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NEW YORK, JANUARY 18, 1873.

## IMPROVED BRICK MACHINE.

We illustrate this week a recently devised apparatus, known as the "Great American" brick machine, in using which, to quote the words of the inventor, " the brick maker has the satisfaction of knowing that, in five minutes from the time the clay is taken from its original bed, it has been thoroughly tempered into a uniform homogeneous mass, thoroughly tempered into a uniform homogeneed into the hack, where no more handling is required until the brick are hack, where no more handling is required until the brick are are obtained, the reader will find in the following description:
$A$, in our engraving, is the pug mill; B is the mold wheel containing twenty-four permanent metal molds, C C C, arranged in groups of ranged in groups of three; under the latter is a movable bottom or follower, not shown, provided with a roller and traveling on a circular track, D, which raises or depresses the follower at proper points in the revolution of the mold wheel. Motion is communicated by the main pulley in the foremound by bevel foreground by bevel gearing to the upright shaft, $G$, on the lower part of
which a horizontal pinwhich a horizontal pin-
ion actuates the mold ion actuates the mold
wheel, B; while nearits apper end is suitable gearing, $H$, which rotates the beaters within the pug mill.
The clay is brought directly from its bed, and not moistened unless it is too dry. in which case a little water is added. The figure on the right is represented as shoveling the crude material into the receiver of the pug mill, within which it is thoroughly ground, tempered, and reduced to a homogeneous mass of homogeneous mass of about the consistency of thick putty. Thence it is forced into one of the groups of molds, $C$, which is carried under it by the revolution of the mold wheel, B, a polished metal surface giving the proper smoothness and finish to the top edges of the to the top edges of the brick. The follower under the mold wheel then travels up an incline, raising a group of bricks, $E$, from the molds, all the angles and faces being preserved smooth, sharp, and perfect. As each set of bricks rises from the mold, it is lifted off by the clamp represented in the hands of the figure on the left, and placed upon a double decked truck that is capable of holding one hundred bricks. When filled, the truck is wheeled away and its contents piled in hacks eight or ten bricks high. Each revolution of the mold wheel, therefore, turns out twenty-four bricks, and it is claimed that the machine can produce sixtyfive per minute, or thirty-nine thousand in a working day of ten hours.
There is no doubt but that this apparatus is compact, of great simplicity, and economical, in that it produces brick without skilled labor. That it is a decided improvement over the old-fashioned methods of grinding up clay with a superabundance of water, molding in sanded wooden molds, and allowing the moisture to evaporate by spreading the brick in a sanded yard, is also evident. It is neither a " soft mud" nor a "dry clay" machine, but aims at a medium between the two extremes. To continue the list of advantages which the inventor claims, the clay is tempered in the machine itself, so that no separate process is necessary; no molding sand is required, the polished steel molds answering every requirement; no handling or washing of molds,
nor edging or spatting of bricks is needed; the bricks are taken directly from the machine to the hack, where they remain while drying, protected from rain and frost. . A smaller yard will give the same drying capacity, the hacks being only six feet apart; and, lastly, the bricks can be manufactured at a much reduced cost.
The inventor points to the severe test which his bricks withstood during the Chicago fire, when 50 per cent came out perfect. As an item of interest, we note that the patentee affirms that he has made five hundred millions of bricks tee affrms that he has made five hundred minions of bricks
since 1865, in Chicago and other points, and that the compa-
fasible substances necessary in the manufacture of candles The illuminating power of candles made from ozokerit has been expressed by the following comparison instituted by Dr . Letheby: To afford a given amount of light, must be taken of ozokerit candles, 754 ; paraffin candles, 891 ; wax candles, 1,150. The candles can be colored with mauve and ma genta, and they then present a fine appearance.

English Prizes for Economical Stoves
A friend of Sir W. Bodkin's has presented the sum of $\$ 2,500$ to the Society of Arts, London, to be awarded in prizes or "otherwise" for the invention of im. proved stoves for securing economy in the use of coal for domestic heating or cooking purposes. The Council have accordingly announced five prizes, each of which will coneach of which win conist of the Gold Medal of the Society and $\$ 250$, to be awarded as follows, provided the competing articles satisfy the judges. The announcement is as follows: The Society's Gold Medal and $\$ 250$ :

1. For a new and im. proved system of grate suitable to existing chim. neys as generally constructed, which shall, with the least amount of coal, answer best for warming and ventilating a room.
2. For a new and improved system of grate, suitable to existing chimneys as generally constructed, which shall, structed, which shall, with the least amount of ing food, combined with warming and ventilating the room.
3. For the best new and improved system of apparatus which shall, by means of gas, most eff. ciently and economically warm and ventilate room.
4. For the best new and improved system of ap. paratus which shall, by means of gas, be best adapted for cooking, combined with warming and ventilating the room.
5. For any new and im proved system or arrangement, not included in the foregoing, which shall

THE GREAT AMERICAN BRICK MACHINE
ny working this invention has turned out eight millions du ing the past season
For further information, address the Great American Brick Machine Company, E. R. Gard, President, No. 53 South Jefferson street, Chicago, Ill.

## Ozokerit Candles.

So much money has been expended in advertising ozokerit that in England the public generally look upon the candles purporting to be made from it as, in fact, nothing more or less than the adamantine candles long furnished to the trade. The suspicion is, however, entirely unfounded, as the candles are really made of purified ozokerit, which is paraffin of the best quality. Ozokerit, or native paraffin, also called earth wax, was found embedded in sandstone near Slanik in Moldavia, in the neighborhood of coal and rock salt deposits. It was afterwards discovered in the Carpathians, from which latter source the English manufacturers obtain their principal supply. The crude mineral has a brown, green or yellow color, is translucent at the corners and exhibits a resinous fracture. It is naturally brittle, but can be kneaded like wax. When exposed to the air it becomes black and waxy, and when rubbed is negatively electrified and yields an aromatic hydrocarbon odor. The low melting yields an aromatic hydrocarbon odor. The low melting
point of $66^{\circ} \mathrm{C}$, renders the admixture of certain other less
efficiently and economically meet domestic requirements.
The Council reserve to themselves the right of withholding all or any of the above prizes, as the judges appointed by them may determine.
The competing articles must be delivered not later than the 1st of December, 1873, with a view to their being tested, and they will be subsequently shown in the London International Exhibition of 1874. Further particulars as to place of delivery and other arrangements will be published as oon as they are finally settled.
One moiety of the sum presented to the Society is thus disposed of, but what arrangements are in view for disposing of the other are not at present made public.

Mechanical Engineering in Cornell Univernity.
It may be a word of encouragement to young meehanics in. the shops to know that the Board of Managers of Cornelly University have selected, for the head of its mechanical engi-: neering department, Mr. John Edson Sweet, of Syracuse, N. Y., a young man who, with but a common school education, has risen from striker at the forge, through the machineshop and drawing room, to be an instructor of engineeringin this celebrated school. He has contributed, during thepast year, a series of articles to Engineering, on "Mechanical Refinements.'

