

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


## THE CLOCK TOWER AT DELHI, INDIA

The city of Delbi is one of the oldest in all the provinces of Hindostan, and the sanguinary fighting under its walls in the days of the Sepoy muting, is still fresh in the memory of most of our readers. Since the establishment of a large depot of the East Indian Railway there, many improvements in tine streets and buildings of the ancient city have been made. Of these additions, the most noticeable from a distance is the new clock tower, which stands in the center of the Chand. nee Chowk, opposite the nee Chowk, opposite the own hall. Of this a photograph is given in "Professional Papers of Indian Engineering," and from the London Builder we extract the accompanying engraving.

This building is erected on an appropriate site at the crossing of four streets, and stands 110 feet high, exclusive of the gilt vane and finial. The lowest story is about 20 feetsquare ex. ternally. The materials used in its construction. are brick, red and yellow sandstone, and white marble. The ca. pitals surmounting the main corner pillars the main core pilars are 4 feet 2 inches wide at top, and 4 feet 6 inches deep; they are carved out of solid blocks of white sandstone, and each of them weighs about two tuns.
The dials of the clock are sufficiently elevated to be visible from the Tost In Railmay East Indian Railway sta$\mathrm{t}_{\mathrm{i}} \mathrm{On}$, and from other $p_{i}$ rominent points in the c ty. The clock is con. s ructsd to work five bells, placed in the open canopy above it; these give out a different peal for each quarter, the largest bell striking the hours.
The building was completed in 18 monchs, at a cost, including clock and bells, of $\$ 14,000$, the whole of which amount was provided from the municipal funds of Delhi.
The tower was designed and built by Mr. E. J. Martin, Executive Engineer of the Rajpootana State Railway.

## Railways without Switches, Turnouts,

 or Crossings.Mr. Charles Jordan, Newport, England, pro poses to stop one extensive source of railway accidents in what is cer. tainly a thorough manner He proposes to make the up and down make the up and down main usual switches, turnouts, and crossings, the lines being continuous from end to end, and to work auch road by transferring a train or trains at stations, or where shunting is necessary, or at junctions', with othor railways, from the


TOWER AND CLOCK AT DRLHI, INDIA.
${ }^{i}{ }_{\text {adds. The time saved in switching will be very great, and }}$
main line to the adjacent siding, by lifting the train bodily from one line to the other. The lifting will only be an inch or two, and the hydraulic apparatus as now constructed will make nothing of the weight, while as to time, Mr. Jordan calculates that a few minutes will suffice to transfer a train from one roadito anothes without disturbing a single passen-
ger. The whole work of a station, as regards the hydraulic
the risk of collision reduced.
Reproduction of Photo-Negatives.
The sensitive compound I have hitherto employed for coating the plates is made up of dextrin, 4 grammes; ordinary white sugar, 5 grammes; bichromate of ammonia, 2 grammes ;
he atmo condition drops.
A new, well cleaned, patent plate is coated with the sensitive chro mium solution; and af ter the superfluous li quid has been allowed to flow off at one of the corners, the plate is dried in the dark by being placed upon a lithographic stone or thographic metal plate, a perio of ten minutes being sufficient for the pur-
pose, with a temperature of $120^{\circ}$ to $160^{\circ}$ Fah.
The film being perfectly dry, the plate, still warm, is put under a negative and printed in the shade for printed in the shade fo ten or fifteen minutes As soon as it comes out
of the printing frame of the printing frame the plate is again
slightly warmed; the slightly warmed; the
brush is dipped into the graphite and ap plied over the surface of the image, which should be just sligbtly visible. The applica tion of the powder is tion of the powder carried on in a shade corner of an ordinary room illuminated by daylight. You must not press hardly upon the film with the brush, but move the aameover the eurface as lightly as possible; nor will it do to hurry the operation.

In proportion as the film cools so the image appears. By carefully breathing or, better still, blowing upon the film, you will be able to accelerate the pro cers, and when the picture has attained sufficient vigor you take off the superfluous graphite powder with a clean brush.
A normal collodion is now applied; such as I uee is composed of Alcohol, 500 parts; ether, 500 parts; pyroxyline, 15 to 20 parts.
When this film has set and bardened, the margins are cut round with a knife, and the plate put into a porce plate put into a porce lain dish of cold water. In three minutes the picture will be free from the glass, and the film may be employed in this position or reversed with a soft brusb, and taken out of the water adhering either to the ame glass plate or to another. A gentle stream of water falling upon the film
will remove any chromium salts still remaining in it，and will also press down the loose film uniformly upon the glass surface．Finally，the plate is allowed to dry in a perpendi－ cular position．Further treatment of the plate with varnish follows as a matter of course．
The image upon the collodion film is very thin；but you need be under no apprehension of its tearing while in the water，when it may be easily manipulated．I have to do with films of this kind measuring three feet square．－J．B．Ober－ netter．

New Antidote for Arsenic．－The only antidote for ar－ senic heretofore known has been hydrated peroxide of iron， which must be freshly made by mixing carbonate of soda or potash with a solution of either sulphate（copperas）of iron or muriate．A French experimenter，M．Carl，says that sugar mixed with magnesia serves as an antidote for arseni－ ous acid．

In Europe the multiplication of photo prints is extensively done by mechanical means，with printing ink，and the copies， equal or superior to silver prints，are supplied at half the cost of the latter．

## Znientifir Ammericam．

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NEW YORE，SATURDAY，JUNE 27， 1874.

| Contenta： |
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| （IIlustrated articles are marke with an asterisk．） |

## THE END OF VOLUME XXX

The thirtieth volume of the present series of the Scien． tific american closes with the present issue，and，com－ pleted，joins its predecessors as another milestone，recording the progress made by mankind in the path of Science during the six months which have just passed．It is hardly neces－ sary to point out that，in the pages now finished，it has been our endeavor，as it will be in those to come，to popularize scientific knowledge，and to make the same generally availa． ble to the masses；not aiming to supply information valua－ ble alone to the engineer，to the ctemist，or indeed exclu－ sively to any profession or calling，but rather to glean from the whole broad field of Science and Art the richest sheaves of genius，and to present，winnowed therefrom，the kernels of wisdom，unmixed with the chaff of technicality and abstruse－ ness．That such a course has met the public approval，our increasing circulation and the many letters of which we are constantly in receipt，offering us pleasant wishes of en－ couragement，are the best and most flattering evidence．
In glancing back over the contents of the past volume， feel that we may confidently assert that in no other periodi－ cal now extant is there to be found a wider range of topics， treated in popular and readable form，the perusal of which will add more largely to the stock of valuable knowledge of any reader．
In the pages now closed we have presented 258 illustra． ted subjects，in many cases with not merely a single cut，but with a series of engravings．These embrace the most recent mechanical inventions，patented in this country and abroad－ new steam engines and boilers－new weapons of war－new tools for every variety of industrial employment－new household implements－new machinery of every kind for especial purposes－illustrations of new scientific experi－ ments－views of new buildings，bridges，and monuments－ pictures of rare and new plants，fossils，and animals－of queer freaks of Nature in the animal and mineral world－
lucid diagrams，explanatory of mathematical demonstrations， lucid diagrams，explanatory of mathemat
As for miscellaneous information，we would refer the reader to the columns of fine type，attached to this number， which form the index，in order to gain an idea of the num－ ber and variety of the matters he has examined．
No great discoveries have been made during the past six
stopping，as we now do，for a momentary breathing spell，we can look back and see a notable advance．Professor Thur－ new has sent us a large amount of important and valuable news regarding the behavior of metals under stress，and how to test them－facts of the liveliest interest to every engineer and mechanic．Professor Orton has continued his letters， telling us about the little known resources of Central South America．In astronomy，we have presented our monthly notes， regarding positions of planets，times of phenomena，etc． abstracts of Professor Proctor＇s excellent lectures during his late visit to this country，and also an account of Professo Wright＇s discovery of the cause of the zodiacal light．We have also noted the discovery of new planets and comets announced the donation of $\$ 700,000$ by Mr．James Lick，of San Francisco，for a gigantic telescope，and illustrated an ingenious plan for the manufacture of that great iastrument the device of Mr．Daniel Chapman．Our abstracts from the proceedings of the British Association，the French Academy of Sciences，and our own scientific associations，have bee very full and accurate，while reducing the new topics dis cussed for ready comprehension by every one．Engineering subjects have been so extensively treated that it is hardly pos sible to particularize．We have illustrated the 1,000 foo tower proposed for the coming centennial，called attention to new processes of tannel boring，bridge building，and rail－ rqad construction，mentioned some important works in hy－ draulic engineering in the West，and，in a multiplicity of articles from the pens of expert writers，considered topics of a timely and lively interest to the profession．Chemical matters have received their full share of attention，and so also the important subjects of electricity and magnetism，in which Wotable advances have been made．
With the end of this volume many subscriptions expire which we hope to see speedily renewed．In accordance with our rule，the paper is not sent after the subscribed－for term has expired；so that those who have failed to remark the notice on the wrappers of the copies received lately will be warned，by the cessation of our visits，that the time has come for them once more to express their appreciation of our efforts by sending us their substantial support．

## HOW TO ATTAIN HIGH TEMPERATURES

In his recent interesting address before the Société des In． génieurs Civils，M．Jordan spoke at some length of the methods now adopted of attaining high temperatures in me tallurgical operations，and of the bearing of chemical princi－ ples and recent discoveries upon the subject．The learned engineer speaks of the＂duel，＂as he terms it，between the fire on the one hand and the refractory materials used in the arts on the other，and recognizes the serious difficultie which impede the effort to utiiize high temperatures，when it is possible to attain them．
The Siemens regenerative furnace and its modifications represent the most successful means yet in general use fo producing extremely high temperatures，and the difficulty most frequently met is that of finding fire brick or other ma terial capable of withstanding the heat of the ignited gases We have known of instances in which the lining of steel－ melting furnaces has been melted down like wax before this tremendous heat．Assuming，however，that we may expect to find sufficiently refractory materials to permit the utiliza tion of atill higher temperatures，the proble
how to reach a higher limit，presents itself．
Under ordinary conditions，we cannot much exceed the temperature of a steel melting furnace，since dissociation occurs at a temperature supposed to be in the neighborhood of $4,500^{\circ} \mathrm{Fah}$ ．，for oxygen and hydrogen；consequently al combustion must be checked at some lower point on the scale，so long as no external force aids that of chemical af－ finity．The temperature of dissociation of carbonic acid is ven lower than that for bydrogen and oxygen，and is shown to be not far from 2，500 ${ }^{\circ}$ Fah．Finally the presence of ni－ trogen in atmospheric air reduces the maximum temperature attainable，by furnishing a mass of gas which，while itsel adding nothing to the supply of heat，abstracts（from the heat supplied by combustion of carbon and hydrogen）the larger amount required for its own elevation to the tempera－ ture of the furnace．
Elevation of the limit to increase of temperature of fur naces may be obtained by elevating the temperature of dis－ sociation，and this，it has been found，may be done by pro ducing combustion under pressures exceeding that of the at mosphere．Mr．Bessemer，the well known inventor who so nearly antedated our countryman Kelly in the invention of the pnoumatic process of manufacture of iron and steel which is generally known as the Bessemer process，has pat ented a method of increasing the pressure under which such operations occur．In the ordinary pneumatic process，this in crease af pressure occurs to some extent in consequence of the small area of the opening by which the gases leave the converter，and it is stated that the pressure within the con－ verter sometimes becomes double that of the external atmos phere．We may doubt if the increase ever becomes so great as this；yet there can be no doubt that it is sufficiently great to have an important influence in elevating the limit of dis sociation and in giving the very high temperature which holds nearly pure iron within the converter in a condition of fiuidity never observed elsewhere．
It is readily seen that the conclusions of M．Jordan，in the address to which we alluded above，are justified both by Science and by practical experience．He advises：The choice of a combustible which may be consomed in a bath of metal furnishing a non－volatile residue withoutinjoring（eane dé－ naturer）the metal，and the adoption of a form，of furnace which，heated by gas or otherwise，may be worked with an internal pressure of several atmospheres．Ho refers to the
marvelous discoveries，recently made，relative to tempera ture and pressure on the surface of the sun and other heaven I bodies as affording illustrations of the possibilities in the irection of attaining high temperatares．
The problem presented is as interesting and attractive as it is important；and the inventor of new methods or of per－ fected apparatus，and the discoverer of more refractory mate rials than those now used，will aid greatly in its solution Powerful intellects and ingenious minds are at work uponit and we hope that our readers will be able to find in ou columns evidence that the ingenuity which has made our people famous as a nation of mechanics，and the growth of Science which is gradually becoming so noticeable among us， have assisted to a valuable extent in effecting so impor tant an advance in this direction．Any improvement or dis－ covery which assists in the production and the economical application of high temperatures aids every branch of indus ry，and promotes our material welfare in an inconceivable number of ways．

## $\triangle$ CURIOUS PROBLEM．

In our queries of last week＇s issue a correspondent，B．F B．，says：＂There is a problem，which some one has found in a work published many years since，which is as follows A man，at the center of a circle 560 yards in diameter，starts in pursuit of a horse running around its circumference at the rate of one mile in two minutes；the man goes at the rate of one mile in six minutes，and runs directly toward the horse in whatever direction be may be．Required the distance each will run before the man catches the horse，and what figure the man will describe．＇I hardly think it admits of a solution under the above conditions；but were they reversed， that is，if the man were running at the rate of one mile in wo minutes，and the

## ould the answer be？＂

This problem gives rise to an interesting investigation of curve，which at first sight appears to be similar to the spi ral of Archimedes，but on further examination proves to be totally different．The spiral of Archimedes is the track of a point which moves with uniform velocity along the radius from the center to the circamference，while，at the same time，the end of the radius travels round the circumference． In this problem，however，the point moving from the center does not move uniformly in the direction of the radius，but more and more obliquely toward a uniformly progressing point in the circumference，giving rise to an intricate applica ion of the differential calculus，which finally proves that the man will never reach the horse，but that the curve described by him will，after three revolutions of the horse，be nearly dentical with a circle，the circumference of which he will approach more and more，and of which the radius is one hird of that in which the horse moves．The most interest ing fact revealed，however，is that，if the velocity of the man is half that of the horse，he will，after two revolations，be near the circumference of a circle of half the radius of the outer one；and when he moves with one fourth the velocity he will，after four revolutions，be very near a circle of one ourth the size，and so on．
In order not to burden our readers with extended calcula ions in the field of the higher algebra，we have solved the problem in the graphic method．In our first figure we hav

divided the circumference of the circle into sixteen equal parts， $0,1,2,3,4$ ，etc．，and taken one third of such a part and set it out on the radius from the center， 0 to 1 ．While he horse has moved along the circumference from 0 to 1 ，the man will have traveled from the center 0 to 1 ；while the horse is traveling from 1 to 2 ，the man will have traveled along the line 1，2， 2 ；while the horse travels from 2 to 3 ，the man will travel in the direction $2,3,3$ ，and so on；the only differ ence between our engraving and the reality being that the hort lines representing the road traveled by the man will be slightly curved，instead of atraight as we have represented them．By making these lines smaller，we may come suff． ciently near to the reality，but the final result will not essen tially differ．If the reader follows the different tracings for hroe revolutions，as represented here，he will see that finally the man will walk in a circle one third the size of that $i^{n}$ which the horse moves，and will constantly see the horse in direction tangential to the circle in which he walks；and herefore he never can reach it if he always moves directly ward the horse．
It is quite otherwise when the problem is reversed，and
the man walks three times as fast as the horse. This is re presented in Fig. 2, in which the track of the horse is divided Into spaces each equal to $\frac{1}{48}$ part of the circumference. At A A, each part of the man's track is made equal to three times that length; and it is seen that, before the horse has accomplished three of these divisions, or one sixteenth of the ciccumference, the man will have overtaken him along the line, $0,1,2,3$. At $B B$, the case is represented that the man walks twice as fast as the horse ; the engraving shows that,

before the horse has accomplished five divisions or one tenth of the circumference, he will be overtaken. At C C, we represent the case that the man walks one and a half times as fast as the horse, tre distances from the conter, $0,1,2,3$, being circumference. It is seen here that the horse will have been overtaken when he has passed over seven spaces, or 7 of the overtaken when he has passed over seven spaces, or 1 of the
curcumference. Finally, at $D$, we have represented the in. circumference. Finally, at $D \mathrm{D}$, we have represented the in-
teresting case that the man walks exactly as fast as the horse ; teresting case that the man walks exactiy as fast as the horse ;
it is seen that, atter going through sixteen spaces, or $\frac{1}{3}$ of the circumference, the man will move very nearly in the circumference, but always nearly one space ( $\frac{1}{48}$ of the circumference) bebind the horse, without being able ever to reach him. All that he then cando is to stop and let the horse overtakehim.

