode of securing the end of a bag's string fastener without making a tie, the latter being liable either to work loose or draw into a
knot, thus occasioning waste of contents or loss of time. The invention consists in loosely journaling upon a screw bolt a pair of stiff metallic disks, inclined and adjustable toward each other, one The string is thus held by its own compressibility between the bag and outer disk.
improved shaving cup.
Philıpp Schauble and Louis Dohm, Elizabeth, N. J.-In order to hold the soap in shaving cups so that it will not come out when the cups are washed, the above inventors propose making a screw
thread in the lower part of the cup, and a similar thread in the soap. The soap can then easily be screwed in place by a simple key.

MPROVED NECK TIE FASTENER.
Johann Waehner, New York city, assignor to Daniel Richter, of same place.-This device has a hook at one end for catching over the collar band. The other end is arranged to pass through holes in the neck tie, bend over, and, by being pressed back, fasten there-
to. In the center is a coiled spring to give the requisite elasticits The three portions may be worked out of one piece of metal with out break.
improved combined cleat and hawser clamp. Ferdinand W. Hofele, New York city.-In docking a vessel it frecause a sufficient hold cannot be had as it nears its end; and to obviate this difficulty, this inventor has constructed a cleat, having a clamp set within it, by which the end of the hawser may be griped and held secure until released by the person in charge

## IMPROVED FENCE

William A. Couch, Hannibal, Mo.-This relates particularly to the construction of a detachable batten to the panels of the fence, which may be readily detached by simply turning buttons to a po-
sition parallel to the rails.

IMPROVED WIRE FENCE BARB.
Henry N. Frentress, Dunleith, Ill.-This consists in barbs formed by cutting thin sheet metal into diamond form, slitting them from each end at an angle with each other to adapt them to be twisted into a two-strand wire cord.
COMBINED TWINE CUTTER, LETTER OPENER, AND STAMP MOISTENER.
John Eitel, Sacramento, Cal.-The invention consists of a pair of small scissors, which are protected within an operating guard spring, a letter-opening knife, and a pivoted sponge holder, for moistening the stamp, are applied.

IMPROVED ABDOMINAL CORSET.
Cathrine A. Griswold, New York city.-This is an improved ab ominal corset, which combines, with a perfect fit, a comfortable or drawing, and throw the weight of the same on the shoulders improved mariners' log.
George E. Elliott, St. Andrews, Can -This is an improved marers log, which registers correctly the speed of a vessel withou onsists of a concave disk or drag, that acts with greater or lesse orce, according to the speed of the vessel, on a rack bar and spring which moves, by suitable actuating gearing, the index hand along face dial. The index hand is retained by a ratchet and pawl, fo eading off the log, and returned to its position by a tension spring
n releasing the pawl.

IMPROVED LIFE PRESERVER.
Beall Hempstead, Little Rock, Ark.-This life preserver is made of wood, in sections, connected and hinged to each other by rubbe ubber strips around the neck, waist, and arm holes.
improved base ball base.
John C. O'Neill, St. Louis, Mo.-This is a case or box, with sockets or elastic columns that support a cap plate, having corresponding nounced by the sound of a bell, caused by the depression of the cap plate.

IMPROVED VENT.
Edward R. Behlers, St. Louis, Mo.-This is an improved vent that closed perfectly airtight at all times, but supplies air as soon as fae faucet is turned. It consists of a rubber tube, which is supported by an interior spiral spring, and fitted, by a perforated closextending tube driven into the bung or barrel with the interior the same. A slit in the rubber tube, above the with the interior o supplies the air on opening the faucet, closing airtight on shutting the same.
improved automatic lighter for gas burners
Henry B. Stockwell and Albert R. Weiss, Brooklyn, N. Y.-This Hention consists in the connection of the gas cock with a ribbonfeeding slide piece, and a spring hammer operated thereby. The burner socket, magazine guide, and anvil are cast of one piece, to
which the fulminate ribbon, slide piece, and hammer are applied, so as to feed the ribbon, and ignite, simultaneously, one of the pel lets by the opening of the gas cock.