# Srientifir Ammeriam. 

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## M以IMS <br> 

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Can buildings be set on fire by steam pipes
The recent destructive fires have raised the question as to the safety of the use of steam pipes in heating buildings; and as in some instances the true cause has been enveloped in mystery (which is quite natural, as fire destroys all evidences) the Fire Marshal of New York has found it most expedient to throw the blame simply on steam, in those cases where the buildings were warmed by that agent.
As steam may be considered to be the most safe, healthy, and economical of all modes of heating buildings, such a suspicion is to be deplored, as it is apt to raise a prejudice against it; hot air furnaces may be considered dangerous, as proved ly the well established evidences of the fire records, but not so with the steam heating. In fact, there is not any well authenticated case on record wherein pipes, through which steam passes, have actually set fire to woodwork, and no one experimentor has yet succeeded in igniting wood with such pipes. We maintain that any man of science who has studied the subject of steam, or any practical engineer of common sense, knows that all that steam can do, even when superheated, is to make the woodwork hot and dry, and to predispose it to catch fire. The epark must be supplied from another source; the steam tubes can never attain, outside the heating apparatus, the high temperature of $900^{\circ}$ or $1,000^{\circ}$ Fah. required for the red heat which is necessary to set woodwork on fire
In this city many of the steam heating apparatuses are worked on a pressure not above 10 lbs . per square inch, in excess of atmospheric pressure, which gives a heat of $241^{\circ}$ $F$. for the water in the boiler, and a somewhat less heat, of course, for the steam which circulates through the pipes. In the majority of buildings heated by steam, a common boiler is used, from which steam pipes are carried through the premises, and an ordinary pressure for such boilers is 40 lbs . per inch, which gives a heat of $289^{\circ} \mathrm{F}$. At a pressure of $120^{\circ}$ lbs. above the atmospheric pressure, we have a heat of $355^{\circ}$. It will thus be seen that at pressures, far above any that are used for heating purposes, the heat circulated in the steam pipes is much below that required for the ignition of wood.
That steam pipes predispose woodwork to combustion, and even may assist the spontaneous combustion which is apt to commence in rags soaked with any animal or vegetable oil, cannot be denied; but then any heating apparatus will do the same, and steam is in this respect not so dangerous as a
draft of hot air proceeding from a furnace, in which a leak draft of hot air proceeding from a furnace, in which a leak
may carry a spark upward, while a leak from a steam tube is utterly harmless. In regard to spontaneous combustion, my danger of that, from oil, may be avoided by using for lubyieation the heavy lubricating petroleum. This material is not apt to oxidation or spontaneous heating, as one of our esteemed correspondents discovered and published in our paper $\boldsymbol{n}$ everal years ago ; which valuable property is now also being pullicly recognized in Europe.
the austrian show before the senate
It is probably needless to state, that the bill granting $\$ 100,000$ as an appropriation for American representation at the Vienna Exposition having passed the House, the supporters of the scheme will concentrate every effort to induce the Senate to increase that sum, in order to allow of a raid upon the Treasury proportionate to the extravagant figures heretofore fixed upon by the United States Commissioner. The Senate undertakes the consideration of the measure with a full knowledge of the objections which ever since its reception have been strenuously urged, and with the advantage of the previous discussion on the merits and demerits of the bill.
We have traversed the whole ground so fully and so minutely that there is little, is addition to that which we
have already presented, left for us to say. We would urge upon the Senate the simple fact that for this appropriation there is no necessity; because, first, as has already been stated by a representative, our citizens should know that for individual success they must depend upon individual enterprise, individual merit and individual energy, and that they are not to be nursed by the Government so that the few may be enriched at the cost of the great body of the people. Second, because we are sure of an adequate representation in any event. This is but a natural conclusion drawn from the precedent of previous European industrial expositions, in which nearly every large manufactory on the Continent exhibited de vices of American origin. Corliss Steam Engines, McCormick Reapers, Amoskeag Steam Fire Engines, Howe, Singer, and Wheeler \& Wilson Sewing Machines, Gwynne's Rotary Pumps, Burleigh Rock Drills, Blake's Stone Crushers, Blan chard's Lathes (in every country where they make gunstocks, lasts, spokes for wheels, or irregular forms of any kind), Whitney's Cotton Gins, Gatling's Mitrailleurs, Remington Rifles, Hotchkiss Projectiles, Tilghman Engraving, Root Blowers, Colt's Revolvers, Clothes Washers and Boilers, Silver's Marine Governors, Henderson's Process for Iron, Danks Rotary Puddling Process, Hayden's Invention for Hollow Ware, Hyatt's Pavements, Print Writing Machines, American Pianos, and Hoe and Bullock Printing Presses are but a portion of the large number of our inventions in constant use abroad which it is safe to say will be found in the coming show.

We would remind Congress that our Centennial Exhibition is now a suppliant for a national subsidy, and that although the same objection to extending Government pecuniary aid to the advertising of private business holds here as well as in the case of the foreign show, still, of the two, if it is deemed expedient to grant such assistance, our own Exposition certainly merits the preference. We need not dwell upon the fact that there are hundreds of matters productive of more benefit to the country at large-the reduction of the national debt, the renewing of our commerce, and the im provement of the navy are bat examples-to which every pare dollar in the Treasury could be advantageously applied. The Centennial has met with decided disfavor from the people, as shown by the withholding of individual subscrip tions. Such an expression of popular opinion has but one unmistakable interpretation, and that is that the public, if they refuse to countenance an exhibition, which will draw the industries of other countries to our own borders, which presents no obstacles to the safe display of the world's best products, which at the same time will afford an opportunity for aggrandizing ourselves by the exhibit of our wonderful progress during the past century, they look with still less appro bation upon a plan which presents not only an equal but lacger number of disadvantages, with a far less pro portionate amount of benefits to be gained.
We trust that, so far from increasing this appropriation, a plan which we understand is to be advocated, the Senate wil either strike it out altogether or, if it must be passed, curtail its figures. In reference to the latter event, it may be well to remember that the Chairman of Foreign Affairs in the House, during the recent debate, made the following assertions: "The Secretary of State has sent to the Austrian Government the project of a law that will entirely protect the inventors of this country. That has been received by the Government of Austria, and the Secretary of State expects that it will be approved by that Government. No expendi ture will be made under this appropriation except with the approval of and by the direction of the Secretary of State.' A strong intimation was added to the effect that, until thi law was passed, no disbursements would be made. We would call attention to the fact that it is now several months, accord ing to the showing of the United States Commissioner, since this "project" was forwarded to Austria, and that ample time has elapsed to have some action taken. The feeling in this country is well known to that government, and has been commented upon in the Vienna journals. It is therefore ad visable, in view of the rapidly approaching time of opening of the Exposition, April next, that an amendment embody ing the above proviso be inserted, in case an appropriation i granted, merely as a protective measure.