## sOURCES OF EDIBLE STARCH.

Besides the well known cereals, the number of plants pro ducing starch,in root, stem, or fruit, in quantity sufficient to make their cultivation proftable,is very large. The number made use of in supplying the starches of commerce is comparatively amall. Not more than a dozen contribute largely, and the excellence of these is clearly due in great measure to long cultivation. With the increasing demand for farinaceous foods, and the development of agricalture in trupical countries, where starch producing plants chiefly flourish, many other starch yielders will doubtless be brought under cultivation, with as marked an improvement in their quality and productive value, we may expect, as the cereals have shown, or, more notably, the potato.
Possibly the effect upon the cultivators may be equally important. The cereale have been to a great extent both the occasion and the means of raiging agriculture to its. high position in temperate climes. In like marner the development of tropical and sub.tropical communities must come largely through habits of industry and thrift acquired in systematic agriculture, in which the starch-producing plants must play the same part the cereals have in colder regions.
The arrow root of the West Indies (maranta arundinacea) furnishes the standard quality and the common name for farinaceous products. Starch is starch the world over, and its composition is the same, whatever its source. The commercial starches are more or less impure, more or less flavored by the elements with which they are associated in Nature, and which are not perfectly eliminated in the process of manufacture. There is a difference also in the size of the granules, but this requires the microscope to determine. Arrow roots contain about 25 per cent of starch, which is extracted by a process of grinding, rasping and washing the pulp with water.
Owing to careful preparation and the purity of the water used, Bermuda arrow root has the name of being the purest and best in market; but an equally fine quality is now fur-
nished from other localities, St. Vincent taking the lead both in quantity and quality. In Bermuda,as in most of the West India islands, the amount produced has greatly decreased of late years, the cultivation of eariy vegetables for our city markets offering larger profits.
In the Bahamas and other West India islands, and in Florida, a starch much resembling true arrowroot is obtained from the roots and stems of certain species of zamia. In Florida they are called conti roots, and the farina prepared from them coutti. In the shops it is known as Florida arrow root. Another West Indian starch, called tous le mois, char acterized by the relative coarseness of the granules, comes
from several species of canna, one of which.canna edulis, has from several species of canna, one of which.canna edulis, has
been largely introduced into Australia, where it yields an excellent quality of starch.
A great number of starch-yielding plants are employed for local use in South America; but for exportation the West Indian maranta and the native manihots are chiefly cultivated. There are two species of the latter (manihot utilissima), other wise known as cassava root, being bitter and poisonoun, th
${ }^{0}$ ther ( $m$. api) sweet, and largely used as an esculent, simply boiled. Both have been extensively introduced into other parts of tropic America, the East Indies, and the coast of Africa. The tubers of the bitter species, which is most exensively cultivated, sometimes attain the length of three eet and weigh thirty pounds, the milky juice being removed by pressing and the poisonous principle expelled by the action of heat. When heated in a moist state, the starch is partly cooked, forming small, hard, irregular masses, the tapioca of commerce. Like the potato, the manihot has developed a large number of varieties under cultivation, differ ing as potatoes do in quality and period of maturing, some coming to perfection in six months, others requiring a year or more. Farina of manihot, both in its crude state and made into thin cakes, is very largely eaten in Vonezuela and Brazil, where the manihot is most cultivated, the single pro vince of Santa Catharina ha
men
The bulbous yoot of another poisonous South American plant, a climber, furnishes the starch called jocatupé, said to have important medicinal properties. Only a small quantity is produced.
The African arrow roots are of various origin. The Cape Verde islands export a considerable quantity, chiefly ex tracted from the Brazilian cassava root. St. Thomas, Angola, and Mozambique also yield a small amount. In Liberia, Sierra Leone, and other African colonies, especially Cape Colony and Natal, the true arrow root (maranta) has been largely introduced, and the prepared starch is beginning to be exported in noticeable quantity. Madagascar and the Mauritius likewise yield a amall amount.
In 1840 the maranta was brought to Madras, and shortly afterwards to several other East Indian coantries, where it thrives abundantly, developing in from twelve to fifteen months. With good irrigation, a year suffices to secure the maximum yield of atarch, 16 per cent. More recently the same plant, together with the manihot, has been introduced into Ceylon, where after much persuasion the nativea have been indaced to caltivate them. Now the amount produced not only supplies tharge local demand, but allows of considerable exportation
What is known as tikor,or East Indian arrowroot,com، s from the roots of a native plant,the narrow-leaved turmeric (curcu ma angustifolia), which abounds in Ticor, Benares and Madras A large part of the diet of the inhabitants of Trevancore i the starch of another plant of this genus, while still another answers the same purpose in Berar. In Chittagong, a wild ginger plant, growing every where in such profusion that it is almost a nuieance, has a root loaded with starch of a good quality. The supply of the root is inexhaustible; and with a little trouble in digging and preparation, it might be made to furnish a vast quantity of cheap and nutritious food Other less known plants pupply a large amount of starch for local use in India, notably a wild arrow root which grows in the jungles. The starch is of excellent quality. In many other parts, the natives also lay under tribute for the same parpose the young roots of the Palmyra palm, which are rich in starch. At Goa, a farina is prepared from the wild palm, and in Mysore from the sago palm of Assam (carryota urens) which yields a sago little if at all inferior to that of the true sago palms of the Maley countries. Less nutritious and palatable eagos are also obtained from the Talipat palm in Celon, and the Phenix farinifera which grows on the Coromandel coast.
The most generous of atarch producers, however, are the true sago palms, of which two species (8agus konigii and sagu leois) are chiefly cultivated. Though most abundant in the eastern parts of the Malay archipelago, these palms are found throughout the Moluccas,New Guinea, Borneo and the neighboring islands, and as far north as the Philippines. The yield is immense, three trees affording more food matter than an acre of wheat, or six times as much as an acre of potatoes. As the trees propagate themselves by lateral shoots as well as by seeds, a sago plantation is perpetual. Wallace shows that ten days' labor or itsequivalent in money will put a man in possession of sago cakes, the principal if not the sole food of the natives, enough for a year's subsistence. A single tree contains from twenty five to thirty buehels of pith, which, with a little breaking up, will yield from six to eight hundred weight of flne starch.
Upwards of 20,000 tuns of sago pith are annually converted into commercial aago by the Chinese at Singapore. The finer quality, known as pearl sago, is prepared in great quan. tities by the Chinese of Malacca, something like 250,000 handredweights being sent therefrom to England alone. The manufacture of tapioca is also largely carried on at Singapore and at Penang, 75,000 hundred weight being sent to England annually from tine former port, and 10,000 from the latter.
Japan sago is made from the pith of a fern palm (cycas revoluta), which yields a large quantity of aago. like starch.
Another starch yielding plant, now extensively caltivated In the East, is the tacca pinnatifida, known throughout the outh Sea islands as pia. The tuberous roots resemble poatoes, and are largely eaten in China and Cochin China. When raw, the tubers are intensely bitter and acrid, but these bjectionable qualities are removed by cooking. The starch is of fine quality, much valued for invalids, and the yield is liberal- 30 per cent. The South Soa tacca grows on high sandy banks near the sea, and yields a starch equal to Bermuda arrow root, when carefully prepared.
In other Pacific islands, certain species of aurum are also atilized for starch, the one most extensively cultivated (nurum esculentum) being known as taro. The natives of Tahiti distinguish thirteen varieties, doubtless the result of artificial nelection. The tubers, which weigh from two to four
pounds, each yield as much as 33 per cent of starch, combined with a blistering bitter principle which is destroyed by heat. Our familiar Indian turnip, with its acrid flavor belongs to the same family of plants.
Among the other starch-producing plants, extensively cultivated for food in tropical countries, and which are destined to add immensely to the food supply of colder climates, are yams, bread frait, and bananas, including the variety known as plantains. The last fairly rival the sago palm in afford og the maximum amount of food for the minimum amount of labor. The yield to the acre is, in bulk, forty four times that of potatoes, and the proportion of starch is somewba greater. The fruit is also richer in other elements of nutri tion, so that the meal prepared by drying and grinding the plantain coreresembles the flour of wheat in food value. It is easily digested, and in Britısh Guians is largely employed as food for children and invalids. The coat of preparing plantain meal cannot be great, and the supply might be unlimited. The proportion of starch is 17 per cent; in bread fruit it is about the same; in yams it rises to 25 per cent, but is hard to extract, owing to the woody character of the roots.

## failure of patent extension schemes

We are glad to be able to state that the Senate Committee have agreed to report adversely upon the application of the sewing machine monopolists, for extensions of the Wilson, Aikens and Felthausen, and Wickersham sewing machine patents.
Adverse reports are also announced on the Tanner car rake, Rollin White pistol, and Atwood car wheel.
The following cases were deferred until next session : Norman Wiard's boiler attachment to prevent boiler explosions, nd Butterworth's patent burglar-proof safe.

## scientific and practical information.

## respiration of plants.

Vegetables, it is well known, exhale carbonic acid in the dark. M. Deherain states the curious fact that if a certain mass of vegetables thus acting be compared with a like mass of cold blooded animals, the exhalating energy will be found to be the same in both cases. This is another of those odd coincidences which seem to level the distinction between the two great organic kingdoms.
diffugion between moist and dry air throvah porous earth.
If a partition of porous earth separates two gases of dif ferent densities, an unequal diffusion takes place across the dividing body; the current of denser gas is more abundant than the other. M. Dufour has recently investigated the uestion as to what takes place when two masses of air of he same temperature, but containing unequsl quantities of water, are substituted for the gas. He finds that there is still unequal diffusion, and that the most abundant curren passes from the dry over to the moist atmosphere. This diffusion depends on the tensions of the aqueous vapor on the two sides of the porous partition.

## gas lighting by enectricity.

A new preumatic gas lighting apparatus, now being intro. duced by Mr. Asahel Wheeler, of Boston, Mass., was recently tested at Providence, R. I., with satisfactory results. $\mathbf{A}$ current of compressed air is transmitted from a central engine to diaphragms at the burners, the moving of which turns on the gas, which is then lit by an electric spark. Forty lights were kindled and extinguished ainultaneously with great rapidity. It is stated that by this device all the street lamps n a city may be lit by the movement of a single lever/ at any certain point.

## beer

The National Brewers' Congress recently met in Boston, Mass., and from the report of the proceedinge, we glean the following statistics of the industry in this country. A teady increase in the consumption of beer of a million barrels per annum shows that, the more people drink, the more the appetite for drink increases. The capital invested is stated as $\$ 89,108,230 ; 1,113,853$ acres of land are required to produce the barley, and are cultivated by 33,753 men ; 40,099 acres are devoted to hop culture, requiring the work of 8,020 people; and 3,566 hands are employed in the malthouses.

## nILE From switzerland

The American process of condensing milk, invented by the late Gail Borden, of Texas, has been everywhere copied in Europe. Large works have been erected in Switzerland, and cows that feed in the finest Alpine pastures now furnish excel. ent milk for the city of New York. The agents are Messra. Dadley \& Co., 153 Chambers street.

Every condition in lifo has its advantages and its peculiar sources of happiness. It is not the houses and the streets which make the city,but those who frequent them ; it is not the fields which make the country, but those who cultivate them. He is wisest who best atilizes his circumatances, or, to transfind us, wherever our lot may be cast

In the proposed railway up Mount Vesuvius, the engind, which is fired at the bottom of the plane, sets two drums in motion, round which the metallic cable is wound, by means of which the trains are drawn up and let down eimultaneously.

A railway train lately arrived at Algiers, Africa, from Oran six hours behind time, the cause of the delay being that the rails were covered with a thick layer of locusts.