IMPROVED ORE CONCENTRATOR
John Longmaid, Bingham, Utah Ter.-The object of this inven on is to separate ores from worthless substances with which the may be mixed, by causing such minerals, in a finely powdered con
dition, to flow, by means of water, over a large revolving table fixed at a certain inclination, and washing the same by means of thin sheet of water, and finally discharging the washed ore at the lower portion of the table by means of jets of clean water.

IMPROVED FAUCET.
willis L. Brownell, Brooklyn, N. Y.-In this faucet a valve acts upon a cam portion of a lever shaft in such manner that the latter
is turned automatically when the lever or handle is relieved of is turned automatically when the lever or bandle is relieved of (hand) pressure, thus allowing the valve to close tightly on its seat There is also a short rigid tube to deliver the water into the hollow valve, and to act as a support or guide for the same when open, and a new
shaft.

IMPROVED REIN HOLDER.
George W. Miller, Constitution, Pa.-This is an improved rein rest prevent the horse from throwing his tail over the reins, and to pre vent the reins from falling to the ground should they be accident ally dropped. It may be turned down out of the way when not required for use.

John W. Schwaner
Jonstruction of wrought York city.-This relates to an improved are a wrought iron bed plate, cut out into proper shape, struck up into proper form, and provided with holes, strengthening corrugations, and recesses for the back band loops; a wrought iron seat plate cut out into proper shape, struck up into proper form, and
provided with the strengthening rib and other arrangements, in combination with the bed plate; and salient angles formed upon the side edges of the seat plate, to be bent down over the side edgess f the wooden seat block.

## NEW AGRICULTURAL INVENTION

IMPROVED CORN UNCOVERER.
Hugh H. Gilchrist, Swan Creek, assignor of one half his right to is to be attached to the sole of the plowman's shoe, and which carries a bar having several prongs or fingers. This arrangement enables the plowman to uncover the corn that has been covered or
partly covered by the soil thrown by the plow or cultivator, and partly covered by the soil thrown by the plow or cultivator, and raighten it up, freeing its leaves from the soil.

## IMPROVED GANG PLOW.

Timothy M. Shaw, Lebanon, Tenn.-In this device are the follow ing new features: First, a frame composed of two curved beams, each provided with a shovel or plow, and adjustably connected a their front ends, so that one shovel or plow may be set in rear of
the other. Second, said frame is provided with handles, which are adjustable correspondingly with themselves. Third, the beams and handles are connected by two sets of transverse parallel bars, made separately adjustable as to length, and connected to said beams and handles by means of universal joints or couplings. The result of this combination and arrangement of parts is that the handles may be adjusted so as to remain opposite each other, and the plow beams will at the same time be held rigidly connected whatever be
the adjustment of the plows, whether in gang or one or both inclined from a vertical, to take more or less into the side of ridges, while cultivating between the rows of growing crops.
improved rice mortar.
Nathaniel O. Tilton, Savannah, Ga.-This rice-cleaning machine has a reciprocating pestle, and is ueed for separating the thin skin or film which remains on the grain after the hull or rough outside shell has been removed. The new feature is an open centrically located ring, which
clean in less time.