## COLLAPSING BOILER FLUES

A correspondent, O. L. M., writes from Niles, Trumbull county, Ohio, to inform us of an accident which affords another illustration of the criminally careless or ignorant engineering which annually destroys so many lives, and which, we regret to be compelled to confess, finds a large number of victims in the United States than in any other country on the globe. The fact is due probably more to the proverbial recklessness of our people than to any other defect in our national character: So far as it is a consequence of ignorance, we may hope that the pages of the Scientific American and its engineering contemporaries may be found to furnish a valuable preventive; experience only can teach our reckless people prudence, or even that a good busines policy dictates greater caution in proportioning and working team boilers.
In the case mentioned, the steam boilers of a blast furnace are forty-eight inches in diameter, thirty feet long, and have each two flues seventeen inches in diameter, and three six eenths inch thick.
The usual pressure carried is forty-five pounds per square nch. Recently, while the engine was standing, the steam pressure rising to fifty-five pounds, one flue was collapsed its entire length. Our correspondent desires to know "what was the cause of the accident." The boiler was well upplied with water, and everything apparently all right. The cause was, undoubtedly, simply weakness in the
flues. They were, probably, a little out of shape when put in, had become somewhat weakened by use, and finally col lapsed when the pressure was a little higher than usual. If these flues had been perfectly round, they would have had a collapsing pressure, when new, of about $606,000 \times\left(\frac{3}{16}\right)^{2}-$ $30 \times 17=55.5 \mathrm{lbs} .$, as determined by the rule which Fair bairn deduced from his experiments on the strength of flues.
The laps of the girth seams would strengthen the flues to a slight extent, and, in this case, about an equally slight weakening had taken place by loss of shape and by use, so that th
These thes should have been made at least one quarter inch thick, or should have been strengthened by properly fitted rings of angle iron at intervals of seven and a half feet. A good engineer, designing such boilers with a view to making good work and sustaining his reputation rather than deferring to a penny-wise, pound-foolish spirit of economy, would have made them of $5-16$, or even $3-8$ inch boiler plate. Although our law dictates that boilers should have, when new, a strength only about four times greater han their working pressure, good engineers are inclined to make the " factor of safety" six or more in every part.
The other flues of these boilers should be looked after at once, or they may produce a more serious disaster. It would also be well for those whose lives and property are jeopardized, to ascertain how it happened that, where steam was nominally carried at forty-five pounds, the pressure could by any possibility rise to fifty-five.

## PROSPECTS FOR 1873

We are gratified to be able to state that the subscriptions to the Scientific American for the new year of 1873 are pouring in from all directions, and there is every prospect that our regular edition for the year will reach the round number of Fifty thousand copies per week.
We hope our friends who have not yet renewed and all who are engaged in the formation of clubs will send along. heir names as rapidly as possible. To prevent the loss of back numbers to those whose remittances are a little tardy, we electrotype each issue and preserve the plates, whereby we shall be enabled to print new editions of any numbers hat may be required
The terms of the Scientific American are $\$ 3$ a year 1.50 for six months.

## DU MOTAY'S PROCESS FOR OXYHYDRIC ILLUMINATIO

Our excellent cotemporary, Les Mondes, a Parisian scien tific weekly, translates our recent article upon oxyhydric ilumination, from which, to use its own words, it derives "affiction and consolation at the same time." Speaking of M. Tessié du Motay's system, it says: "Misunderstood in France, the inventor and the invention are received and ap. plauded abroad-in England, Germany, Belgium, and America. The glory of the one and the benefits derived from the ther will be the consequence of this unfortunate importaion.'
Our cotemporary strongly dissents from the adverse report of M. Le Blanc, and adds that proof of the value of the process are pouring in from all sides. The best, it continues, is the demonstration recently made that, by the inventions of M. du Motay, the cost price of about 35 cubic feet of hydrogen is reduced to two cents, and that of a smaller quantity of oxygen to the price of about $13 \frac{1}{4} \mathrm{lbs}$. of coal or other fuel. The lowest quotation of coal, as now selling in Paris, given by the commercial journals, is $\$ 10$ per tun ; so that $2 \frac{1}{4}$ lbs. of fuel costs about one cent; consequently oxyhydrogen gas is worth, per thousand cubic feet, a fraction over $\$ 1.14$. In worth, per thousand cubic feet, a fraction over $\$ 1.14$. In
this city and the environs, ordinary street gas varies from this city and the environs, ordin
$\$ 2.80$ to $\$ 3.50$ per thousand feet.
The economy of the process is obvious from the fact of fuel in this country being much cheaper. Ten dollars per tun is far above our market rates. Taking into consideration the mechanical nature of Du Motay's process, and even allowing for the increased expense of labor in this country, we should judge, from the above, that this improved and excellent mode of illumination might be supplied at a cost not exceeding one half, or, at most, two thirds that of the inferior gas now in use.

## OXIDIZING AGENTS

We are frequently asked by correspondents to name some of the leading agents employed by chemists, to produce what called oxidation. The operation is an important one in he arts, as upon it depends the success of bleaching, disinfection, and similar processes. We will mention some of the methods now preferred by chemists for the purposes indicametho
ted.
Ozon
le
Ozone, if it could be cheaply made, would be almost invaluable, but the cost of production stands in the way of its common use. The permanganate of soda or potash is a chemical compound that cannot be excelled in its oxidizing properties, and its use has gone on steadily increasing for years. In England, under the name of Condy's fluid, it is a common article about the household, and for hospitals and bleacheries t is coming into vogue. A little more knowledge of its value would soon lead to its production on a large scale.
Bleaching powders have long been known and used as oxidizers, and, as they can be had in any quantity, are likely to continue to be employed.
Chromic acid, whether in saturated or dilute solutions, has the power of converting carbonic oxide into carbonic acid, readily and completely under ordinary temperatures. Ammonia gas is powerfully oxidized by it, and it readily dedestroys organic matter. The chlorates and nitrates can also be mentioned in this connection.

## PROPERTIES AND USES OF KIESERITE．

Kieserite is a mineral composed of sulphate of magnesia and water，which occurs to the extent of 12 per cent in the salt deposits of Stassfurt，Germany．It differs from Epsom salts by its difficult solubility in water and smaller percent－ age of water of crystallization．
age of water of crystallization．
The first attempts to economize kieserite were made in 1864，when it was proposed to employ it in the preparation of sulphate of potash．Since that time the applications have greatly increased，and it has now become an important arti－ cle of commerce．The largest quantity of the raw material is sent to England，where it takes the place of the sulphate of magnesia，formerly manufactured from dolomite，or Gre－ cian magnesite，in cotton printing．Another portion of kiese－ rite is converted into Glauber salts which，on account of its freedom from iron，is highly prized by gas manufacturers． Manufacturers of blanc fixe employ kieserite instead of sul－ phuric acid to precipitate the sulphate of barium from chlo－ ride of barium，and in all similar cases where it is proposed to prepare a difficultly soluble sulphate，the kieserite can be advantageously used．Kieserite is recommended as a substi－ tute for gypsum in agriculture，as a top dressing for clover，and is largely employed in England for this purpose．It is pro－ posed to use kieserite in the manufacture of alum．There is a mineral called bauxite which chiefly consists of the hydrat－ ed oxide of aluminum；this is easily dissolved in hydrochlo－ ric acid．Cheap potash salts and the calculated quantity of
kieserite are added，alum crystalizes out of the solution， kieserite are added，alum crystalizes out of the solution，
and chloride of magnesium remains in the mother liquor． and chloride of magnesium remains in the mother liquor． The uses indicated above are wholly inadequate to con－ sume the enormous quantities now obtained from the Stass－
furt mines．Millions of pounds of kieserite are annuall？ furt mines．Millions of pounds of kieserite are annual 17
brought to the surface，and it is becoming a serious question brought to the surface，and it is becoming a serious question
to know what to do with it．If it could be used as a substi－ to know what to do with it．If it could be used as a substi－
tute for gypsum in building materials and cements，its cheap－ ness would at once commend it to notice．Experiments look－ ing to this application have been tried．
Two equivalents of kieserite and one equivalent of caustic lime were stirred to a paste in water．The mass hardened， but remained granular and brittle．On calcining it，how－ ever，again pulverizing and moistening with water，it set to a solid marble－like mass，which could be applied to many useful purposes．It is proposed to employ this material for ornamental decorations in the interior of houses and in gen－ ornamental decorations in the interior of houses and in gen－
eral for the manufacture of cements and as a substitute for eral for the man
plaster of Paris．
plaster of Paris．
Kieserite appears likely to prove a valuable accession to our supply of useful minerals，to be ranked by the side of kainite，a potash mineral also found at Stassfurth and now largely imported into the United States．