IMPROVED WIND WYEEL AND WATER ELEVATOR Irregularity of motion, oscillation of turning table and vane, unavoidable use of small wheels on the main shaft preventing the transmission of quick motion when the same is needed, liability to get out of repair, and excessive cost. are objections to the employment of wind power, which the inventor of the device herewith illustrated claims to have overcome. The fans are centrally pivoted to two circles, which constitute portions of the frame of the wheel, and the bearings for the main axle rest upon stationary posts. A
is a weight attached to a rod which traverses the shaft and is a weight attached to a rod which traverses the shaft and
is pivoted in a sleeve which slides back and forth between is pivoted in a sleeve which slides back and fore
the arms. To the sleeve are attached jointed rods which are connected with guides, at B, so that, as the sleeve passes back and forth, the rods are given an inward and outward motion. Near the outer extremity of the latter are placed systems of amall rods, C , jointed together to form parallelograms, operating on the principle of lazy tongs. From each of these extend three arms, one passing through the outer circle and carrying a ball, $D$; the second piroted to the inside corner of one fan, at $E$, and the third similarly secured to the outer corner of the other adjacent fan, at $F$. The rods, $G$, connect these fans with those next to them, so that one shifting rod, with its lazy tongs, governs a set of four fans, which move through the same space at the same time.
In order to stop the windmill, the weight, A, is removed, when the balls tend to bring the portions of the lazy tongs to a position at right angles with the shifting rods, and hence the fans, to a right angle with the wheel. The fans, it is stated, move with equal facili, y in strong or light winds, no greater force being required to operate them than is necessary to overcome the friction of the dif. ferent bearings. The power is, besides, through its application diagonally across from the inside corner of one fan to the outside corner of the other, tranmitted to the best corner of the other, transmitted to the best advantage. For large wheels, we are in-
formed, hydraulic pressare is used to equalze the motion
The water elevator consists of a series of buckets, H, which are pivoted, a little above their centers, between every two links of an endless chain or band which passes over two pulleys, one at the bottom and the other above the well. The bottom of the bucket swings in, and a projection thereon takes against the upper shaft as the vessel is carried over. This upper shaft as the vessel is carried over. causes the latter to empty, with little splash,
into the conduit provided, in which the water is conducted to any desired point.

It will be seen that the construction of the apparatus denotes considerable strength, as it is built on the plan of a wagon wheel, the fans serving as spokes. The inventor states that it is almost impossible to blow it to pieces.
The machine, combined with a pump and also with the elevator described, was exhibited at the Kansas State Fair, last fall; and received five first premiums, and also com: mendatory notice from the State Board of Agriculture.
Patented March 17, 1874. For information pertaining to | your gold fish die, it is attributable, as a rule, to one of three manufacturing or royalty, or relating to purchase of wheels, address the inventor, Mr. J. N. Dietz, Salina, Saline county, Kansas.

## MACHINE FOR TURNING CRANE PINS AND JOURNALS

 OF LOCOMOTIVES.In this apparatus, for the engraving of which we are in debted to the Belgian Bulletin du Musée, the ool is fixed immedi ately against the pin or journal by four strong screw bolts, $a$, and is set in motion by the driving pulley, $f$, to which a belt is carried centering on one side effected by the point effected by the point , and on the other, by he ring of the pinan he annular piece, $c$. The tool, $d$, which acts on the cylindrica surface, is placed on the circumference of a tool carrier, $e$, whichi rotated by the pulley, $f$, through the cog wheel, $g$. The advance motion of the tool, pamotion of the tool, pa the pin, is gained by means of a screw, $h$, at the rear extremity of which is fixed a wheel, $m$. Each time that this wheel etrikes a sboulder, $i$, the screw turns, and the support, $k$, advances with the tool. The working of the apparatus is readily understood from the illustration.
 ternate, one on one side, the next on the other.


IMPROVED WIND WHEEL AND WATER ELEVATOR.

Improvements in Bleaching.
M. Pierre Isidore David, a French chemist, has invented he following processes
Chlorine in the gaseous state is produced in a closed recepta cle by one of the ordinary methods, for example, by the ac tion of an acid on chloride of lime diluted with water, and is conveyed by a tube into a chamber containing the articles to be bleached, the sides of such chamber being constructed of a traneparent material in order to permit the entrance of light, which assists considerably the process of decoloriza tion. After an interval, varying with the nature of the ar ticles to be bleached, he sends into the chamber a rapid cur rent of carbonic acid gas, obtained by any of the well known processes. The appa ratus in which the carbonic acid is genera ted communicates, however, with a versel containing liquid ammonia, the fumes of which combine with the carbonic acid, and are conveyed into the chamber, where the two gases neutralize the hydrochloric acid, and accelerate the decolorization of the ma terials contained therein. The ammonia should be contained in a vessel of sach a shape that the evaporation surface of the liquid can be augmented or diminished ac cording to the quantity of cblorine em ployed.
In the second process, permanganate is obtained by the action of peroxide or binoxide of manganese on lime aided by beat, preferably in the following manner: One part by weight of peroxide of manganese and three parts of quick lime in powder are mixed together and submitted to a red heat for about threehours. When the heat has been continued for one hour, however, rapid current of carbonic acid is passed through the mixture and continued till the completion of the process, the object being to superoxidize the compound. The per manganate of lime thus prepared is placed in a closed receptacle, which communicate by a tube with the bleaching chamber, com mercial sulphuric acid is gradually added and "ozonized oxygen" is evolved. In or der to accelerate the evolution of this gas the inventor adds a vegetable acid in quan tity equal to the oil of vitriol, acetic acid being preferably used.
In the third process, M. David employs phosphorus and acetic acid. The produc tion of ozone by means of phosphorus in a moist atmosphere is well known, but the quantity thus obtained is very small. By causing air which has been previously forced through acetic acid to bubble through the water containing the phosphorus, the pat entee has discovered that the quantity of ozone is considerably increased. The ozone is conveyed to the bleaching chamber in the aame manner as before described, the air being forced through the liquids by mean of a fan or any other of the well known methods of obtaining a current either by pressure or exbaust.
The fourth process consists in the use of chalk, alum, and sulphuric acid. A satura. ted solution of alum is prepared at a tem-causes-handling, starvation, or bad water.

Handsaws in America and Fandsaws.
解 they are made with teeth pointed the other way. The latter must be operated by pulling them, the former by pushing |perature of $140.160^{\circ}$ Fah., into which powdered chalk is thrown, about equal in weight to the alum employed; sul phuric acid is then added, and the gas evolved is conveyed by a tube to the bleaching chamber, where it effects the de sired object.

It will be seen that in three of the four processes chlorine is dispensed with, and the formation of hydrochloric acid avoided. When the articles are remored from the ing chamber, it is de sirable to expose them for a time to the ac tion of the atmo. sphere in order to re move the cbaracteris tic smell of ozone. These processes are claimed by M. David to be applicable to the decolorization of raw or worked materials especially those whic from their shape or nature do not admit of immersion in li. quid; they are also specially adapted to thebleaching of books, papers, and engravings. Oils and fattr matters may be decol. orized by them; alco holic liquids may be "improved"or "aged,"

## In delicate work, and where very fine small saws are used, as it is called, by the oxidizing properties of the ozone; fer-

 the Eastern saw is the best. The Orientals differ from us in mentation may be arrested and unpleasant flavors removed; setting the teeth of the saw also. They turn a group of adozen one way, and the next group the other, while we al-
economical than those at present adopted.

EFFECTS OF AIR PRESBURE ON ANIMAL LIFE. A series of brilliant and remarkable experiments have re cently been conducted in France by M. P. Bert, having for their object the determination of the influence of changes in barometric pressure, either augmentations or diminutions, upon animals. The author, in submitting the results of his in vestigation, states that both men and inferior animals which live on elevated land are submitted to a pressure the weakness of which, in proportion to that at the sea level, cannot be with out its effect upon their organizations. Important cities, in fact, exist at altitudes above 9,600 feet, and the high plateaus of Anahuac, Mexico, are populated by thousands. There are, besides, industrial pursuits which require workmen to labor in a strongly compressed atmosphere in submerged caissons, as are employed in bridge building, in the operation of sinking wells, in the descent of diving bells, and in pearl, coral, and sponge fish. ime
In describing the discoveries of M. Bert, to the experimental demonstration of which we shall shortly pass, it is necessa'y first to remind the reader that the actual tension of the oxygen in the air which we breathe is equal to one fifth that of the atmosphere, since the gas constitutes 0.21 of the composition of the lat. ter. Now this tension may be increased by compressing the air, so that air containing 42 per cent of oxygen will correspond to ordinary airat two atmospheres pressure, and so on, relatively, upwards. Inversely the tension of a semi atmosphere, equal to 14.8 inches of mercury, will be 105 ; of one third atmosphere, 7 , and thus dowing.
The researches of $\dot{M}$. Bert show that the atmospheric pressure never acts by any mechanical or physical influence, as has been heretofore supposed, but solely by causing the tension of the oxygen to vary, and hence the conditions of the combinations of that gas with animal blood and tissuesWhen the pressure decreases, animals and vegetables are
menaced with death by simple suffocation, due to a privation menaced with death by simple suffocation, due to a privation
of oxygen. When the opposite state of affairs occurs, death likewise supervenes, due to the poisonous effect of the excess of oxygen.
In the following description, the experiments upon the results of diminution of pressure are detailed, and in a succeeding article we shall notice the investigations bearing upon the effects of opposite conditions. In order to experiment upon large animals, M. Bert, constructed the apparatus repreupon large animals, M. Bert, construct
sented in Fig. 1. A A are large cysented in Fig. 1. A A are large cy-
linders containing heary glass winlinders containing heavy glass win-
dows. B is another cylinder, in dows. $B$ is another cylinder, in
which a vacuum is formed. $C$ is a bell glass in which, by means of $\mathrm{B}, \mathrm{a}$ vacuum may be instantly produced. R $\mathbf{R}^{\prime}$ are cocks communicating with the cylinders; $r, d$, and $s$ are other cocks for removing blood, etc. At $a$ $a^{\prime}$ are the thermometers, and at $m m^{\prime}$, manometers. The boiler shown at the left operates a steam air pump, which, in connection with the appa. ratus, produces low pressures of air in the cylinders.
In order to determine the gases in the blood, a dog wasfixed on a sort of semi circular frame (Fig. 2), which fitted exactly into one of the cylin ders. The carotid artery being ex. posed, a tube was conducted therefrom and carried to the exterior of the cylinder. By suitable devices the blood could be drawn at any moment without causing coagulation or allowing the surrounding atmosphere to enter the artery. The drawing was done by the operator outside, by means of a graduated ayringe, and the gases were removed from the fluid by a peculiar pump.
From numerous analyses thus conducted, it appeared that below a pressure of $21 \cdot 4$ inches there was an increasing diminution of the oxygen in the blood. From 20 volumes of oxygen to 100 volumes of blood at the above barometric hight, the decrease proceeded as follows: 17.5 inches, 16 volumes; 13.6 inches, 12 volumes; 97 inches, 10 volumes; 6.4 inches, 7 volumes. In other words, below 11.7 inches the arterial blood is poorer in oxygen than ordinary venous blood.
A very striking experiment showed clearly that the suffocating effects were due to the preponderating influence of the tension of the oxygen and not to the almost null results of barometrịc pressure. A sparrow was placed under a bell glass, in which a gradual depression was produced. The bird appeared very ill at $9 \cdot 7$ inches, and fell apparently dying at 7.8 inches. Normal pressure was then re-established by admitting oxygen. The bird recovering, further depression was proceeded with, when the same effects did not take place until from 7.02 to 5.8 inches. Oxygen again admitted caused a second revival, and, finally, it was ahown that the diminution might be carried to $\mathbf{2 . 7}$ inches. without killing the animal.

Not content with thus proving the trath of his theories
upon lower animals, M. Bert, in order to determine the sensations experienced, entered the cylinder himself. At a pressure of $17 \cdot 5$ inches, he experienced the sickness known as mal de montagne accompanied by nausea and weakness, the pulse increasing from 60 to 85 beats. At this moment he admitted and breathed an artificial atmosphere containing 75 per cent of oxygen. Instantaneously the illness disappeared, and the pulse returned to its normal condition, The investigator remained in the cylinder without inconvenience when the barometer marked $9 \cdot 7$ inches. This corresponds to a hight of 28,320 feet, a point above that at which Glaisher, in |his celebrated ascent, fell senseless, and equal in altitude to the highest mountain peak on the earth.


BERT'S APPARATUS PR NOTING EFFECTS OF AIR PRESSURE.
foreign ordnance factories that interest is chiefly awakened, Little is known in this country of foreign ordnance, except that nearly every country in Europe has obtained Woolwich guvs and projectiles for experimental comparison with their own, and they one and all haverejected both the sonstruction and the rifling in favor among English soldiers. Holland does, it is true, import Armstrong (Woolwich) guns and projectiles for its few ships of war: but its army adopts the French breech loader. For a time the Austrian naval armament was divided between Krupp's breech loaders and Armstrong's (Woolwich) muzzle loaders, but the short life of the latter has led to its being discarded. France, which has fallen behind the race of ordnance construction, gave the Woolwich system a patient and exhaustive trial, with the like result. Italy is striving manfully to work out a system of its own. Russia and Germany have given themselves over unreservedly to the Krupp aystem.
All heavy ordnance are now built with steel barrels, this material being found best capable of withstanding erosion from the powder and indentation by the shot. But much divergency occurs in the mode of supporting the barrel by exterior layers of metal. Woolwich obtains support by coiling, round the steel barrel, bars of wrought iron. Vavasseur supports the barrel by shrinking on hoops of steel, so regulated that the first layer of hoops shall not come into serious operation until the elasticity of the barrel has been developed. Krupp, who has been gradually assimilating his construction to that of Vavasseur, first by abandoning block steel for the breech, and then abandoning it for the chase, still makes the barrel much thicker at the inner end than

It would appeas, therefore, that, through M. Bert's discoveries, explorers will be enabled to ascend elevations hith orto deemed inaccessible, and aeronauts to penetrate regions of our atmosphere where life, under ordinary conditions, cannot exist.