IMFROVED CHURN DASHER
John R. Underwood, Nelsonville, Ohio.-On the dasher shaft are two sets of bars, arrayed radially to the axis of the shaft and placed one above the other. The lower sides of the bars are concave, so
that when the dasher is forced down the bars enter the milk with the recesses filled with air, and the air and milk are forced out throwing the milk into violent agitation, and bringing the butter in a very short time.
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vertisors.-[Repubitican, West Meriden, Conn., Feb. 28.] Manufacturers of Improved Door, Sash, \& Blind
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off, Wheel \& Governor, $\$ 190 ; 5$ in.x12 in. Cook \& Rhym's
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Hand Fire Engines, Lift and Force Pumps for fire nd all other purposes. Address Rumsey \& Co., Senec 1,2,\&3 H.P. Engines. Geo.F.Shedd, Waltham, Ms. Solid EmeryVulcanite Wheels-The Original Solid Emery Wheel-other klnds imitations and inferior. Cau-tion-Our name is stamped in full on all our best Stand-
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ville Spinning ling Co., Whttinsville, Mass. For best Boit Cutter, at greatly reauced prices,
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is informed that no one is entitled to The right to sell patented articies in a certain territory depends on the agreement which the agent has made with the patentee.-J. F. W. will
find a recipe for lemon sugar on p. 378, vol. 30.fnd a recipe for lemon sugar on p. 378, vol. 30.-
R. B. will find good directions for making an aquarium on p. 8C, vol. 31.-N. F. will find a recipe
for gutta percha varnish on p. 379, vol. 30.-J. N. will find a description of the physiological and will find a description of the physiological and
pathological properties of alcohol on $p$. 91 , vol.31. -W. H. K. will find an if iustrated description of
the gyroscope on p. 91 , vol. 31.-W. M. will find the gyroscope on p. 91, vol. 31.-W. M. will find
good directions for building a cistern on p. 91 , vol. 31. - F. W. can straighten his gun barrel by the process described on p. 107, vol. 31.-N. S. B.
$\&$ Co. will find, on p. 43 , vol. 33 , a good recipe for aquarium cement.-R. K. will find a good recipe fill find a good recipe for blacking for patterns on p. 409, vol. 33.-J. C. L. is informed that his queries as to currency are not in our line. Many
saws are made entirely in this country ; same very saws are made entirely in this country; same very
large ones are made from steel plates made and large ones are made from steel plates made and
forged in England.-A. D will find directions for
find directions for producing verde bronze on
brass on p 283, vol. 31 , and for an Etruscan colo on jewelry on p. 333, vol. 33.-C. W. E. will find prescription for boils on p. 379, vol. $24 .-$ S. Z. R.
will find a description of a method of wire trans portation on p. 370, vol. 31.-L. D. will find direc ions for black enamel on iron on p. 208, vol. 26 .A. R. S. will find directions for melting brass in
mall quantities on p. 263, vol. 33 . An average
 tions for staining common wood in imitation of black walnut on p. 337, vol. 33 .
(1) A. B. H. asks: What will cause anigreat affinity that woolen materials have for all the aniline colors, we should think, would rende the dying of even very fine felt a not difficult
matter, if properly managed, Where a delicate bade is required, the flbers are sometimes dyed before matting. In any case the material should
(2) W. S. W. says: I have read of drowned
pasons being found by putting mercury in pieces persons being found by putting mercury in piece of bread and letting them float on the water in
which the bodies were supposed to be. The bread floated till it came over the bodies and then sank, it being supposed that the mercury was attracted by articles of gold jewelrs on the bodies. Is
this so $\%$ A. The statement is not true. The most delicate instruments have failed to deter mine the existence of any attraction between th which metals, save the force of chemical affinit minute distances. This also answers severa other correspondents.
(3) T. Y. asks: What liquids (besides acids) A. Water.
(4) G. W. D. says: In the manufacture of raisins by artificial processes, the grapes ar dipped in a strong, hot solution of concentrated
lye, whicn opens the pores, or cuts the skin, lye, which opens the pores, or cuts the skin, so
that the moisture can pass off freely in the evaporating chamber. Such preparatory treatment however, leaves on the raisins an alkaline taste which is objectionable. Can you suggest some other metbod by which the skin of the grape can be opened or softentd for the purposes named,
without injury to the flavor? A. In the preparawithout injury to the flavor? A. In the prepara-
tion of raisins for the market, this and simila tion of raisins for the market, this and similar
processes seem to be employed almost u uiversally. In cases such as you mention, where the taste of the raisin has been impaired by such treatment, we should recommend the trial of some metho that will tend to neutralize or destroy the objec inable flavor, such as dipping for a few moment washing in clean water,
How can I remove the oil from salmon, prepa atory to drying same, so as to overcome the ten dency to rancidity ? A. We do not know of any method by which all the oil may be removed and the flsh remain intact. The tendency to rancidity might be overcome by steeping the fish for a sho uch as salicylic acid or iodate of calcium.
(5) C. P says: I poured some clean water water remained on the bottom. On oild,when the water remained on the bottom. On adding com the lime sunk to the bottom, then came a layer of water, then a layer of spawn like matter, then clear kerosene. What was the spawn-like matter? A. Probably a mixture of water and oil, in which ase, if allowed to remain quiet for a short time, would separate, and a distinct line would mark the surface of contact between the two liquids.
You should have stated what, besides lime and water, the whitewash contained, if anything.
( $6 \mathrm{~F} . \mathrm{X} . \mathrm{M}$. says: 1 . It is said that muddy case, at what point does the clarification commence? It is evident that water may be very cold, and yet remain muddy, so that it must be at the freezing point: it is certainly not after the ice
has formed. A. Water, on freezing, does purify has formed. A. Water, on freezing, does purify
itself from all foreign matter provided the latte itself from all foreign matter provided the latter
be not in too great excess, in which case the rebe not in too great excess, in which case the re-