## balancing machinery．

In designing and constructing machinery，it frequently becomes necessary to make provision for balancing the weights carried by rotating shafts，and for neutralizing the effects of forces developed by the motion of either rotating or reciprocating parts．Mechanics are in the habit of dis－
tinuishing between a＂standing＂and a＂running balance，＂ tinguishing between a＇＂standing＂and a＂running balance．＂ When a heavy piece is carried upon an axis，in such a man－ ner itself about the shaft until it comes to rest with its center of gravity in the lowest possible position．This effort center of gravity in the lowest possible position．This effort
is measured by what is called a moment．A moment is the product of any force into its lever arm，the latter quantity being the shortest distance from the line of direction of the force to the axis about which it tends to produce motion． In the case of a crank on its shaft，the force is the weight of the crank acting vertically downward through its center of gravity，and the lever arm is the distance from the center
line of the shaft to the vertical，through the center of gravity line of the shaft to the vertical，through the center of gravity of the crank．The moment would have a maximum value
when the crank lies horizontally，and would be one thousand foot pounds were its weight five hundred pounds and its center of gravity two feet from the center of the shaft，or center of gravity two feet from the center of the shaft，or
were the weight seven hundred and fifty pounds and this were the weight seven hundred and fifty pounds and this
distance sixteen inches，or again，if the weight were two distance sixteen inches，or again，if the weight were two
hundred and fifty pounds and the lever arm four feet．If opposite this crank another heavy piece is placed，of such weight and at such a distance that its moment，tending to produce rotation in one direction，is equal to that of the crank tending to turn the shaft the other way，the latter will be balanced．This will be shown by the fact that the slaft，if unacted upon by any other forces than the weights of the crank and its counterbalance，will remain in any position in which it may be placed．In this case we have an illustration of the＂standing balance．＂Should it have happened that the counterbalance，although exerting an equal moment was not of equal weight with the piece which it was intend－ ed to balance，it would be found that，upon setting it in mo－ tion at a sufficiently high rate of speed，the shaft would shake in its bearings；or if they were set up tight，the whole machine and even its foundation might shake in conse－ quence of the unsteadiness of the rotating parts．
It would thus become evident that a standing balance and a running balance are not secured by similar conditions．In fact，we have to deal with quite different forces．In the first case we have to equilibrate the force of gravity；in the second，we have to neutralize the effects of the force of Inertia as developed by bodies in motion．The force of grav－ ity has an effect simply proportioned to the weight of the
piece，while inertia produces an effort proportional to the piece，while inertia produces an effort proportional to the
weight of the mass and，also，to the square of the velocity with which it moves．When a piece swings about a center， as in the case of the crank just considered，or of a stone in a
ang，the force witll which it tends to break its connection
with the center，its centrifugal force，is due to a constan ${ }^{t}$ tendency to move in a straight line，and is a consequence of its inertia．The intensity of this force is measured by the product of the weight of the body into the square of its velocity per second，divided by sis＇een and one twelfth times the diameter in feet of the circle in which it moves．Alge－ braically expressed，this force is $\mathrm{F}=\frac{\mathrm{WV}{ }^{2}}{16 \frac{1}{18} \mathrm{D}}$
We may assume，without great error，that this force acts at the center of gravity of the piece．Then our crank，weigh－ ing 500 pounds，would have a centrifugal force，at 50 revo－ lutions per minute，of $\frac{500 \times\left(2 \times 3 \cdot 1416 \times \frac{6}{6}\right)^{2}}{16 \frac{1}{12} \times 4}=213$ pounds．At 100 revolutions per minute，this would become four times as
great，or 852 pounds，and at 150 revolutions the force would become 1917 pounds．Such forces as are thus developed a high speeds frequently have very se ous effects，and it some－ times becomes absolutely necessary to secure a good running balance by neutralizing them．Were it attempted to effect a balance by a piece placed opposite，at a double distance，but of half the weight，the counterbalance would liave a double of half the weight，the counterbalance would rave a double
centrifugal force，and hence，although a standing balance would be obtained，it would not give a running balance．To secure the latter，it would be necessary to reduce the weigh of the counterbalance one half，and this，in turn，would destroy the standing balance．
En resume，the condition of a standing balance is that the moments of the weights carried by the axis shall neutralize
each other．The condition of a running balance is that each each other．The condition of a running balance is that each viva ismall have a counterbalance of equal vis viva．By vis of a moving body by the square of its velocity
The condition of a combined standing and running balance is that each rotating mass shall have a counterbalance of is that each rotating mass shall have a counterbalance of
equal moment and of equal vis viva．This is complied with when the counterbalance is of equal weight，and equally dis tant from the axis with the piece which it balances．If there are several masses revolving on the same shaft，it may hap－ pen that，although no two have the same vis viva，the sum of
the excesses may equal the sum of the defects，and an equili－ the excesses may equal the sum of the defects，and an equili
brium may still occur．In most instances where the balanc is secured in such arrangements by trial，this latier case is exemplified．
In high speed engines，and notably in locomotives，it be comes necessa $=$ to balance the reciprocating parts．In this case the same principles apply as in procuring a running
balance of rotating parts，and the problem is solved by secur－ balance of rotating parts，and the problem is solved by secur
ing equal and opposite vis viva． ing equal and opposite vis viva．
We will continue this article
the Scientific American．

## the sewing machine monopoly．

An extended article on the application of A．B．Wilson，for another extension of his sewing machine patent，is in type，
but is necessarily crowded out this week for want of space． ut is necessarily crowded out this week for want of space．
Sewing machine manufacturers and patentees who are not members of the gigantic sewing machine monopoly should bestir themselves at once if they would avert another seven years＇servitude to this oppressive combination． Action should be taken immediately，and every honorablemeans be adopted to prevent Congress from passing the bill，should the Committee on Patents be wheedled into recommending it．An inexpensive and practical mode of enlightening the it．An inexpensive and practical mode of enlightening the
people throughout the country in regard to this scheme， which pecuniarily effects every user of sewing machines， will be to send circulars to every postmaster，merchant and manufacturer in the United States explaining how excessive has been the profit exacted from every seamstress and fami－ ly now using sewing machines，and the heavy tax which every new purchaser will have to pay in consequence of the existence of the sewing machine monopoly，and which anoth－ er extension of the Wilson patent would further perpetuate． With this circular（requesting the obtaining of as large a list as possible in the shortest time）should be sept a blank peti－ ion for the signature of persons opposed to the extension， with a request to forward to the member of Congress from the District where the names are obtained，as soon as a num ber of signatures are registered．