European Orduance.
The United States Government,being in quest of a system of rifled ordnance, sent a naval mission to Europe four years ago to inspect the chief gun factories in the principal countries in Europe, and to report upon the systems of ordnance in course of manufacture. This has resulted in two quarto volumes, containing 640 pages of matter, the best
is found desirable in this country, and so shrinks on the outor hoops as to cripple the elastic action of the barrel. The French have adopted a system of construction which would be tolerable enough in conversion of old cast iron guns into rifled ordnance of an inferior order, but is without any merit but cheapness in new pieces. A steel half barrel is imbedded in cast iron, and further supported by steel hoops over the powder chamber. By this means the elasticity of the steel half of the barrel is crushed, and a joint with cast iron formed in the interior. The idea was, probably, taken from Parsons' system of converting old smooth-bore cast ironguns into rifled ordnance, which was tried in France with most marked success. But if so, we can hardly think the new plan an improvement on Parsons' method of inserting a full length steel barrel into the old cast iron bore, and supporting the powder chamber by steel jackets in contact with the barrel.
The Palliser conversion differs from the Parsons, chiefly in employing a barrel of wrought iron, a ma. terial too soft to endure large charges or the hammering of loose heavy projectiles. But the strangest system of converting cast iron system of converting cast iron
smooth bores into rified ordnance is that adopted in Holland, of lining the bore with bronze, a soft material quite incapable of withstanding the beat and rush of gases evolved in the combustion of large charges.
Belgium employs a cast iron bar rel, supported, from breech to trannions, by two tiers of steel rings or hoops. But as this country bas no navy, it does not require very heary ordnance, and its experience in this direction is not so great.
Next to the material and system of construction, the question of breech versus muzzle loader demands attention. Recent experiments have shown that an enlarged powder
half of which is devoted to the ordnance produced in Great chamber, in permitting a reduction in length of the cartridge Britain and the remainder to the Continent. Cons:derable discrimination has been shown in selecting salient points or detail, and much impartiality in describing the merits of the various systems, both of construction and of rifling, etc. Admitted to the principal factories of Europe, the American naval mission made good ust of eyes and ears, and the result is a compilation of varied information which only needs an index-strarge omission-to prove of great service both o the manufacturer and to the artillerist.
Amongst the factories visited in England: Woolwich, the London Ordnance Works, Whitworth's, Jarrow, Barrow-in Furness, and Low Moor are duly honored, the system of construction at the Royal Arsenal and by Messrs. Vavasseur being carefully detailed; while the treatment of the ore at Jarrow and Low Moor, etc., is carefully described, as well as the production of steel by Firth and by Whitworth Our gunpowder factories, dockyards, iron plate rolline torpe does, and nsval organization are not forgotten. Our own naval men may learn from their United States brethren some important facts connected with their own weapons, which have hitherto been shut up in the archives of the War Dopartment. It is, however, when the naval mission passes to

The real difficulty in ordnance lies, however, in the projectile. To contrive a projectile which can be driven most rapidly out of the gun, without wriggling in the bore, with its center coineident with the axis of the piece, and with the minimum of strain upon itself and the gun, while receiving the impress of a rotation proportionate to its length, has exercised many minds. Though the lead-coated projectile of Krupp has many excellences, high velocity or great penetration cannot be amonget the nunaber, inasmuch as the drag through the barrel resists high speed, and the peeling off the lead coat in passing through armor impedes perforation. Vavasseur's copper-ringed projectile would compare favorably in both these aspects. And either would ensure a far steadier passage through the barrel, and therofore more equable powder pressures, than the balancing studs of Wooluricb. France appears to have adopted copper rings on the projectiles for its new breech loaders. Objection may be taken to the overhang, unsupported at either end of these shot; but as the ring bites the grooves above as well as below, there is none of that balancing movement which is present wherever a windage shot touches the bore only at the two studs beneath and is free all round its body. If the long iron bearing and centering devices, employed in muzzle loaders by Vavasseur, Scott, Lancaster, and Whitworth,could be efficiently employed in breech loaders, we should expect higher velocities and better penetration than from any compression system of rifling. The difticulty be not insurmountable of preventing these windaged projectiles overmountable of preventing these windaged projectiles over-
shooting their seat when loading from the breech. With. shooting their seat when loading from the breech. With-
worth has breech loaders on his system, but of mall caliber, worth has breech loaders on his system, but of small caliber,
where the difficulties are small, and we can hardly accept this ovidence as alone decisive in favor of the employment of windaged shot in breech loading ordnance.
The dispassionate tone adopted by the naval mission of the United States in describing the ordnance of Europe lends weight to their impartial descriptions and very reasonable recommendations; so that, whether we adopt their conclusions or not, we cannot but listen respectfully to their suggestions. The sum of their recommendations is that the Varasseur aystem of construction is the best in Europe; the Parsons system of conversion, most suitable for old guns. Breech loading cannon being universal except in England, the breech closing arrangement of Krupp, with the Broadwell ring for "gas check," is regarded as best for adoption, while projectiles should bave the copper rings of Vavasseur. The Wool wich system is honored in being made the standard of comparison with that of the civilized world, with the result, however, of being declared inferior to the Vavasseur and Krupp; and the concluding paragraph of this extensive report is reserved for a condemnation of the studded tensive report is reserved for a condemnation of the studded
projectile in favor at Woolwich, which is the chief offendprojectile in favor at Woolwich, which is the chief offend-
ing cause that has landed us in such artillery difficulties that ing cause that has landed us in such artillery difficulties that
Rear Admiral Sherard Osborn, C. B., F. R. S., says: "I, for one, do not desire to take any share of responsibility in the great gun fasco, which, I fear, awaits us on the commence. ment of a war with a frrst class naval power."-Iron.

## The Education of Artisans.

Since the application of steam as a motive power for the production of almost every commodity required by man,everything seems to be wanted in a hurry; and for smart, intelli. gent workman of every craft, a continually increasing demand is plainly observable. But in nearly every calling thorough. ness has been hitherto sacrificed to the impatience of customers, and we seem to bscome the more pressing the quicker we are served. The consequence is that the mechanical arts are cut up into branches, and the artisan, who should know all about his business, is made a mere expert at ove particular part. Whatever a workman is quickest at like a machine, that be is kept to; and as long as hecarns a living by that one thing, it is ten to one if he ever seeks to know any more. Were he compelled to turn his hand to other parts of his business, he would have to occupy in a useful way, in order to quali
fy himself for the performance of taak by which he earned fy himself for the performance of task by which he earned
much brain work, he is the more easily led into idle pastimes, in which he oftenindulges to excess. His compara. tive prosperity makes him consequential. It he were made to feel that on the completeness of his abilities depended the bread which he is in the habit of earning by the repetition of a mere mechanical performance, which through constant practice becomes of no troubleto him, his mind would receive a new stimulant with each different job, and study would be the result.
Being thus compelled to see for information, his mind would be led into the parts of true knowledge in the search, and, once fairly started on that road, he would not be long until he could discern sound argument from bombast. There is much talk at present about technical education; but before the attainment of it will bear any fruit, the system of parceling out must be changed. When a boy is apprenticed to the tailoring trade, if he proves any way smart at making a vent, he never will get the chance of making trousers; and if he be quick at the latter, he will never be anked to put a stitch in a coat. What is the use of teaching the theory of any trade in schools with such a practice in ex. istence?
In the building trade, we have masons or atonecutters who are not expected to set the stone they have wrought; wallers and hundreds who could notread s drawing or get out a mold by which to work. Among those who are called joiners, we have men who make sasher they could not hang, and who never eaw a "mouse" in their lives. We have
"flixers" who, as a rule, make nothing they put up; and "fixers" who, as a rule, make nothing they put up; and
" framers" who would not be able to perceive the same angle
in two different positions. We have "staircase bands" who affect to despise everything else connected with the construction of a building, and who, as a rule, look upon themselves as gods of wood, although they never made a circular headed sash in the whole course of their existence. Well planned houses suffer in their erection through this practice; for the bench hand, " who has been kept for a number of years at what he can do quickest, is often necessitated to turn
Considering the present system, it would appear that, with most builders, profit alone is the alpha and omega of every undertaking. It looks as if they do not care whether a house stands or falle,afler it has been built and their gains counted into the bank. Very few have any considerations for the welfare of those whom they employ; and consequently, there is little or no reciprocation. The workshop, which ought to be conducted on the principle of a school where technical instruction is imparted, as well as for the fabrication of an article which brings a profit, is very often superintended by a man chosen more for his driving qualities than for his information.
It is seldom that a man capable of imparting what he knows is met with in such positions, and the generality of men in charge are cross and intemperate in their language, instead of being kind and considerate. As to receiving instruction, men are left very much to themselves to pick up that which they would seonerand better understand if explained by a man competent to do-so. The language used by the generality of foremen, too, is very often the most abusive and sometimes revolting, such as no man aspiring to are spectable position in society should be heard giving utterance to. The susceptible dull youth of one and-twenty is sneered at if he chance to ask the foreman a question concerning his work, and mulcted out of money, or wheeled into paying for beer, for the information which he receives from his older fellow. Capitalists should look after these practices, and apply a remendy, for one or two hours' prefatory instruction or forethought often saves a great amount of labor. Those whe cannot see before them lose much time groping their way, thd obviously the loes is to the employer. It is often said that the workers are not expected to be thinkers. In fact, the remark is frequently made: "You are paid for working, sir, not for thinking," addressed as a reprimand to those who gave such a reason for being caught, as the man in charge might suppose, wasting the employer's time. This is, too, without the least inquiry concerning the truth of the assertion. The result of this system is that men who would otherwise seek to become intelli. gent and useful in a general sense, lay down their minds to becomeexpertat one or two things, and in many cases sharponly at what is called "shaping," thatis, by their bustling about and wielding their tools juggler fashion, making people believe they are qualified for anything. To be sure, this kind of tact shows a knowledge of human nature on the part of the person who empinys it, and the present system is the chief cause that lendminy to resort to it; but also shows the weak-
ness, s: 1 and ciality, perhaps vanity, of those who are the victims.
If it were the practice that the foreman was bound to call his apprentices and men together once or twice a week, say for an hour, or even half an hour, at a time, and give them a lecture during working hours upon some technical subject, hundreds would be very thankful, and willing to subscribè to the expense. After working hours, very many working men do not like attending lecture halls for such a purpose, and they would be more at home in a class got up specially for themselves, and particularly when it would be taugat where every practical appliance necessary for demon stration was close at hand. -The American Builder.

## Cotregipoudeuce.

## Horse ve. Steam Power.

To the Efditor of the Scientific American:
I see that, on page 346 of your current volume, W. F. W. asks which is most efficient, a two horse steam engine or two horses weighing 2,000 lbe., when used in an endless railway power. The answer to this query states that usually an engine of one horse power will do more work in the same time than one horse could do, with the adrantage that the engine would not get tired.
I desire to statethat, from numerous statistics from English and French authorities for a century past, together with over thirty years' experience in the application and use of animal power as a substitute for manual labor, and numerous and exhaustive trials with all motors, especially horses doubt that any two good work horses, of two thousand pounds weight, can walk eight hours each day at the rate of about $1 \frac{1}{2}$ miles per hour upon a moving plane at an inclina tion of from $13^{\circ}$ to $15^{\circ}$, without fatigue or injury,forsir days per week for their natural working life; and this, upon a well designed and constructed ondless railway power, will cause them to exert an average constant power equal to power; from which must be deducted for friction of such power (by actual results) from 11 to 15 per cent, which reduces the force transmirted and atilized to, say, 77,550 foot pounds per minate, or 38,775 foot pounds per minute for each horse, or $1 \cdot 175$ horse power net, transmitted. These United States Agricultural Society and the New Fork State Agricultural Society during the past ten years.
In regand to small steam engines, I have always allowed and dedacted (for thoir own friction) 25, 30,35 or 50 per cent from their rated power for six, four, two, and one horse
firmed in my mind the correctness of this reduction. With poorly designed and poorly constructed horse powers or steam engines, the results would be lessened, while almost invariably the expens
Albany, N. Y.
Horace L. Emery.

## The Missisippi Rive

## To the Editor of the Scientific American:

Haring noticed within the past year a number of schemes to relieve the shipping of the bar at the mouth of the Miseissippi river, I intend to bring before the government a plan for carrying vessels, not over but through the bar, in the fol lowing manner: I would build a propeller to draw as much water as the largest ship that will be required to be towed through the bar. She should be as short as possibie, in order to be easily manipulated and not require too much ballast to get the required draft. In or near the bottom of her hold, I would place a sufficient number of immense force pumps, to be worked by steam. I would have five iron discharge pipes, of nine inches diameter, to discharge their water through the steamer's cutwaler, one above the other, well down below the mud line. The two lowest pipes are to point slightly down in order that the water will pass under the boat when she is in motion. The pipes are to come fush with the outside of the boat and to be reduced to a diameter of six inches at the point of discharge, to give the water velocity. Then I would have three seven inch discharge pipes, contracted to five inches at the mouth, on each bow, one above the other, well down under the boat and pointing down and forward at an angle of $30^{\circ}$. Then I would have a row of seven inch discharge pipes about 10 or perhaps 15 feet apart, along the whole length of the boat on each side, well down under her sides and pointing down and forward at an angle of $30^{\circ}$. Those pipes are to be contracted at the mouth to five inches diameter. I propose also one six inch pipe to discharge its water down through or alongside the keel, well forward under the bow. The feed or suction pipes are to take the water as near the surface as possible, in order to use clear water.
I believe such a boat would tow any ship or steamer through the bar at the mouth of the Mississippi river with perfect ease and safety. She would have a perfect volcano under her, constantly bursting up through the mad and sand and leaving behind her an immense channel. And as she would be constantly tearing the bar to pieces, the abb and flow of the river would in a great measure remove the bar altogether. I think there in no plan by which the obstructions can be so cheaply overcome, as one such boat will do all the towing both in and out of the river.
A powerful force pump put on board of the steamers running above New Orleans, to throw a powerful stream or two under their bows, would be a great assistance to them in getting off sand bars, where they often get stuck fast Preaque Isle, Mich.

Sidney Cook.
The following are the current rates for gas paid by con sumers, per 1,000 feet:

| Albany. | \$2.50 | Rochester.. | \$3.50 |
| :---: | :---: | :---: | :---: |
| Baltimore | \$2.75 | St. Louis. | \$3.25 |
| Boston | \$2.50 | Syracuse. | \$3.25 |
| Chicago | \$3.371 | Troy. | \$3.25 |
| Cleveland | \$2.50 | Washington | \$3.56 |
| Concord | \$3.20 | Hamilıon. | \$3.00 |
| Harlem | *3.00 | Kingston | \$3.50 |
| Lowell. | \$2.75 | London, Canada | \$3.00 |
| Manchester. | \$2.70 | Montreal. | \$2.60 |
| New York. | \$2.75 | Quebec. | \$2.80 |
| New Orleans. | \$3.00 | Toronto. | \$2.50 |
| Oswego.. | \$3.50 |  |  |

A writer in the Boston Cultivator finds that most of the so-cslled strained honey sold in bottles is composed as fol-
lows: Cane or other sugar is melted in a decoction of sliplows: Cane or other sugar is melted in a decoction of slip-
pery elm bark in water. Some manufacturers use, instead of elm, a solution of gum arabic and starch, to give it consistency and save sugar; but this last does not resemble honey so much when dropped, as it lacks the stringy appearance. These mixtures, with or without the addition of a little cheap Cuban honey, are flavored with essence, and the mess is ready for sale. The only true way to obtain real honey is to buy it with the comb.

To Destrox Moles.-Bryan Tyson, Washington City gives the following method for making pills to deatroy moles: Make a stiff dough of corn meal, mixing with it a small quantity of arsenic. Make a hole with a finger in the runways, drop in a lump of dough about the size of a marble, and then cover over with a lump of earth to exclude the light. After the first rain, go over the field again and deposit in all freshly made roads. I once concluded to plant a piece of sandy bottom land in sweet potatoes; but as it was much infosted by moles, my success depended on first exterminating them. A few doses of arsenic given in the way described brought about ihe desired result, and it was a very rare circumstance to see the track of a mole in this piece of ground during the en tire summer.
Charges for Machine Tools a Quarter of a Century Ago.-The following is interesting as showing the cost of work done on machine tools twenty-five years ago. We give the charge per day for use of tools: Large boring mill, $\$ 17.50$; medium boring mill, $\$ 12$; large punching machine $\$ 25$; heary lathe, $\$ 15$; small lathe, $\$ 550$; large drill, $\$ 8$; medium drill, 84.50 ; large planer, $\$ 7.37 \frac{1}{\frac{1}{2}}$; medium size planer, $\$ 5.53 \frac{1}{8}$; forge (with smith and helper), $\$ 10$; small orge (with smith and helper), $\$ 5$. Machinists recoived from $\$ 1.95$ to $\$ 2.15$, and boiler makers, from $\$ 1.75$ to $\$ 1.90$.