jected impurities may become entangled between the fast forming crystals. This self-purification probably takes place at the moment of crystalization. 2. In building an ice house, what cheap substance is best for flling between the walls? A.
Use good charcoal, finely crushed. 3. What adUse good charcoal, finely crushed. 3. What ad-
vantage is it to a cooking stove to feed the fire vantage is it to a cooking stove to feed the ire
with air heated to $300^{\circ}$ instead of supplying it A slight saving in fuel.
(7) J. W. S. says: Please give me a good A. Anexcellent pigment for this purpose consists of chrome green (hydrated oxide of chromium) ground in oil and tempered with white lead and sometimesbarytes (sulphate of baryta).
(8) E. R. says: I am making a pulse test ne end. It is half flled with alcohol ; and in o der to expel the air, I boiled the alcohol, and then closed the tube by the spirit lamp, but it does not
work satisfactorily. If I mix a littleliquid carbon work satisfactorily. If I mix a little liquid carbon-
ic acid with the alcohol, would there be any danger of explosion in case the tube should break? A It requires some care and practice, as well as some previous knowledge of the requirements of the case, in order to satisfactorily construct these little instruments. Carbonic acid is not suitable for (9) H. S. asks: How much would a st ooiler, made of copper $\frac{1}{32}$ tnch thick, of a cylindrical form, 18 inches in diameter, and 13 inches
deep, stand? A. About 15 lbs . 2. What part of eep, stand? A. About 15 lbs. 2. What part of
a horse power would such a boiler give, if kept a horse power would such a boiler pive, if kept
boiling? A. We cannot tell you, as there is no rule
(10) A. E. R. says: In warming a shop with the drip pipe oocks so far that nothing but water will come out, thereby letting about half the exhaust steam into the air through the exhaust pipe by opening the drip pipe cocks and letting al By the latter method, as we understand the ques By th
tion.
(11) W. W. L. says: I wish to build a boa go up the rivers of Texas. There will be fou pedition. We want a small cabin, and the boat should be so constructed as to run about 5 miles an hour. What should be the dimensions and hape? What power of engine will be required?
What should be the size and pitch of propeller? What should be the size and pitch of propeller?
Would side wheels do as well as a screw? She hould not draw over 1 foot of water. A. You can make a boat 30 feet long, and 5 or 7 feet wide nches in diameter and of 4 feet pitch.
(12) J. E H. says: 1. Given a small steam heat is applied, will the hydrocarbon vapor that is ormed have the same behavior as steam, and will a steam gage indicate the pressure in the boiler as
if it were steam? A. Yes, unless the naphtha is if it were steam? A. Yes, unless the naphtha is
more volatile than water. 2. If naphtha be used more volatile than water. 2. If naphtha be used
for some time, as in the above case, will there not for some time, as in the above case, will there not
be a thickish deposit in the boiler, which will be equire to be cleaned from time to time? A.Ge rally, yes.
(13) J. B. W. says: I put a lightning rod made of copper about $\frac{5}{16}$ inches in diameter. I of iron turnings, not spread out into large surfac
lod but tumbled into an excavatinn made for the purpose, and so arranged that the bottom of the mass of turnings was about 3 feet below the surface o
the ground, and the top about 1 foot below, th rod running through the mass and some 5 feet in to the ground. Now what I want to know is, if this conducting material and the manner of plac ing it is in accordance with your views of eafety If not, what can I do to remedy it? A. You method of arrangement of rod within the con ducting material at the terminal is correct; bu minal in the ground is insufficient. You its te feet conducting terminal. You should have 2,000 feet. The rule for dry soils is to have for the ter minal of the rod, underground, an area of conducting surface equal to the roof area. Your roof area is 2,000 surface feet. You should therefor rod terminal. Cou for the purpose. A trench 400 feet long, 18 inches wide, 5 feet deep. with a layer of charcoal on the botton 9 inches deep, firmly compacted, and th rod extended along the whole length of the trench, in the center of the charcoal, will give you a reli
able terminal. The joints of the rod should b able terminal. The joints of the rod should be
welded, or soldered and firmly bound, so as to make the rod, practicalls, one continuous netal.
(14) H. F. K. asks: I am desirous of hea which I can know the boiler capacity requisite fo every 100 feet of radiating surface in my pipes? fair economy of fuel. A You do not send sut sient data, but by applying to a relable boiler $m$ ker, and givng him full particulars, you ca
(15) A. M. says: My flouring burrs are running on very hard spring wheat; and they sweat badly and gum up everything near them
with dough. How can I prevent this? A. We do not know of any remedy except waiting for the wheat to dry, if your stones are properly dresse If any of our readers can
(16) W. R. C. asks : 1. Can I locate a boiler 100 yards from the building containing the engine is protected, run the eogine? Will there be much loss of steam? A. Lay the pipe in a box and pac sawdustor uther non-conducting material around it ; and put in a good trap to carry off the con
(17) W. I. Co. say: We have a large vein of magnetic iron ore, but it has an access of top
water. By making a cross cut tunnel or adit, 600 water. By making a cross cut tunnel or adit, 600 feet in length through soft ground (which requires
timbering). we can cu ${ }^{*}$ the vein at 50 feet under timbering). we can cu ${ }^{+}$the vein at 50 feet pump-
the surface for a water adit, and save the pump ing of the water to the surface from that depth. What is the customary adit grade in Cornwall and other parts of Europe, and in America? Of what grade are the railroad tunnels in America and in the Alps, that carry off their top water? A. The rades vary considerably, from 067 feet in 1,000 ,
(18) W. M. D. says: I am building a smal年ine, 25 br br 5 inches stroke. My boiler is inches long, internal diameter 17 inches, made o do? Of what thickness should thes be? Will one inch flues besufficient? What pressure will it be able to carry? A. It would be better to use wrought iron heads. Get in as many tubes as you can without corroding. If your boiler is wel built, it should sustain from 130 to 140 lbs . per quare inch with safety