## to intending exhibitors at the vienna show．

Mr．Van Buren，the United States Commissioner，in a re－ cent card reminds intending exhibitors that they should hurry up or it will be too late to send their goods．He ex－ pects that Congress will pay for freighting the articles over o Austria．But exhibitors may expect to pay pretty freely to have their merchandise looked after and displayed on arrival．This was the case at the Paris Exposition，and the Austrian charges will be much higher．The late war has
greatly increased the prices of living in Vienna．The great greatly increased the prices of living in Vienna．The gre
show will be a money harvest for the people of that city．

PRACTICAL ADVICE TO EXHIBITORS IN AUSTRIA．
The worthlessness of the pretended protection offered by the Austrian government to exhibitors，at the coming Vienna show，is set forth in the accompanying letter from Mr．Hotch－ kiss．This gentleman is an American patentee who，in the course of regular proceedings under the Austrian patent laws，has become practically acquainted with their working，
and his views may be relied upon．Weadvise intending ex－ hibitors to profit by his advice．
To the Editor of the Scientific American：
I am very much gratified to see the articles in your valua－ ble paper concerning Austrian and other European patent
laws，and the gross injustice now practiced under themat

There are two or three important points which I have no touched upon in connection with the working of patents in Austria，and in connection with the Exposition certificates proposed．
I would advise inventors designing to exhibit at Vienna not to avail themselves of the proposed exposition protec－ tion，but to apply for their patents before the exposition of their goods takes place，for the reason that an Austrian may ake a patent for the same thing，during the existence of the Exposition protection，and claim that he was the original in－ ventor，thus creating a dispute between the holder of the patent and the holder of the certificate of protection．
In taking patents the inventor should be particular about his drawings and specifications，and not describe more than one mode of accomplishing his object，for the Austrian pat－ ent offlice demands，if an inventor describes two，or three，or more different ways in which his invention can be made， hat，in working his patent within the first year，he shall work it in all the different modes described in his patent，no matter how indifferent some of the modifications may be．
Under the present working of the patent office，where an nvention has several modes or modifications described，they allow you to prove the general principle working，and then afterwards demand of you to prove that you have worked some one of the modifications；and if you fail to prove that you have worked any one of them，no matter how trivial or in－ significant a matter it may be，the patent becomes void．
Inventors must not expect to have any favors or liberality hown them under the Austrian patent laws．
I hope that you will give publicity to these suggestions and facts，for the benefit of those who propose to be exhib． itors at Vienna．

B．B．Hoтсн⿱亠䒑ss．
Paris，December 20， 1872.
AN INTERNATIONAL SHOW IN SPAIN．
A grand international exhibition is to be held in Spain in 1875；and if the policy of paying out the money of the United States to assist foreign shows is to be continued，of which the Austrian exhibit is an example，we hope that poor Spain will not be forgotten．She really needs help．
If the public funds must be used for such wrongful pur－ poses，we suggest that a fair division be made，and we hope that some of the Senators will introduce an amendment to the bill of Commissioner Van Buren，which calls＇for one hundred thousand dollars for Austria，so as to give half of the amount for the Spanishoshow．Fifty thousand dollars Is quite enough to support our Commissioner ior six months n Vienna．
Louis de Coudres．J
Died，in Brooklyn，N．Y．，on the 16th ult．，Mr．Louis De Coudres，in the 83d year of his age．
Mr．De Coudres was one of the very few yet living who had a hand in fabricating the machinery of the first steam－ boats．At the early age of thirteen，he was taken by James P．Allaire as his first apprentice，Mr．Allaire at this time car－ rying on a small brass and bell foundry．It was at this estab－ lishment that the brass castings were made for Mr．McQueen， who had machine works and did the work for Robert Ful－ ton in applying his steam engine to the first paddle wheel steamboat，the North River，of Clermont．Several years later，Mr．Allaire started his steam engine works，in Cherry street，which became the leading establishment of the city and famous over the entire country for the number and char acter of the engines it supplied to the first steamboats which plowed the waters of this continent．Mr．De Coudres contin ued with Mr．Allaire more than half a century，some of the time as superintendent of the iron foundery and all of the time in charge of the brass casting department，in which art his reputation was pre－eminẹt．This branch of the Allaire works possessed for many years almost a monopoly of the trade of bell casting．The first great fire alarm bells，put up in the City Hall park，were cast here by Mr．De Coudres．He was in his 83d year，and was probably the oldest brass founder in this country．
The Citizens Association of Des Moines，Iowa，＇invites men of capital to come there to build new factories and to enlarge the factories already established．Those for agriculturalim． plements and farm machinery are greatly needed．Starch factories，cotton mills，factories for boots and shoes，hats and caps，canning fruit，and sewing machines，are also required； copper and brass founders，glass works，cooperage，furni－ ture，chairs，baskets，brushes，etc．，are all here offered manu－ facturing inducements．A vinegar factory，possibly a tan－ nery，and many other establishments，and indeed every de－ demand of this new and extensive business field．
a Transandine Railway．－A transandine survey，made jointly by the Argentine and the Chilian Governments，leaves jointly by the Argentine and the Chilian Governments，leaves
little doubt of the possibility of railway communication be－ little doubt of the possibility of railway communication so
tween the Atlantic and Pacific．The length of such a com－ tween the Atlantic and Pacific．The length of such a com－
munication would be about 1,200 miles，of which nearly 400 munication would be abou
miles are actually made．
Immutability of Species．－Cats and dogs embalmed in Egypt four thousand years ago are precisely like chose of to day，said the late Sir David Brewster．What have the revo Iutionists to say to that fact？Four thousand years are noth－ ing，so gradually are organic changes brought about－would probably be the Darwinian answer．
＂I have been a constant reader of the Scientific Ammri－ cas for many years，＂says a renewing subscriber，＂and would not be without it for many times its cost．It has been the key to unlock many problems which have agitated my

## IMPROVED FEATHERING PADDLE WHEEL.

The invention illustrated in the accompanying engraving is $\omega$ feathering paddle wheel, or, in other words, a wheel in which the paddles are so arranged as to remain during their motion in a vertical or very nearly vertical position. They are thus prevented from lifting up bodies of water or from striking the water without acting fully and fairly to propel or otherwise give a useful effect.
Fig. 1 gives a general perspective view of the device, and Fig. 2 shows the manner of supporting the paddles in the wheel rim. A is the axle held in suitable bearings upon the frame. B B are the wheel arms connected with the axle and supporting the rims, C. D, the paddles, are secured by bolts passing through flanges of the semicircular cast iron segment, E, Fig. 2. The latter form, when combined, a 2. The latter form, when combined, a narrow cylinder which turns in the
wheel rim, $C$, and is guided by the flanges, $F$, secured thereto. By means of the journals shown, the segments are connected to the eccentric ring, H , which forms a united body with radial arms and an inner ring. $J$ is a center bearing permanently attached and supported by braces to the wheel frame, having on its outer circumference a number of friction rollers, so that the inner eccentric ring rotates freely around it.
It is evident from the foregoing construction that, as the wheel is revolved by the shaft, the rim, $C$, and the paddles, $D$, are rotated about the axis of said shaft. But the paddles, being connected with the eccentric ring, $H$, will be moved relatively to the wheel rim, C, in accordance with the eccentricity of the ring as itrevolves about the bearing, if. The result of the combined motions is that the paddles and segments, E, are so turned in the wheel rim as to preserve a vertical position during a full revolution thereof. The segments, E, rotating in their housings, are always firmly guided and supported on all points of the circumference, thus resisting strains and contusions, whether arising from currents of water, fce, drift wood, or other obstacles.
The journals by which the eccentric ring is connected being situated at the upper edges of the segments, the feathering movement of the paddles is in the direction of the water pressure, as produced by the current made by the wheel, so that to obtain such movement but little power is required. It is further claimed that, by the arrangement of the roller center, $I$, the power required in actuating the eccentric ring is reduced to a minimum.