PRACTICAL MECHANISM.
numbir iII.
by joshea bose.
the bpring tool.
Fig. 15 is a spring tool, which is specially adapted to fin-

ishing sweeps or curves, and may bs used on either wrought or cast iron, or brass; the only difference in shape required to fit it for such various uses is to give it less top rake for cast than for wrought iron, and less for brass than for either. The fulcrum off which it springs is at the point, $a$, because that is the weakest part (since the cutting edge, $B$, is at a leverage to $a$ ); the line of spring of the edge, B , is therefore in the direction of the dotted line, C , which is away from its cut, so that it will give way to the metal rather than spring into it, which causes it to recede from the harder and spring into the softer parts of the metal, rendering its use unadvisable except for finishing curves, which it will do more smoothly and cleanly than any other tool, especially when necessity compels it to be held far out from the tool post.
boring tools.
Standard bits and reamers have superseded the use of boring tools for all special and many other purposes, but there are numerous cases where a boring tool cannot be dispensed with, especially in repairing shops and for promiscuous work.
The boring tool is very subservient to spring in consequence of its catting edge being in most instances far out from the tool post, and also from the slightness of the body of the tool when used to bore holes of a comparatively small diameter.
It should, when used for wrought iron, always be placed so that its cutting edge is a little below the center of the hole, in which case the bottom of the body of the tool is liable, in small holes, to bear against the bottom of the hole, unless the cutting part is made to be a little below the center of the body of the tool, rendering it rather difficult to grind on the top face; it is not, however, imperatively necessary to grind it there, since it can be sharpened by grinding the side faces; and the advantage gained by being enabled to get, into a given sized hole, a stouter tool than otherwise could be done, and, as a result, to take deeper and more nearly parallel cuts (for these tools generally sp:ing off their cut at the back end of the hole, leaving it taper unless"several light cuts are taken out) more than compensates for the extra wear of the tool, consequent upon being able to grind it upon one part only.
Fig. 16 represents a section of a boring tool, as above described, for use on wrought iron. $a$ is a section of the body

of the tool; B is the cutting part, and C is the outline of the hole to be bored.
Very little bottom rake need be given to the tool, so that, when it springs from the pressure of the cut, it cannot enter the cut deeper than is intended, bezause of the pide rake coming into contact with the side of the hole. It may, however, possess a maximum of top rake.
Boring tools for cast iron require less top and more side rake, and to be placed at the center of the work or even a little above the center. For brass, the catting point, B, should have no top rake; and if the tool jars or chatters, as frequently occurs in cutting a groove, it must be made as shown in Fig. 17, $a$ being a section of the body of the tool, B the cutting part, and $C$ the outline of the hole. B, being the

owest point of the top face, possesses negative top rake, and a corresponding tendency to scrape rather than cat keenly. The point, B, should always be above the center of the hole, so that, in springing, it will spring away from and not into its cat. Less top rake is required, if the point, $B_{\text {, of the }}$
cutting edge is ground so as to be used for screw.cutting than ! if for taking plain cuts.
When the skin of the metal to be cut is unusually hard, as frequently occurs in cast iron, the shape of the cutting part of the boring tool must be such that its point will enter the cut first, so that it cuts the inside and softer metal. The hard cut first, so that it cuts the inside and softer metal. The hard
outside metal will then break off with the shaving without outside metal will then break off with the shaving without
requiring to be cut by the tool edge, while the angle of the requiring to be cut by the tool edge, while the angle of the
cut will keep the tool point into its cut from the pressure required to break the shaving. A tool of thia description is

represented in Fig. 18. $a$ is the point of the tool, and from $a$ to B is the cutting edge; the dotted lines, $c$ and D , repre sent the depth of the cut, $c$ being the inside skin of the metal, supposed to be hard.
The angle at which the cutting edge stands to the cut causes the pressure, due to the bending and fracturing of the shaving, to be in the direction of $e$, which keeps the tool point into its cut; while the resistance of the tool point to this force reabting upon the cut, from $a$ to B, causes the hard skin to break away.
When a cut is being taken which is not sufficient to clean up or true the work, less top rake must be given, as a very keen tool loses its edge more quickly than one less keen. The reason for taking the rake off the top of a tool is that. if it were taken off the bottom, the cutting edge would not be so well supported by the metal, and would have a tenden cy to scrape, which rule applies both to inside and outside cuts. For brass work, top rake is never applied, because it would cause the tool to jar and cut roughly, bottom rake alone being sutficient to give a tool for brass the requisite keenness.


Fig. 19 shows a front tool for brass, concerning which nohing requires to be said, except that it cannot be made too hard, and that the top face must have negative rake when the tool point is held far out from the tool post.

SIDE TOOLS.
Side tools for iron are subject to all the principles already explained as governing the shapes of front tools, and differ from them only in the fact that the cutting end of the tool is bent around to enable the catting edge on one eide to cut a face on the work which stands at right angles with the straight cut. A front tool is used to take the straight cut nearly up to the shoulder, then a side tool is introduced to nearly up the corner and cut the side face.
take out the

A side tonl, whose cutting end is bent to the left, as in Fig. 20, is called a left-handed side tool, and one which is bent to theright, a right-handed side tool. The cutting edges, $a$ and B, should form an acute angle, so that, when the point of the tool is cutcing out a corner, either the point only or one edge is cutting at a time, for if both of the edges cut at once, the strain upon the tool ceuses it to spring in.
The form of side tool shown in Fig. 20 is that most desirable for all work where it can be got in: and in the event of a side face being very hard, it possesses the advantage that the point of the tool may be made to enter the cut first, and, cutting beneath the hard skin, fracture it off without cutting it, the pressure of the shaving on the tool keeping the latter to its cut, as shown in Fig. 21.

$a$ is the cutting part of the tool; B is a shaft with a collar on it; $c$ is the side cut being taken off the collar, and $D$ is the face, supposed to behard. The cut is here shown as being commenced from the largest diameter of the collar, and being fed inwards so that the point of the tool may cut well beneath the hard face, $D$, and so that the pressure of the cut on the too! may keep it to its cut, as already explained, but the tool will cut equally as advantageously if the cat is com menced at the smallest dismeter of the collar and fed out wards, if the akin, D, is not unusually hard.
For catting down side faces where there is but little room or the tool to pass, the tool shown in Fig. 22 is used, $a$ being the cutting edge. Not much clearance is required on the

away the edge, C , so that the top face, from C to $a$, is an in clined plane, $a$ being the apex. This tool should be so placed that the point, B, cuts a little the deepest, and the cutting edge at the point, $D$, is clear of the cut, the only consideration with reference to it is how much rake to give it on the face, from $C$ to $a$, which should be less for cast iron than for wrought iron, and more when the metal is soft than when it is hard. Its spring does not'affect it to any degree, since it springs vertically and in a line with the face of the cut, and not laterally and into it.
The best form of side tool for cutting brass is the diamond point, presented in Fig. 23, a a being the cutting edges. It
 either but little side rake upon held far out from the tool post should have the rake taken off the top to prevent it from epringing. In grinding it, grind only the end (rounding off the corner elightly), so as to preserve the bend upon the end of the tool, which is placed there to give it clearance. It will take a pa. rallel cut equally as well as a side one, and for amall work can be used to advantage for both purposes.

## Vibrations of Liquid Surfaces.

Barthélemy has subjected to investigation the undulations which are produced upon liquid surfaces when these are which are produced upon liquid surfaces when these are
thrown into vibration. The best results were obtained when the vessel of liquid was placed upon the resonant case when the vessel of liquid was placed upon the resonant case
of a tuning fork. Similar results were also obtained upon the sounding board of a piano. In this way the surface of the liquid assumed a fixed condition of olevation and depression, the result of uniform vibration over its entire area. Rectangular vessels give two sets of brilliant lines parallel to each side, formed by the ridges of the waves. Between these are less luminous lines produced by the hollows. Bright points are formed at the intersections of both. As the movement dies away, the lines parallel to the shorter sides disappear first, leaving those parallel to the longer; though sometimes components of both are left, forming zigzags diagonally across the surface. From his experiments Barthélemy deduces the following laws: 1st, the breadth of the undulations is inversely as the number of vibrations; and 2d, the distance between two lines produced by the same fork is independent of the density of the liquid. The figures given by circular masses of liquid consist of equidistant circular lines intersected by radii equally equidistant, thus giving trapezoidal forms with curvilinear bases. If the fork touches the vescel, a cross of no vibration appears, corresponding to the nodal lines of this vessel. As the vibration ceases, two opposite sectors dinappear and the two alternate ones remain. By placing sand on the surface of the mercury and then covering it with water, circular lines are formed and also the cross of no vibration, the eand gathering in heaps at the vibrating parts. Triangular vessels give lines perpendicular to the sides, forming brilliant hexagons, the centers of which are the angles of fainter hexagons, having the radii of the first set for sides. As the motion lessens, only one set of lines persists, and the surface is covered with rectilinear waves perpendicular to one of the bases. Elliptical vessels give figures of exceeding beauty, the lines having reference to the two axes of the ellipse. The author calls attention to the general character of these wave surfaces. In the basin of a fountain, in the waves of the sea, these forms are recognized. Even in the sand on the sea bottom they can be traced. Certain lines thus made gave on measurement $2 \cdot 6$ vibrations per second. They may be seen 300 feet from the beach and at a depth of 25 or 30 feet. So, out of the water, the sand on the beach was found to have taken these forms, thus sug. geating that the air itself was capable of similar vibration. So also clouds are arranged often in parallel bands, being So also clouds are arranged often in parallel bands, being
being then considered a precursor of fine weather. Even in geology, the author thinks certain regular and equidistant foldings of stratified rocks evidence of analogous vibrations. The ventral segments of a liquid vein, M. Barthélemy thinks, are produced by the vibration of the liquid mass upon which it falls reacting, upon it. And he makes an ingenious application of these facts to accoant for the phenomena of stratification produced by electric discharges in rarefied media-An. Chim. Phys.-American Journal of Science and Arts.
L. P. S. says "I have run a piece of machinery in rawhide boxes for fourteen years without oil; it is good yet and runs at 4,500 per minute. I put it in while soft, and let it remain until dry." [We are glad to receive notes of this kind, giving results of actual practice. Nearly every one of our readers could send some information that would be valusble.]

## STEVENS' IMPROVED HINGE

The invention represented in our engraving is a hinge, which is shown applied to the door of a safe, for which purpose it is especially well adapted. Upon the casing or body of the safe is cast, or otherwise attached, a socket, A, into which passes the pin, B. The latter is held in place by the crews shown in the sectional view, Fig. 2, and which have their heads within the safe. In order to remove the door, these screws are taken out; and a punch, pushed down the oil hole, C, speedily forces out the pin, B, in case the same should tick. The top of the door is then moved out a little, when the lower hinge, D, is readily lifted out of its socket, E. F s a set screw, provided to prevent the door from sagging a the tenant of the lower hince wror awey


This invention is quite simple and easily applied, while it appears to be substantial and secure. Patented December 30, 1873, by Mr. Wm. F. Stevens, of Melrose, Mass., who may be addressed for further information.

## IMPROVED PATENT GANG SAW TABLE.

This is an invention specially adapted to meet the want users of flooring machines, who have found difficulty in upplying material, sawn in strips from mixed widths of boards, fast enough to keep the floorer in operation. A good machine of the latter description should plane and match from ten to twelve thousand feet, broad measure, of four to six inch flooring, in ten hours; but it is hardly possible for a man to saw more than from six to eight thousand feet, into strips, in the same time and over a single saw. Hence it is either necessary to buy strips prepared at the saw mill (and these are rarely accurately sawn), have two saw tables for the floorer, or else not work the latier up to its full capacity, none of which are economicul operations. Made on an ordinary saw table, strips are produced in valying sizes; and perhaps after ome hours work, not enough of any one -ze can be sorted out to keep the match. ing machine at work, thus involving changing the apparatus so frequently as to prevent its performingits fullamount of labor.
The device illustrated in the annexed ongraving is claimed to meet the requirements above indicated. It is able to provide a supply sufficient to keep two matchers constantiy at work. Two saws are used for slitting the lumber into strips of suitable width, one of which, A, is secured upon the arbor rigidly, and the other, $B$, is attached to a sliding and revolving sleeve and collar. This sleeve is provided with grooves to receive Babbitt metal, and works within a journal box which slides with it, and, besides, has a longitudinal channel to receive the feather by which it is made to revolve with the shaft while still slioing freely along the same. The lower part of the box is provided with a downwardly ex tending arm, at the end of which is an eye to receive a guide rod, which extends transversely across the machine. A mortise is made through the arm, between the box and the eye, to receive a lever which is pivoted at one end to the frame and terminates at the other with a handle, C, convenient to the operator. By means of thislever the arm, and with it the sliding sleeve and saw, B, is moved nearer to or further from the fixed saw, $A$, in order to govern the distance between said saws, and hence the width of the strip. At D is a gage which may be adjusted to any desired distance from the screw, A, by means of the hand lever, $\mathbf{E}$ which communicates with a sliding sleeve traveling on a guide rod, which sleeve is suitably connected with the gage The carrying or gaide rollers, shown at F, grasp the sawn


CARROLL'S PATENTKGANG SAW TABLE,
The fibrous state of iron is not a normal and regular one All crystaline iron, if the crystals are not too hard, breaks with a fibrous structure, if time be given, in the breaking, or these crystals to be drawn out into fibers. Iron which is fbrous is only iron in which the primitive crystals, surroundd by very thin films of slag-and thus separated from each ther-have not been welded together during the rolling, but have been elongated into wireg. A bar of such iron resembles a bundle of wires in its resistance to fraction, but it breaks with a granular fracture when exposed to a transverse blow, suddenly applied. -M. Jordan.