Minerals, atc.-Specimens have been re ceived from the following correspondents,ani xamined, with the results stated:
J. A. B.-A variety of magnetic oxide of iron. f silex, alumina, and carbonate of lime, which constitute the chief part. It does not necessari
y indicate the presence of metal. There are
many localities of tin ore in the United States, ut no genuine of tin ore in the Unsely associa ted with Hluor, apatite, topaz, blende, wolfram, c.- - N. W. D.-No. 1 is a rock composed of calcite, hondrodite in grains, and traces of serpentine There is no reason for rejecting the determina-
tions of the professional assayer. No. 2 consist of hornblende, quartz, felspar, and muscovite nd the silver may be taken as the assayer has de ermined.
J. R. A. asks: How can I cure and prevent racked beels in horses?-J. L. asks: How is oat meal manufactured ?-R. H. B. says : The genera
mpression is that the ranbow is literally a bow. Has any one ever the ranbow is the complete circle of rainbow, which of course can only be seen from balloon?-B. B. asks: Will it damage flax straw or manufacturing purposes to thrash it with a common spike cylinder thrashing machine?

## COMMUNICATJONS RECEIVED.

 The Editor of the SCLENTIFIC $\triangle$ MERICAN ac mowledges, with much pleasure, the receipt of ng subjects:On Chemistry on a Mathematical Basis. B On th
By. Jy J. M. R
On Mr. Edison's Discovery. By N. P.
On a New Form of Chair. By C. M. A.
On the Hydro-Pneumatic Puzzle. By W. H.C On the Hydro-Pneumatic Puzzle.
On the Speed of Pulleys. By J. B.
uso inquiries and answers from the following: F. B. S.-R. B.-J. T.-S. N.-F. H.-C. E. H. Jr.-
P. S.-W. H.-W. S. D.-C. B. L.-R.Y.-J. G.-A.A
E. R. McG.-A. A. M.-A. J. C.-R. C.-W.L.G.-
E. H.-A. J. M -J. H. H.-W. D. - A. S. C.-B. P.-
J. D. - H. B. P. - C. J. T.

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