This invention is notably stmple in form, in that it a voids the use of projecting cranks for feathering, while its general construction is such as to afford every requisite of strength and durability. It may be readily adapted to any form of wheel now in use. The inventor informs us that a similar wheel was placed upon the steam canal boat Port Byron, recently illustrated in our columns, which vessel has made a remarkably quick passage from Buffalo to New York.
Patented Sept. 28, 1869. For further information address the inventor, Mr. Primus Emerson, Carondelet, Mo.

## Experiments with Disinfectants.

As the result of a series of experiments with isinfectants, Herr Eckstein, of Vienna, strongly recommends chloride of lime as the cheapest and best. Bleaching powders rapidly decompose all hydrogen compounds, such as ammonia, sulphuretted hydrogen,sulphide of ammonium, phosphoretted hydrogen; and these are the gases which occasion miasma. It acts rapidly by liberating oxygen, and its chlorine violently decomposes organic matter. At the same time bleaching powders are a cheap commercial article, and hence always accessible. In order to avoid the inconvenience often resulting from the liberated chlorine, the ingenious device has been tried of enclosing the bleaching powders in a bag made of parchment paper. This bag remains quietly where it is placed, and by the principle of endosmose and exosmose, the full effect of the liberated chlorine is attained without any inconvenience to the occupants of the house.
Herr Eckstein made comparative experiments with different disinfectants, for two years, with the following results

1. Two pounds of sulphate of iron dissolved in water and
poured into a saucer at first liberated sulphuretted hydrogen, and after twelve hours no longer produced any effect.
2. A solution of sulphate of copper behaved in the sam way.
3. Two pounds of crystals of green vitriol retained its ac tion for two days.
4 A mixture of sulphates of iron and copper and carbolic
acid lasted two days.
4. Sulphurous acid was suffocating, and ceased to act i one day.
5. Carbolic acid produced a worse smell in the house than the bad gases of the sewer.
6. Two pounds of sulphate of iron in a parchment bag re-


EMERSON'S FEATHERING PADDLE WHEEL.
tained its valuable property longer than when exposed free.
8. Two pounds chloride of lime in a parchment bag con 9. Po purify the air for nine days.
9. Permanganate of soda was successful as long as it
sted, but is too expensive lasted, but is too expensive.
Enclosing chloride of lime in a parchment bag, and sus pending it in an out-house or leaving it in a sewer, is recommended, by the experimentor, as the best disinfectant to be obtained in the market.

## Wooden Ties in Stone Edifices

All the great temples of Egypt which have withstood the destructive tendencies of time and the assaults of man for four thousand years are of hewn sandstone, with a very few exceptions of about the color and character of the brown stone houses of New York. But the only wood in or about them is ties, holding the end of one stone to another on its upper surface. When two blocks were laid in place, then, it appears that an excavation about an inch deep was made thus, this being a representation of two hewn blocks, into which the hour-glass-shaped tie was driven:
It is therefore very difficult to force any stone from its position. The ties appear to have been the tamarask, or shittim wood, of which the ark was constructed, a sacred tree in ancient Egypt, and now very rarely found in the valley of the Nile. Those dovetail ties are just as sound now as on the day of their insertion. Although fuel is extremely scarce in that country, those bits of wood are not large enough to make it an object with Arabs to heave off layer after layer of heavy stone for so small a prize. Had they been of bronze, half the old temples would have been destroyed ages ago, so precious would they have been for various purposes.


Probably all those monster edifices were raised, course after course, secured in that manner, carefully adjusted by being admirably jointed above and below, but left rough inside and out. When carried to the proposed elevation, then, supported on moveable stays, the workmen dressed both surfaces from top to bottom, leaving figures in relief or the deeply cut symbolic characters which so puzzle archæologists in these latter days.
If our stone buildings were reared in the same manner, of blocks the thickness of the walls, they would certainly be more substantial than those slightly built houses which have their weakness concealed by a casing of thin sheets of brown stone. A difference of climate necessarily modifies architecture, but it is undeniably true that the architects of a remote antiquity, whose structures are monuments of their practical wisdom, were men of genius and extraordinary attainments in a department of art and science combined, not to be underin a department of art and science combined, not to
valued in these times of haste which end in waste.

## The Importance of Drawing.

The Select Committee of the House of Commons on Scientific Instruction recommend, in their report, that instruction in drawing should be given in elementary schools. The disegard of such elementary instruction, as a branch of general education, is surprising. Drawing is a universal language; $t$ is easier of acquirement than writing. By the use of a ruler, pencil, and compasses, a child may become self-edu caated, and acquire a handicraft of essential service in after life.
The
The exclusion of drawing and geometry from the subjects of examination by the Council of this Society on the recent jets of local examination, is great ly to be deplored. Encouragement in this acquirement might thus be given to those who can never at tain mediocrity either in reading, writing, or arithmetic; and who can tell what may be the aid to development thereby afforded to the natural born talent of an artist?
I look upon linear drawing and geometry, says Mr. Buckmaster, as the very foundation of instruction, and as affording, at a more advanced stage, the means of separating and classifying minds into orders or classes, so as to utilize each to the utmost, according to the powers with which it is en dowed.
The neglect of drawing, at the earliest stage of the use of a pencil by a child, may be regarded as a great defect in our system of teaching, which our educational authorities have done much to remove.
What reason can be suggested why a child should not commence geometrical and mechanical drawing contemporaneously with learning to write"? In deed, so soon as it has the power of handling a pencil, the discipline of learning to draw would be equal to the discipline of learning to write. The want of this simple first elementary knowledge is declared by competent authority to be a great barrier to the success of artizan students.

## TURTON'S COMPENSATED SPRING SAFETY VALVE.

The object of the peculiar arrangement of the safety valve illustrated herewith is to diminish the load on the valve as

the latter rises, and thus to allow a greater amount of lift than is possible so long as this load remains constant. The device, which we extract from Engineering, is the invention of Mr. Thomas Turton, of the Liverpool Forge Company.
The spindle, as shown bearing on the valve, is prolonged upwards into a casing, and, between a collar on the spindle and a pair of single plate springs contained in the casing, are disposed a pair of strut bars. These bars form a togglejoint and as the valve rises they assume a more nearly horizontal position, the effect being that the downward thrust they exert on the valve is diminished. The plate springs are hinged at the bottom to fixed fulcra, and at the top they are connected by an adjusting screw, by means of which the pressure they exert can be regulated.
Further details will be readily understood from the en graving. The invention seems to be one of utility, and, if properly proportioned, should act well. There is a great demand for an efficient device of this kind.