FOR a marking fluid, use coal tar dissolved in naphtha.
strips and carry them forward, thus acting also as feed rollers to guide the stripstruly through the machine. The upper roller is made yieiding by the application of the weight, G. It will be observed that no feed rolleis are used to hold the lumber before the same reaches the saw; and by such arrangement, the operatoris enabled to see, when the end of the timber is placed upon the table, whether the sliding saw or gage should be removed, so that all the material in the plank ay be utilized.
The arrangement of two rows of notches, into which the hand levers'are dropped to hold them securely in any position, will be readily understood from the illustration. The feed is driven from the saw arbor, so that a slip of the driving belt checks the feed correspondingly.
Though the machine is designed especially for planing mills, we are informed that it can be used as a strip machine in small saw mills, and the mothod of holding and moving the movable saw can be advantageously used on all the dif ferent makes of gang edgers. The gage can also be applied to the ordinary single saw table. The speed is from 2,500 to 3,000 revolutions per minute, and we learn that over 20,000 feer of dimension stuff can be made in a day from miscellaneous lumber, and a much larger amount from stock boards.
Patented August 12, 1873. For machines address the Erie City Iron W orks(sole manufacturers of the apparatus for the United States), or George Carroll \& Brother, Erie, Pa. For right to manufacture in Canada, address John McIntosh, To ronto, Ontario.

## The Welding of Iron

When two pieces of ice are rubbed against each other, fusion take place between the surfaces of contact, at a temper ature below zero. As soon as the pressure ceases, solidifica tion is again produced and the pieces are welded together
It seems to me that the welding of iron is á phenomenon ex actly similar. The two pieces of iron are brought to a white heat, that is to say, more or less near to the fusing point. The repeated blows of the hammer, or the pressure of the rolls, lowers the point of fusion and causes a superficial liquefaction of the parts in contact, and thus welds the masses together; and this, because, like water, iron dilates in passing from the liquid to the solid state. Many other metals are similarly endowed; they all therefore may be welded like iron, if other conditions do not come in to oppose the maniestation of this property. Platinum welds easily at a white eat because its non-oxidizable surface, like that of ice, takes on a súperficial fusion. To wold iron successfully, it is necessary that its surface should be clean, that is, free from oxide. Iron containng phosphorus welds more easily than pure iron, because its point of fusion is lower. Steel, which is more fusible still, welds at a lower temperature than iron, but the process is a more delicate one. Silver, too, like iron and platinum, has the property of expanding when it solidifies; but as it melts at a cherry red heat, it is easier to form t by casting than by welding. Bismuth and zinc are always ncluded in the same class; but they are so very brittle near

The hydrant represented in the annexed engraving is claimed to prevent freezing and waste of water. It is of durable construction, and is self closing. The valve is not liable to become choked with dirt, as the passage of the water

serves to clean the orifice, while the pressure of the fluid keeps the valve down.
A is a cylinder or chamber, sunk in the well and provided with a piston, B , the rod of which connects with the handle, C. Dis the eduction pipe, having a suitable discharge noz le, as shown. To this pipe is attached a guide plate, E, Fig. 1, which may be adjusted to various elevations by means o a clamp screw. On the piston rod is a fixed disk, between which and the plate, E, a epiral spring, F, is extended. The latte r,being stretched when the hand lever is depressed and the piston, B, raised, will retract and throw down the piston into place as soon as the force on the lever is remitted. G, Fig. 2, is a gravi. ty valve, having a subjacent slotted tube and an upper head working in a guide. As the piston rises, the valve is carried up until the slotted tube receives, through the inlet pipe, H, a supply of water, which is then forced up through the eduction tube, $D$, and disthrouga the eduction tube, $D$, and dis-
charged. The chamber, $A$, is thus kept always in a condition to receive the watir that maybe left in the tube, $D$, after the flow has ceased from the spout.
I is a leather or flat flexible ring that is secured to the valve by a metal ring or pin, and which acts, in case of gravel or other obstruction settling between the valve and its seat, as an auxiliary valve, being forced by the pressure of the superincumbent water to coverany crevice made and to form a watertight joint.
Patented through the Scientific American Patent Agency, April 28, 1874. For further particulars regarding sale of patent rights, licenses, etc., address the inventor, Mr. John T. Davis, 1,212 Eleventh street, Southeast, Washing. ton, D. C.

Wire Worms.-These are found in the greatest quanti ties in fresh new loam, just brought from the field, and such soil, when used for valnable plants, should be carefully examined, and the wire worms crushed; their brownieh red bodies are easily seen. Mr. Tillary writes to the Garden that elices of potatoes or lettuce stems will likewise eatice them where they are numerous. The slices should be placed under ground and then fis ozamined. He ased a bed or of which, he found afterwards, swarmed with wire worms, by
placing slices of potatoes and lettuce stalks in the ground af ter he found that some of the plants were flagging.

## THE ROYAL GARDENS AT CASERTA, ITALY.

THE ROYAL GARDENS AT CASERTA, ITALY.
Most of our readers are familiar with the chief features of the Italian school of landscape gardening, the broad plateaus, the artificial lakes and waterfalls, and especially the formality of shape shown in trimming the edges and rows of trees. Of the pleasure grounds attached to the palace of Caserta, the country residence of the late King of Naples, we herewith publish a view. extracted from The Garden. Our contemporary, in dercribing the scene, says:" You enter throngh a huge royal palace, which seems admirably suited for accommodating several regiments of life guards, when the commodating several regiments of life guards, when the
scene depicted in the illustration meets the eye-the huge cascade facing a distant hill covered with evergreen oak. cascade facing a distant hill covered with evergreen oak.
Good as the engraving is, it can give little idea of the enorGood as the engraving is, it can give little idea of the enor-
mous length of these garden waterworks, long and well constructed stone reaches of deep clear water, broken here and there by falls, which are embellished by a rich display of sculpture and statuary. But, before reaching the waterworke, we have to traverse a very large space by habit called a garden, but which is simply a huge expanse of turf, on which stands clumps and squares, and avenues of trees. We have to approach these closely to see what they are composed of, for all are either clipped or mown, or in some way mutilated, till they lose all individual character, and merely form irregular walls of vegetation. Under one of the falls, there is a vast covered way, with well constructed rocky walks and walls, and here the maiden-hair fern grows everywhere as freely as meadow grass; it ventures out from the moist and shaded grottoes, and creeps into the eyes and ears of the spouting sea monsters outside in the sun-the only trace of life or Nature near. The distressing effect of all this gradually passes away, for one of relief, as the base of the great ifregular (but almo artificial) cascade is reached, till the eye dwells happily on the hills around, densely garlanded with evergreen oak. All this kind of art comes from allowing the apace intended for a garden to be converted into an open air gallery for the exhibition of architecture, sculpture, etc., mostly of a mediocre, and often of a feeble or ridiculous character. Let us not, however, delude ourselves into the belief that, in creating such scenes, on either a large or small scale, we are making a garden. There is at Caserta, however, an example of one phase of real gardening which will repay the visit. It is what is called the English garden, a large piece of diversified pleasure ground, with many trees allowed to assume their natural development. Towards the end of the last century this garden was planted, and with a very happy result. The great geometrical district, so to say, gives one an idea that the region is not a fertile one; this is at once dispelled on entering the English garden. The cedars, cypresses, and deciduous trees have attained great size and beauty, and grow in stately groups, with open spaces between, so that their forms may be seen. Here is the first camellia ever introduced into Italy, where the plant is now so abundantly grown, and whence we get most of our new varieties. It is a epecimen of the single red, now in full
bloom, and about 20 feet high and 15 feet through. The camphor tree is seen in fine health here, in specimens nearly 50 feet. The gardon is enriched by some grand cork trees, which may give many visitors a fair idea of what a noble tree this oak is when fully developed. The trees are huge in stem, picturesque in their branching, and about 80 feet high. Some of the scarcer pines attain much perfection here, as, for example, the Mexican ( $p$. Montezuma), which is 60 feet high.

## The Posibilities of Future Discovery.

A striking illustration of the popular lack of scientific reasoning is to be found in an editorial which recently appeared in the New York Herald as follows:
"The wildest imagination is unable to predict the discoveries of the future. For all we know, families in the next century may pump fuel from the river and illuminate their houses with ice and electricity. Iron vessels, properly magnetized, may sail through the air like balloons, and a trip to the Rocky Mountains may be made in an hour. Perhaps within fifty years American grain will be shot into Liverpool and Calcut ta through iron pipes laid under the sea. By means of con densed air and cold vapor engines,excursion parties may travel along the floor of the ocean, sailing past ancient wrecks and mountains of coral. On land the intelligent farmer may turn the soil of a thousand acres in a day, while his son cuts wood with a platinum wire and shells corn'by electricity. The mat ter now contained in a New York daily may be produced ten thousand times a minute, on littlescraps of pasteboard, by improved photography, and boys may sell the news of the world printed on visiting cards, which their customers will read through artificial eyes. Five hundred years hence a musician may play a piano in New York connected with in struments in San Francisco, Chicago, Cincinnati, New Orleans and other cities, which will be listened to by half a million of people. A speech delivered in New York will be heard in stantly in the halls of those cities; and when fashionable audiences in San Francisco go to hear some renowned singer, she will be performing in New York or Philadelphia.
In the year 1900 a man may put on his inflated overcoat, with a pair of light steering wings fastened to his arms, and go to Newark and back in an hour. All the great battles wil be fought in the air. Patent thuaderbolts will be used instead of cannon. A boy in Hoboken will go to Canada in the fami ly air carriage to see his sweetheart, and the next day his father will chasten him with a magnetic rebuker because he did not return before midnight. The time is coming when the Herald will send a reporter to see a man reduce one of the Rocky Mountains to powder in half a day. Skillful miners will extract gold from quartz as easily as cider is squeezed rom apples. A compound telescope will be invented on en tirely new principles, so that one may see the planets as distinctly as we now see Staten Island. Microscopes will be made ao powerfal that a particle of dust on a gnat's back will appear larger than Pike's Peak. And marvelous progress will
be made in peychological and mental sciences. Two men will set in baths filled with chemical liquids. One of them may be in Denver and the other in Montreal. A pipe filled with the same liquid will connect the two vessels, and the fluid will be ao sensitive that each may know the other's thoughts. In these coming days, our present mode of telegraphing will b? classed with the wooden ploughs of Egypt, and people will look back to steamships and locomotives as we look back to sailboats and stage coaches."

## MEDICAL NOTES.

Cholera.
There may come another cholera scare this year ; certainly there will come one before many years. Some doctors think the scare worse than the disease. At any rate, the nervous depression produced by reading and hearing alarming stories is a well proven semi-cause of death, by diseases which of fect the nervous system, whether alone or conjointly with other disorders; and sometimes light ones are aggravated to the bitter end by imaginary fears. Knowing the force of this fact, as all experienced people do, it seems a happy thing to find an antidote, as far as cholera scares are concerned, in the following statement: Dr. Blakiston says, in the London Medical Times and Gazette, that it has been fully proved in the Paris hospitals that cholera is not communicable by the breath of the patient, or by contact with his body during life or after death. Most of the "stiffs," as they are called in technical vulgarity-that is, the subjects of dissec tion-were for many months victims of cholera in Paris,and yet no doctor and no student caught the disease. Therefore let no timid person have any fear about the infection of air or touch, but remember that the germs of cholera have been proved to be propagated through the dejecta (voidingsin any way) which come in contact with water or food, possibly with air much breathed, though this is not fully shown

Valerian in Diabetes.
Dr. Bouchard says extract of valerian is a powerful agent n diminishing the elimination of urea and waste of tissue seen in diabetes. Headds a curious fact, observed in long practice among the Indians of Lower California. The warriors, before entering on an expedition, go through a course of valerian regimen for a month, to get themselves into a fatigue-supporting condition. This fact suggests another, concerning the Peruvian Indians, who are able to go without food for five days, under a burdensome journey, when well supplied with the juice of the plant, so extensively used in that country, called coca. It seems to us that coca and valerian might be used in thickly settled countries as articles of medical nutrition, to say nothing of their possible value as substitutes for food of the common sort among the very poor.

Poisoning by Hydrate of Chloral.
In the case of a man who took six drams of chloral to commit suicide, electricity was first used to induce regular

breathing, and then subcutaneous injections of nitrate of
strychnia to stimulate the heart's action. Finally the patient awoke, quite refreshed, thirty-two hours after swallow. ing the chloral.

## A Good Disinfectant

A very weak solution of permanganate of potash is an excellent disinfectant for light purposes, such as rinsing spittoons, neutralizing the taint of diseased roots, cleansing the feet, and keeping the breath from the odor of tobacco smoke. Permanganate is not poisonous.

A Preventive for Lead Poison.
Any soluble salt of lime (if plaster of Paris or gypsum is used, there should be added a little saltpeter or sal ammoniac) in the most minute quantity prevents the oxidation of lead in contact with water. Therefore it would be well to put a little chalk into wells which have leaden pipes, also in leaden beer pipes and other conduits, if people will use them. Perhaps it would be better to dip leaden pipes in a moderate so lution of sulphuric acid (oil of vitriol) before using, and to dip the common soldered tin cans for fruit in the same, in order to form an insoluble coating of sulphate of lead. For, all wiseacres to the contrary, every good chemist knows that lead is easily oxidized 'by pure water, and still more so by water containing carbonic asid; and since lead is a comulative poison, a very little of it at a time, taken into the system for weeks, months, or years, will be sure to produce some ugly disease, like neuralgia, painter's colic, hardened liver, or paralysis, the frequent foe of the aged.

## mproved: Mustard Poultice

The Medical Brief says: In making a mustard plaster, use no water, but mix the mustard with white of egg, and the result will be a plaster which will draw perfectly, but will not p .

Anæsthesia.
At Bellevue Hospital, bromide of potassium, 30 grains previous to administering sulpburic ether and the same dose as soon as the patient can swallow after the administration, is now regularly resorted to. The effect is to prevent the vom. iting which so commonly follows the use of ether.

THE CONVENTION OF THE CIVIL ENGINEERS.
The sixth annual convention of the American Society of Civil Engineers was recently held in Tammany Hall in this city. About 100 delegates appeared, representing the principal cities in the country. Colonel Julius W. Adams, President of the society, presided; and in the course of the proceedings, a memorial was adopted urging upon Congress the necessity and importance of a series of complete testa of American iron and steel. We give below abstracts of the papers read.
papers read.
B. Eads said that

## UPRIGHT ARCHED BRIDGES

can be more economically constructed for railroad purposes than is possible with the suspension system, no matter what the length of span may be. He said that it is entirely practicable to brace the upright arch more effectually, and with equal, if not greater, economy, than is possible by any known method of stiffening suspension bridges. By any method of girder construction hitherto known, it is impossible to span a
clear opening of 500 feet with less than three times the dead clear opening of 500 feet with less than three times the dead
weight of the arch in the proposed system, with equal strength of girder and with the same material and allowable strain.