The President of the Royal Society of Agriculture, Engand, offers a prize of $\$ 500$ for the best treatise on the dis eases of the potato and the means of avoiding and remedying the same. The conditions of the competition may be obtained by addressing Mr. H. M. Jentrins, Secretary, 18 Hanover Square, London

PROFESSOR TYNDALL'S THIRD LECTURE IN NEW YORK. CRystals and light.
After a brief review of the preceding discourses, Professor Tyndall began his third lecture by referring to the manner in which scientific theories are formed. They take their rise, he said, in the desire of the mind to penetrate into the sources of phenomena. We have learned that in framing theories the imagination does not create, but that it expands, diminishes, molds and refines materials derived from the world of fact and observation. The germ of the conception that the sun and planets are held together by a force of attraction is to be found in the fact that a magnet has been previously seen to attract iron. In our present lecture the magnetic force must serve us still further; but what we must master here are elementary phenomena.

## the general facts of magnetis

are most simply illustrated by a magnetized bar of steel. Placing a bar magnet some two or three feet in length before the audience, the lecturer then showed its effect upon a mag. netic needle. Holding the latter near the bottom of the bar, one end promptly retreated; raising it along the magnet, the one end promptly retreated; raising it along the magnet, the
rapidity of the oscillations decreased as the force became rapidity of the oscillations decreased as the force became
weaker, and at the center they entirely ceased. Passing further upwards, the end which had previously been drawn toward the magnet retreated, and the opposite extremity approached. This doubleness of the magnetic force is called polarity, and the points near the ends of the magnet in which the forces seem concentrated are termed its poles. Professor Tyndall then explained that the separate halves of the magnet would each be a perfect magnet having two poles, and if a hardened and magnetized piece of steel be broken into any number of bits, the same would be true. This thing any number of bits, the same would be true. This thing
that we call magnetic polarity is resident in the ultimate that we call magnetic polarity is resident in the ultimate
particles of the magnet. Each atom is endowed with mag. netic force.
tendency of magnetized particles to assume definite FORM.
If we place a small magnetic needle near the magnet, it takes a determinate position, which might be theoretically predicted from the mutual action of the poles. A needle of simple iron will be affected similarly to the magnetic needle, or it is magnetized by the bar magnet. The action of two or more rods of iron near the magnet is more complex, for they act on each other. If we pass to smaller masses of iron-to iron filings, for example-we find that they act substantially as the needles, arranging themselves in definite forms in obedience to the magnetic action. The spraker then showed that, by sprinkling iron filings on a sheet of paper held over the bar magnet, various forms were produced. This experiment was represented optically by means of the apparatus shown in Fig. 1. A is an inclined


B a lens above which are two small magnets around which iron filings were scattered, and C a prism deflecting the ray to the screen, where the image appeared as represented. Professor Tyndall said that he had never seen more beautiful specimens of these curves than those recently obtained by Professor Mayer of Hoboken, "a young professor," he added, " from whom I expect considerable things."
Every pair of filings possesses four poles, two of which are attractive and two repulsive. The attractive poles approach, the repulsive poles retreat, the consequence being a proach, the repulsive poles retreat, the consequence being a
certain definite arrangement of the particles with reference certain definite arrangement of the particles with reference
to each other. This idea of structure, as produced by a to each other. This idea of structure, as produced by a
polar force, leads us to our next subject of enquiry-the acpolar force, leads us to our next subject
tion of crystals upon light. First, of

## CRYSTALINE ARCHITECTURE

Crystals are put together according to law. They split in certain directions before a knife edge, exposing smooth and shiny surfaces which are called planes of cleavage, and by following these planes we sometimes reach an internal form disguised beneath the external form of the crystal. We cannot help asking ourselves how they are built. Familiar as we are with the polar force and its ability to produce structural arrangement, the answer will be that these crystals are due to the play of polar forces, with which their ultimate molecules are endowed, and upon which their visible form depends. Large crystals are formed with deliberation. Thus a saturated solution of niter just deposits a minute crystal, which afterwards grows, augmented by molecules, from the surrounding liquid until we have large prisms of the salt of perfectly definite shape. Alum also crystalizes with the utmost ease after this fashion. If the crystalization be too sudden, the regularity disappears.

## SUSPENDED CRYSTALIZATION.

Water may be saturated, when hot, with sulphate of soda. When the liquid is cooled it is supersaturated, yet the molecules will not crystalize. Each molecule wishes to unite with both of its neighbors on either side; one tendency neutralizes the other and it unites with neither. But if a single
crystal of sulphate of soda be dropped in, its adjacent molecules will precipitate themselves, and others will follow, until ihe whole solution, as far as possible, is solid. But the crystals are small and confusedly arranged because the process has been too hasty to admit of the orderly action of the crystalizing force. The

## formation of crystals

was exquisitely illustrated by pouring over a glass plate a solution of chloride of ammonium. Setting the glass, on edge to allow the liquid to drain, a thick film was obtained, the evaporation of which was promoted by slightly warming the plate. The glass was then placed in a solar microscope. Reflected upon the screen appeared the most beautiful crystals, forming themselves with extraordinary rapidity. A somewhat similar effect may be produced by breathing on a pane of glass during cold weather, and
tion of the frost crystals with a lens.
A second illustration was the placing of thin platinum wires from a small voltaic battery in a solution of su_~ar of lead. As soon as the current began to pass, the metal was liberated by electrolysis, and attached itself in exquisite crystals to the end of one of the wires. Then the poles were reversed and the tree of metal already formed seemed to dissolve and was built up on the other wire.

## ICE AND SNOW CRYSTALS

were then explained. An inflexible power bends spears and spiculæ to the angle of $60^{\circ}$. We may sometimes see in freezing water small crystals of stellar shapes, each star consisting of six rays with this angle of $60^{\circ}$ between every two of them. The

REFRACTION OCCASIONED BY DIFFERENCE OF DENSITY, according to the undulatory theory, was illustrated by the Professor holding a long rod in a horizontal position and asking the audience to consider it a wave of light coming plump downward from a star. Supposing the platform to be transparent, this wave might be expected to pass through it with out change of direction. He then held the rod at an angle of $45^{\circ}$ to the floor, and, supposing the rod a wave, showed clearly that if on entering the material of the platform it encountered a denser medium, the lower end of the rod would be somewhat retarded before the upper end reached the surface of the platform. This would change the front of the wave and consequently its direction. This change constitutes the refraction of light and is evidently propor tionate to the density of the transparent body. Now, in vir tue of the crystaline architecture that we have been consid ering, the ether, which surrounds the atoms of all bodies, in many crystals possesses different densities in different directions, and the consequence is that some of these media ransmit light in two different welocities. But refraction depends wholly upon the change of velocity being greatest when the density is greatest. Hence in many crystals we have two different refractions, a ray of light being divided by such crystals into two. This effect is called double refrac| tion. |
| :--- |
| tion |

ordinary and extraordinary polarized rays.
Double renccion is ansplayed very strongly in Iceland spar, which is crystalized carbonate of lime. Placing a piece of this substance in the electric lamp, Professor Tyndall caused two images of the carbon points produced by the divided rays to appear. They were then concentrated by lenses into two bright spots of light. When the crystal of spar was rotated, one spot became a center around which the other one revolved. One beam obeys the ordinary law of refraction, discovered by Snell, and is called the ordinary ray. The other does not; its index of refraction, for example, is not constant, nor do the incident and refracted rays lie in the same plane. It is, therefore, called the extraordinary ray. In the bright spots on the screen, the most strongly refracted, is, in this case, the ordinary ray. Turning the spar around, the extraordinary image is the one that ing the sp
rotates.