The objection to the combination of wood and iron in bridge construction, owing to the difficulty of repairing the bridge, does not exist in this method. In all others, the wood is either under tension or compression, and therefore difficalt to be removed without endangering the stability of that arch, or of any other one of the series; for it is plain that,if any temporary weight were placed on the floor which would equal the weight of the cords to be removed, the equilibrium of the whole series would be undisturbed by their removal so long as the whole bridge remained unloaded. In repairing, it would never be necessary, however, to remove any one cord entire at once, but only to replace such pieces as were found defective.

## Mr. Francis Collingwood read a paper on the

anchorage of the east river bridge.
The front face of the Brooklyn anchorage is 930 feet back feet, and extreme width, 119 feet 4 inches. It consists of a timber platform of three feet thickness, thoroughly bolted. Below this platform are bearers, placed longitudinally with about nine feet spaces, the bottom of these being at the level of high tide in the East River. The extreme size of the excavation at the bottom was 122 feet 4 inches wide at the rear, 112 feet and 4 inches at the front, and 135 feet long.
This space had to be excavated entirely to a uniform level This space had to be excavated entirely to a uniform level before the foundation could be started; and the problem was to so support the banks as to effectually prevent damage to surrounding property, and at the same time not have the bracing interfere with the free movements of workmen, or with lowering or placing the timber and stone in position.
All materials for the anchorage had to be brought 1,000 feet through crowded streets from the dock at the river,and it was also desirable to transport the same from the excave tion to the yard at the pier for storage.
The form of the masonry throughout is in plan the same as that of the foundation, the stone work being set back 18 inches all around from the edge of the platform. There are a series of offsets at the bottom, but its general form in oleabove ground half an inch per foot rise The top of the ma-
tion of 89 feet at front, and 85 feet 9 inches in the rear. The front portion is divided into three parts. The central of these will support and contain the two central anchor chains. Between this and the two exterior walls are spaces arched over to support the roadway above. Sinse diagonal braces could be used, this determined the use of two lines of through longitudinal bracing and six lines of through transverse bracing. At the intersections of the main lines, square timber piles were driven, before the excavation was begun, to a depth of about three feet below tide. The excavation was then started at the highest point, and the first stringer, etc., put in. After this was well under way, the second range of sheeting was started on the opposite side and ends, and before the pressure had become severe the braces between the heads of the piles were put in in each direction. In this way the work was carried down progressively, the excavation the central portion being in every case the last removed.

## he EXCAVATION

In driving the lowest range of sheeting, greatdifficulty was found in penetrating the fine, compacted sand below the water line. After trying several devices, it was decided to use a water jet. For this purpose a small rubber hose was pro vided, having a three quarter inch jet from pipe four feet long for a nozzle. This was attached to the city works, and by its use the planks were forced down very readily. Six inches below tide was the average depth driven. To overcome the last two feet of theexcavation, it was necessary to pump the water out of the pit; and the question arose as to the size of pump required. To solve the question appropriately the following experiment was tried: A piece of lo the pit. The sand was then removed from theinterior and the water bailed out. The time and depth below and top was then noted, and when nearly filled the time was again noted, together with the increasein hight. The average head under which the water entered did not exceed six inches, and it was though that this would probably be as great as it could ever be around the sheeting, and, taking the relative perimeter of the two as a basis, to be pumped about 80 gallons per minute. At a time afterwarde, when the pump was in regular working, the amount discharged was found to be 60 gallons per minute. This method would no doubt be safe in similar cases whereno springs in the bottom were to be apprehended. The maximum pressure upon the sand underneath, caused by the completestructure, will be about 4 tuns per square foot
The only remaining point of interest was the method tak en to lower the four anchor plates into the pit. These were massive castings, $17 \frac{1}{2}$ feet by 16 feet and $2 \frac{1}{4}$ feet deep (over all), and weighing 53 tuns each. For this purpose, an
excavation 20 feet wide, with slope of two to one, was made excavation 20 feet wide, with slope of two to one, was made in the rear, and a hole cut through the shecting. In this tim of the plates, for sliding pieces. They were then lowered by tackle without trouble.
Abstracts of several other interesting fapers will be given n our next.

## Metallic Bedstead

The works of Mr. S. B. Whitfield are situated in Watery lane, in the Coventry road, Birmingham, Eng. They are called the Gladstone works, and occupy about 3,000 square yards, of
he sides.
First, we go into the cutting shop. Here the angleiron, ound irons,snd rods are cut into the lengths required for the parts of the bedstand. As many as 200 or 300 different leagths are required for the various parts. The rods are brought in bundles, and are cut by a machine worked by steam, as cany as five rods being cut by one movement of the catting press. These are for acrolls and other ornamental parts of the bedsteads. When the angle rods have been cut, they are then stamped straight by hand-worked presses. They re next passed to lads by whom they are studded, and n these studs the laths are put when the bedstead is made p. All these processes are executed with great precision, s all the parts of the same kind of bedstead are interchange able, and the greatest exactitude is required in every part o the work.
From the cutting shop we pass to one of the galleries, of which there are two overlooking the casting shop. In the first gallery the rods, having been cut and studded, are brought to be bent into the various forms required by the pattern. This process is exceedingly simple. The pattern or the scroll or other design is placed in a vice and the rods re placed around it, the iron lengths used being either plain or bended, according to the design. In this gallery the ron is bent into shape for the bands or the bottoms of the bedsteads. In every case the work has to be done with
great nicets, as every one mast correspond with the rods with which they are to match. This department is very properly named the bending gallery, and every visitor will be struck with the beauty of many of the curves produced, nd the elegance of many of the designs and patterns.
After having been bent, the various parts of the head and oot are taken into the casting shop, which is, of course, on he ground floor. These are placed on a frame, and the end feach of the parts is placed in a chill; in some elaborate patterns more than twenty chills are used. Into these chills is poured the molten metal, and from the pattern caet in them is produced the flowers, knobs, and other ornaments
which are seen at the various points of felntire. As seon as this process has been performed, we have a head or foot, as the case may be, completely produced. This is the method of casting all the parts together, the invention of which pro-
duced quite a revolution in the trade. As soon as the meta is poured in, the chills are opened, and the work is ready fo chipping. This process is done by hand, and by it the cast ing is cleaned of all superfluous bits, and thus made ready for the next operation. In this part of the premises all the casting is done. The sockets, into which the dovetails and onds of the angleiron are placed, are cast on the corners of the posts. This is done while the parts are still in the frame, The furnace is funnel-shaped in the inside, and is charged with coke and pig iron in the proper proportions, and the metal is taken from it in pots and carried to the variou parts required by the casters. The casting finished, and the work chipped of the bits of metal which are left by the cast ng, it is ready for japanning and painting.
Before passing to this part of the works, we visited the tock room. This is not so called from its containing the stock in the ordinary name, but in a technical sense. A stock in a bedstead manufactory is a die or pattern, for pro ducing the ornaments for the tops of the pillars and other parts of the bedstead. In fact a chill may also be called a stock, as both are patterns and dies by which the ornamental parts are produced.
In the top gallery, folders, chairs, and cabinet bedsteads are made. Here we saw some which would either serve for a chair, a sofa, or a bed. As a chair, you can, by adjusting a small check, obtain any inclination you wish. By a very simple arrangement, you can unfold it and makeil into a bed. Having used it, it can be folded up into so small a space, and is withal so light and portable, that a not very etrong man could carry his chair'and bed about with him wherever he pleased.

## pannting and japanning process.

We now pass into the japanning and painting. This work is carried on in separate shops, each mode of decoration requiring stoves of a different temperature. The common, or black japanning, is done on the ground floor. The bedsteads are taken from the casting shop, and then covered with a coating of black japan and placed in large stoves, or rather heated iron rooms, where they are subjected to a temperature of $250^{\circ}$. In the second or upper room, a better kind of work is done, and a green, a maroon, and other colors are employed. In this work the heat required for fixing purposes is s'ill very intense, but much less so than for black japanning. In the top room the more artistic paint ing and ornamentation is done, and a still lesser temperature is required, often not exceeding $100^{\circ}$. This is a very pretty process. The designs in metal are made on slips of paper, wich are fastened on the scroll, or pillar, or rail, to be ornamented. The pattern is then washed, and the paper comes ff, leaving the design in gold and colors on the bedstead. The ornamentation is in gold and colors, and some of the designs are very beautiful and elaborate. Some of the work is decorated by hand. After the painting, the parts are placed in the oven to fix the colors.
From the painting and japanning rooms, the articles, now finished, are taken to the wrapping rooms. The best goods are wrapped in paper, the head and the sides and laths being made into different parcels. The inferior work is only partly prepared, and then banded up with straw, and sent away to prepared, and then banded up with straw, and sent away to
various destinations. The more delicate work is packed various destinations. The more delicate work is packed
in skeleton cases. Every bedstead is put together and ested before it leaves the works.
One very carefulkind of work is stamping the holes in the laths for making the iron racking. These are flat slips of iron cast to the required length. The hole at one end is tamped out by a hand press. In stamping the hole at the other end great accuracy is required, and it has to be done by gage. If this were not most carefully executed, the result would be that the latter would not fall into the stads on the sides or angle irons. They invariably do so, however, so nice is the adjustment of the parts. This done, he stud has only to be screwed down, and the bed is made, no keys being used in putting up metallic bedsteads.
From the wrapping rooms we passed to the fitting shop, n whioh also ؛ 11 the stocks and chills are made. Thisis one of the most important departments of the works. Here the design for the pattern of a stock is made in wax, then the model is taken in plaster of Paris, and from this the stocks are made. The utmost care is required in planing, turning, and cutting the various parts of a stock; for unless everything is made to fit and work into the nicest exactitude, the stocks will not close on the ends of the different parts which are to be joined together by casting. It is in this shop, in act, that the bedstead is made. The various parts of a head or foot are placed on a frame, and then the stocks are tried, and every defect removed, until each one is in perfect working order. Here also are made the molds in which are cast the dovetail joints for the corners. In this room the nick in the top of the studs is cut, and the machine employed in this work acts
by a girl.

## TREATMENT OF BRASS FOR BEDSTEAD WORK

Up to this time we have been engaged with the manufacture of iron bedsteads; we now turn to brass work, which is a distinct part of the trade. It is most interesting to witness the various processes through which this work passes. The framework of the bedstead is of iron, and the pillars, tubes, rails, and other parts are covered with a brass casing of not more than 1-64 inches in thickness. Some of the ornaments of the brass work are exceedingly elaborate and
beautiful. A preceding writer has somewhat minutely described one part of this work; and as any account would be only a ropetition of his words, we prefor to quote them. He an open shed facing us, one stage in the manipulation of or
namental brass work. A number of finely formed vases o excellent design have just been delivered from the bras foundery. They are, however, the reverse of sightly being strung on wire, and is treating them to a series of baths of diluted aquafortis. The vases are first immersed in a weak solution, which removes earthy matter and the outer skin. They are then moved to a stronger solution, in which the liquid, while the brass is in the bath, bubbles violently, giving off a strong vapor of sulphuric acid gas: it is then moved to the third bath, and, after a few alternate plunges, is ready for drying, a wonderful transformation having taken place during the process, the final dip giving the article a beautiful but evanescent color. The precipitate in these baths is copperas, which is readily salable. Following the vases we have been referring to, we find that they are thoroughly dried in heated sawdust, when they are ready for the burnisher.

## brass burnishing.

While the vases are being dried, we notice that some boys are very deftly filing the edges of brass castings, and learn that hundreds of boys are engaged at this work in Birming. ham. One of the vases having been thoroughly dried is passed to the burnisher, who rapidly enhances its beauty greatly, by burnishing the shields and other projecting parts of the ornaments. His appliances are his burnishing tool, a Chartley Forest stone upon which to polish it, a solution of soda to keep his hands free from grease, and gall in which to dip the tool and help its slipping action. Gall is a very valuable commodity in Birmingbam. From the burnisher the work is conveyed to the lacquering room. This part of the work is done very neatly and effectively by women, and is necessary, as may be known, to the preservation of the color of the metal and to the preservation of the surface indeed. Quick drying is essential here as in the painting room ; and to provide this, the room is furnished with large flat-topped stoves, heated by gas, which obviates the moke and dust that would be produced by stoves heated by coal. Brass tubes are lacquered upon an iron tube through which a jet of steam is passed. Any depth of tint can be given to the lacquer, but whether deep or light all brass wort receives a number of coats. In this room we noticed a variety of brass bedsteads of very charming designs in twisted, taper, and plain pillars, with ornaments of great beauty.
About 200 people are employed by Mr. Whitfield in all the departments of the trade, and from his works bedsteads of every form and pattern, and of widely different prices,are sent to all parts of Great Britain. The works are admirably arranged, and every care has been taken for the comfort and convenience of the work people. The ventilation is admirable; the shops are large, lofty, and airy.-Iron.

## A New Comet

The inhabitants of this part of the world are likely, before long, to enjoy the evening entertainment of a brilliant comet, which is now barely visible in the western sky; but it is ap. proaching the earth and sun with great velocity, and will soon be a conspicuous object in the heavens. This comet was first seen on the 17th of April, at Marseilles, France. It was discovered here June 8th, by Professor Lewis Swift, of Rochester, N. Y., who gives the following particulars
"It is approaching both the sun and the earth with a constantly accelerated velocity, arriving at perihelion (nearest the sun) and perigee (nearest the earth) about the 1st of Au gast. I see nothing, therefore, to prevent its being a very conspicuous and beautiful object in the western sky during the months of July and August. It is now situated, at 1

o'clock in the morning, directly beneath the polar star, and about twenty-five degrees from it, and is just visible to the naked eye. With an opera glass it can be easily seen as a hazy nebulous mass, with a bright point a little to one aide. Through my telescope of four and one half inches aperture, six feet focus, it presents a, tail flling the whole field, with a low power of thirty-six. So directly toward us is it moving it seems almost to stand still, its slight deviation from it giving an apparent motion toward $\beta$ Ursa Majoris. It is now visible all night, but will soon be so only in the early hours of evening, setting in the northwest.
If at the time of its nearest approach to the earth the moon should be absent, we may expect, from present indications, to be treated with a cometary display which may rival the transit of Venus in popular as well as in scientific interest. The comet will be brightest on the evening of Augast 3,
ooing then 245 times as bright as at the time of discovery,
while now it is only $5 \frac{t}{2}$ times as bright; and as the moon will while now it is only $5 \frac{1}{2}$ times as bright; and as the moon will circumstances more favorable than may occur again in many years. It will then beabout $5^{\circ}$ from Denabola, the brightest star in Leo.'

To assist those of our readers who are not versed in astronomy to find the comet, we give a diagram showing the seven bright stars forming what is commonly known as the Dipper, from which the observer will carry imaginary lines down to three smaller stars below the Dipper, thence obliquely to the right, where the comet will be found. Just at present a spyglass or an opera glass will be needed to assist the vision; but in a few days the comet's tail will stand out clearly, and a special search will be unnecessary.

Three Thousand Five Fundred Milles by Rallway.E The new route between San Francisco and New York is hus composed:

Central Pacific-San Francisco to Ogden. Union Pacific-Ogden to Kearney.
.....
878
835
Burlington \& Missouri River, in Neb.-............... Hastings
St. Joseph \& Denver City-Hastings to St. Joseph
Hannibal \& St. Joseph-St. Joseph to Hannibal. Hannibal \& St. Joseph
Hannibal to Louisiana
Chićago \& Alton-Louisiana to Chicago Michigan Central-Chicago to Detroit. Great Western-Detroit to Suspension Bridge New York Central-Suspension Bridge to New York

Across the Continent.
TO boston.
San Francisco to Chicago.
Chicago to Albany
Albany to Boston.

THE cheapest articles of which we have lately heard are alligators. A correspondent from the South says that you can huy them five feet long at Perry, Ga., for onedollar a piece.
aluminum Silver. -The following alloy is distinguiahed by its beautiful color, an lakes a high polish: Copper 70 nickel 23 , alu minum 7, total 100.

## zeceut gamericau aud fortigit zatuts.

Improved Watch Escapement.
George H. Kinapp, Wapakonetta. O., assignor to himself and Harvey Grokaw, same place.-To prevent overbacking, the notched end of an escape lever with curved arms is so arranged as to go
wheel back into a notch when the trouble occurs.

Improved Children's Carriage.
A C spring is attached to the front arle, and extends back over the hind
arie, to which it ts also attached, and then springs by a large curve around axie, to which it tis also attached, and then springs by a large curve around
the body, which is suspended from it. The body of carriage is provided the body, which is suspended from it. The body of carriage is provid
with a portion which may be made to serve both as a dash and a table.

Improved Hoof Trimmer.
Frederick R. Sutton and William G. Sutton, Wellington, Im.-This ined, at the heel, by a right and left screw, constituting a frame, to be clamped upon the hoof by screwing the side pleces against it. Ou the frame is a cutter fixed in slots in the aforesaid side pleces, and provided with a cranked screw for forclng it up to the toe plece, to shave off the bottom of the hoof. At the toe is a gage, to regulate the amount to be shaved off, and on one of the side clamping pleces is a contrivance for quickly releas-
ing the clampling frame from the hoof in case the horse becomes restive-

Improved Cross Cut Sawing Machine.
David R. Carter, Rockport, Ky., and Thomas H. Carter, Bremen, Ky.This invention relates to a mechanical contrivance whereby a cross-cut saw may be operated by hand mechanism to so much advantage that one
man may be made to do the work of six, the whole device welghing but about one handred pounds, and being conveniently portable to the tim.
Improved Cerriage Door.
ber.
p. Herman Jury New York clty, This is a door pull
F. Herman Jury, New York city.-This 15 a door pall handle and a holder for the sash-hold!ug strap, comblned in one derice, and so arranged that
both parposesare subserved by the one device better than by the separate both purposesare sabserved by the one device better than by the separate
devices as commonly arranged. The invention also consista of a novel contrivance of the device for connecting the strap holder, which holds the sash-holding straps up out of the way of the door when it closes to said strap.

Improved Feeder for Grindingl(Mill.
John Phillipa and John E. Bradford, scranton, Pa.-This favention consists of a hopper of two or more compartments, and a feed shoe, with a special compartment and regulating gate for each compartment of the
hopper, all so arranged that two or more different kinds of grain, meal, or other material may be fed separately from different compartments into the stones at the same time. The object is to mix different kinds of grain substances more regularly and with less labor than they can be in the or dinary way of arst mixing them and then feeding them together.

## Improved Mowing Machine.

Frank H. Bryan, Troy, N. Y.-This machine may be reversed at each end of the field forcutting furward and backward along one aide, for side hills and other places where it to not conventent to go around the fild. It is truck around without requiring the manipulation of any part by hand, except the raleing of a catch pin.

Inaproved Level.
Dr. John Thornley, Charlottesville, Va.-This invention relates to an
mprovement in the class of levela provided with a hinged base bar for indicating different grades by the ad justment or angle to the body of the level proper. The improvement consists in arranging the block or prop plece
to silde between the hinged bar and an inclined plane formed on the base of the level, so that the bar will be adjusted at an angle to the base corres-
on ponding to the distance it moves over the inclined plane. Means are pro vided for clamping the silding block at any desired point, and the base is graduated to indicate the grade. The block is also connected with the base and hinged bar by a screw and dovetailed groove.
Improved Grave Mound.
 Whereby the dome of a grave mound is adapted to graves of diferent
lengths and sizes by ntting thereto successively increasing elliptical lengths
pleces.

Improved Cheose Mill.
aill in which are combined a vessel having a partially perforated bottom and rotary grinder, whereby cheese or amearcase may be ground and dell-

Device for Registering the Slipping of Lacomotive Wheels.
James $W$. Boyle, of New Texas, Pa. - This invention consits of a couple of wheels or ditiks independent of each other, driven synchronously, one by the truck axle and the other by the driving wheel axie. They are arran ged with a cam and ratchet mechanism, so contrived that, in case the driving wheel slips, and thas turns one of sald pulleys faster than the other, the pawl mechanism will be caused to move the recording appara
tures one degree for each turn of one wheel more tnan the other. and thu tures one degree
record the sllp.
Improved Wheel or Vehicles.
Michael Mickelson, Ashland, Oregon.-By this device, a tire may be ightened without removing it from the wheel. The invention consists in the pleces or caps in comblnation with the tongue and socket blocks
formed upon the ends of a cut tire, and with the wedge or key that draws sald ends together.

Improved Grading Scraper.
Jonathan C. Smith, South Solon, Ohio.-This invention consists of a road, ditch, or grading scraper, having the front portion, which carries the
blade, jointed to the body portion, and provided with springs and pushers adapted to tilt the blade down so as to run into the ground when the scra. per is drawn along the surface. Latches and levelers are combined with the sald jointed front part and the handles, to turn the blade upward to run out of the ground when a load has been obtained by pressing the handle downward. Cams throw the latches into connection with the levers so
that the blade may be turned up when the handles are pressed down. The that the blade may be turned up when the handles are pressed down. The
handles pass down below the spring catches, to be fastened to the body by the latter to ralse the rear end to dump the scraper by causing it to ro over on the front end.

Improved Boiler Flue Cleaner.
John Dykeman, Green Island, N. Y.-This Invention consists in the com
bination of three toothed rollers, whether made solld or of toothed disks bination of three toothed rollers, whether made solld or of toothed disks
springs, and levers with each other, and a box for cleaning the outer surspings, and levers with each other, and a box for cleaning the outer sur-
face of tues; and in the combination of a loose arin and a set screw with a race of nues; and in the combination of a loose arin and a set screw with a
box that supports the toothed rollera, the springs, and the levers, to adapt the machine to be attached to the tool rest of a lathe. In using the ma chine, the levers and roller are turned bock, and the fue to be cleaned is placed upon the rollera, and its end is sccured to the chuck of the lathe The roller and levers are then turned down upon the fue, the necessarv
pressure is applied by the welght or spring, the lathe is set in motion, and pressure is applied by the weight or spring, the lathe is set in motion, and
the machine is fed forward with the feed screw, cleaning the fiue thor the mact
oughly.
Sidney T. Bruce, Mmproved Spring Brace.
body adjuatably, by means of a slotted or grooved plate. of this plate is bent downward to ascommodate the pla. above it. Thas the bottom and top of the front spring betng both fastencd to a common
point behind, whatever depresses the body of the vehicle similarly de point behind, whatever depresses the body of the vehicle similarly de presses the free end of an inflexible bar, which cannot go forward so as to
enforce a perpendicular motion of the carriage body. The bars belng fas. tened to the springs at the topand bottom in front, and to each other a the center, no force can project the springs, etther front or rear.

Improved Movable Head Light.
Horatio G. Angle, Chicago, Movabie Fead suitable construction, as the truck of the locomotive turns in passing around a carve, the head light tis also turned, so that the stream of light may always be thrown upon the track.
The light from the lamp may also be thrown more or less from a stralght The light from the lamp may also be thrown
line to adapt to to the carvatures of the road.

Improved Kettle Scraper.
Samuel A. Potter, Emaline Potter, and John Potter, Fowler, Im.-This is a ecraperplate with a round or otherwise shaped rear handle at one side

Improved Apparatus for Making Torpedo Envelopes.
Mahlon Chichester, Bhelter Island, N. Y.-The paper bags for torpedo have beea made, one at a time, with the ald of a plece of board having holes and a hand pln. The present invention consists in an improved appa. ratus whereby a number of bags are slmultaneously made, the paper being desired number.
Improved Fare Box.
Joseph J. Whte, New Lisbon, N. J., assignor
Joseph J. White, New Lisbon, N. J., assignor to himself and Howard White, Tullytown, Pa.-This invention relates to apparatus for collecting
pasenger fares oa rail cars, and consists of a cash bor supported from the wast or shoulders of the conductor, to which is attached a ferible tabe, having at its end a hand plece or recetving box containing an endless car rer, which is arranged on pulleys, so as to be moved, by means of a ratche and pawl operated by a spring lever, by the conductor. The conductor car ries a hand plece in his hand, and, by virtue of the flexible tube and belt
he is enabled to pass it round among the passengers to recetve the fares.
mproved Furnace for the Manufacture of Iron and Steel. Edgar Pecckham, Antwerp, N. Y.-This is a new method and apparatus
for manufacturing steel blooms directly from the ore. It consists in the furnace patented by the same inventor, June 24,189 , improved so that it has two series of ore chambers instead of one, so as to treat the ore at dif
ferent degrees of temperature to remove aulphur and phosphorns, and so ferent degrees of temperature to remove sulphur and phosphorus, and so
that one sertes may serve for a flue to heat the ore in the other series whes that one serles may
the coal is impure.
Gullford Norton, South Improved Hatchet.
Guilford Norton, South Boston, Mass.-This is a combined claw hammer nected with the hammer portion, so that, when worn out, it may be re noved and a new one substituted.
David H. Pierson, Fort Rice, Dak. Ter.-This desk is made in sections which are hinged together and so arranged that they fold together and orm a compact body, resembling in shape and proportion an ordinary feld desk.

## NEW BOOKS AND PUBLICATIONS.

a Treatise on Bracing, with its Application to Bridges and Other Structures of Wood or Iron. By Robert Henry Bow, Civil Engineer. With 156 Lithographed Illustra-
tions. Price $\$ 1.50$. New York: D. Van Nostrand, 23 Mur ray and 27 Warren streets.
Thisis an excellent and very explanatory book on the whole question of arranging the parts of any construction so that they shall be as inttle as
possible affected by variation in the strains to which the erection is subjected. As a matter of course, the bullding of briduges is very extenisively treated, and the examples explained and illustrated show that the author to a writer of considerable knowledge and very varied experlence.
The International or Metric System of Weights and
New York: Hurd \& Houghton, 13 Astor Place 50 cent
very sbe resume of the recen progress of
A ver. Although many of the arguments used by the adrocates of the favor. Although many of the arguments used by the advocates of the
method are well known, and are generally deemed frrefragable, they will bear repeating till the world has adopted this most simple and ratlonal
arrangement of weights, measures, and coinage, which, it must be now arrangement of welghts, measures, and colnage,
everywhere admitted, is only a question of time.
The Ketstone Bridge Company's Illustrated album, embracing Iron Bridges, Roofs, Columns, Chord Links, and Shapes, with a Description of Long Span Bridges
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An elegantly printed and illustrated volume, whieh contains'not only ailand interesting description of the large means and business operations o
he extensive frmm who is sues it, but also mach explanatory and statistica information, formulas, etc., of great value to the engineering profesion

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cles are in market, where can I get one? A. A . Mcllin tock. Wilkee Barre.Pa.
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the days heretnafter mentioned:

29,760.-HAMMER.-R. Boekker, Auguet 5.
29.
SEWING MACHINE.- D. Haskell. August 12.
29,789.-Cultivator.-E. s. Huff. August 12.
30,415.-Gas Requlator.-J. G. Lefflagwell. Sept.
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23,469.-Horseshor.-R. A. Goodenough.
23,4i99.-MAKING TVbe Joints.-S. J. Hayes.
23,499.-Maring Tube Joints.-S. J. Hayes.
28,482.-Cooking Stove.-J. C. Hendersou.
28, $882 .-$ CoAL STOVE.-J. C. Henderson.
28,433 - SEEDING MACBINE.-S. T. Holly.
28,433.-SERDIng Machine.--S. T. Holly.
28,88.-Rattan MACHine.-J. Hull.
28,488.-RATTAN MACHINE.-J.
28,495.--SKATE.-J. Lovatt.
28.512.-CAR WHERL.-


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28,495-SEATE.-J. Lovatt.
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7,455.-Fur CloAKs.-C.Hülster, New York c
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7,456.-Stove - J. s. Perry et al., Albany, N.
7,457.-Statuaby.-J. Rogers, New York city.

7,459.-BUCKLE.-S. G. Sturges, Newark, N. J.
$7,460 .-$ Molding s.-J. Nonnen bacher, New York

TRADE MARKS REGISTERED.
1,800.-Wrivarr.-Empire Wringer Co., Auburn, N. F.
1.801.-Mosse.-Ferguson \& Haber, New Orleans, La.
1,802.-WATCEEs.-Lingg \& Bro., Philadelpha, Pa.

1,804.-SHIRTs.-Neustadter \& Co., New York city.
1,805.- Grindira Mils.-Straub Mill Co.,CIncinati, 0


land, O .
COMMONICATIONS RECEIVED.
The Editor of the Scirntifio American
acknowledges, with much pleasure, the re-
ceipt of original papers and contributions
apon the following subjects:
On Army Ants. By J. S.D.
On Army Ants. By J. S.D.
On the Boiler Explosion at Philadelphia.
By C. and G.
On Doubling the Value of the Currency
By J. H.
On Botanical Scraps. By S. C. Y.
On the Insurance Question. By F. A. M.
On an Ear Trumpet. By J. E.
On an Ear Trumpet. By J. E.
On Engineering Tables. By W.Z.
On Engineering Tables. By
On Sun Stroke. By E. S. G.
On Sun Stroke. By E.S. G.
On White Ants. By T. H.
On the Westinghouse Brake. By F. G. W.
On the Westinghouse Brake. By F. G. W.
On Bullets Inpacted in the Air. By H. A.
Also enquiries and answers from the follow.
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I. X. L.-L. M. B.-J. H. J.-W. M. R.
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vas boats? Makers of the above articies will probably
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## ILLUSTRATIONS.



Cable,the new Atlantic telegraph 371
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