## ORIGIN OF THE TERM " pOLARIZATION."

It has already been explained that the vibrations of individual ether particles are executed across the line of propagation. In ordinary light, we are to figure the ether particles vibrating in all directions across this line. In a plate of tourmaline, cut parallel to the axes of the crystal, the beam of incident light is divided into two, one vibrating parallel to the axis of the crystal, the other at right angles. One of these beams, namely that one whose vibrations are perpendicular to the axis, is quenched with exceeding rapidity by the crystal, so that,after having passed through a very
small thickness of crystal, the light emerges with all its vi brations reduss of crystal, the light This is what we call beam of plane polarized light. The fact that
polarized rays are quenched when crossing at right aNGLES
was exhibited by throwing the image of a plate of tourma line upon the screen. Placing parallel to it another plate, the two gave green images, as at A, Fig. 2. These image

gradually darkened as the plates were rotated until, when at right angles, the center was utterly black, B. On continu-
ing the rotation, they gradually lecovered color and trans.
parency. Professor Tyndall then reflected the green images being flected tency of the green light to be reflected in that direction. In one case, the mirror receives the compact of the edges of the one case, the mirror receives the compact of the edges of the
waves, and the light is quenched: in the other, the sides of the waves strike the mirror, and the green light is reflected.
polarization by reflection.

The quality of two-sidedness conferred upon light by Iceland spar may also be conferred upon it by ordinary reflection. If we hold a piece of window glass so that the beam shall make an angle of $56^{\circ}$ with the perpendicular to the glass, the whole of the reflected beam is polarized. This is called the polarizing angle. B, Fig. 3, is a lens. C con-

tains Iceland spar, by which all the vibrations of ordinary length are reduced to two planes, right angled to each other. But unlike tourmaline, this spar transmits both beams with equal facility. When, therefore, the light is polarized by reflection, the direction of vibration in the spar which corresponds to the direction of vibration of the polarized beam transmits it, and in that direction only. Consequently, from the two rays which proceed to the glass, D , but one image is possible.

BLACK OR GREEN IMAGES OF TOURMALINE.
Professor Tyndall next threw on the screen two disks ot ight produced by the double refraction of the spar, $E$ and F, Fig. 4. He then placed before the crystal a plate of

tourmaline, the light emergent from which, he said, was po arized. The spar has two perpendicular directions of vibraion, one vertical, the other horizontal. Now when the green light should be transmitted along the latter, which is parallel to the tourmaline, and not along the former which is perpendicular to it, the light in the circles, as represent ed in the diagram, was white. In the middle of each the trip or tourmaline was represented, in one by a green, in the ther by a black, image. The tourmaline was rotated on its center, and when the two images formed a horizontal line, they both appeared of a darkened green. When still further rotated, the images entirely interchanged colors.
mica turns darkness into light.
When the plates of tourmaline were crossed, the intersected saces were black, but the least obliquity of the crystals allows light to pass through. If we introduce a third plate of tourmaline obliquely, it will abolish the darkness. Having no tourmaline, Professor Tyndall introduced a film of mica between the crossed plates. The effect was almost magical, he darkness being apparently pushed away by the edge of he mica.

## THE NICOL PRISM.

We have seen the two beams emergent from Iceland spar and have proved them to be polarized. It is possible that one of these rays may be totally reflected and the other not. An optician named Nicol cut a crystal of Iceland spar in two in a certain direction. He polished the severed surfaces and reunited them with Canada balsam, the surface of union being so inclined to the beam traversing the spar that he ordinary ray which is the most highly refracted was :otally reflected by the balsam, while the extraordinary ray was permitted to pass on. Professor Tyndall then explained
he apparatus sketched in Fig. 5, in which were two Nicol

prisms. Placed with their directions crossed the light is quenched; on introducing a film of mica between light is received. But we also obtain colored light. Taking a thin splinter of selenite, the lecturerplaced it between the prisms, when the image on the screen showed the most magnificent tints. Turning the prism in front, these colors gradually faded and disappeared, but, by continuing the rotation until the vibrating sections of the prism were parallel, vivid hues, complementary to the former ones, appearod.
'Placing some films, shaped to represent flowers, between the prisms, by turning the front Nicol $90^{\circ}$ around, a red flower and green leaves were shown; rotating it another $90^{\circ}$, a green flower with red leaves appeared. Other beautiful chromatic experiments of similar nature were introduced, which Professor Tyndall said could all be explained by the principle of interference, and he promised to develope the causes in his next lecture.

## Conregimudemfe.

## The Universal Caravan

## To the Editor of the Scientific American.

My learned friend, the Abbé Moigno, has called my attention to an article on the " Universal Caravan" which appeared in your valuable paper of November 23. I beg to offer my compliments for it to your humorous contributor, and, without taking the least offence at its raillery, which I believe to be well intentioned, I am anxious to set his mind at ease upon one or two points upon which he has incidentally touched.
' How," asks your contributor, "can frequent telegraphic communication be possibly kept up between the caravan, wherever it may be, and Europe? and why are certain States mentioned as calculated to furnish, on their territory, any native troops to the expedition?"
In the States of Asia and several of South America, where the country is devoid of roads practicable for carriages or mule trains, the dispatch service between villages, settlements, and often even between populous towns, is performed by means of native foot postmen, who run for three successive hours at an average speed of six miles an hour. On ar pival at the relay station, the package is transferred to a second runner, who goes over his eighteen miles, and so on; ond runner, who goes over his eighteen miles, and so on; verse 144 miles in 24 hours. Suppose, for instance, that the caravan happens to be in the western part of the Province of the Amazons, belonging to the Republic of Equador, at about 200 miles from Riobamba, that is to say, at about ten stages or thirty-four hours from this town, whence a courier starts every day for Guayaquil, which he reaches in thirty-six hours. Our letters are then delivered to an agent of the Havas agency, appointed for this special duty. This agent condenses into the smallest possible number of words and transmits to the nearest telegraphic station all special information respecting the members of the caravan. Transfer formation respecting the members of the caravan. Transfer the same system into the stony desert of Australia, now tel-
egraphically connected with the European and North American systems of wires, and you will understand how the problem is solved.
I more specially mentioned certain States or colonies (without indicating all of them) in which communication is the most imperfect when travelling alone and without any recognized political or scientific mission. In these States, I have met with aid and protection from the authorities, which has been carried so far that I have been gratuitously accompanied by a certain number of native troops, who were of the ut. most assistance to me in the forest.
Although the caravan has an object within the limits of human possibility, and has no encyclopædic pretensions, I am anxious to explain, by one striking example, the practical and immediate services which it may render to science.
Quinine was imported into Europe sixty years before its admission into the pharmacopœias. I will not now inquire why science remained so long deprived of the most efficacious remedy for fever at its disposal. Whenever the natives of the region I am traversing shall point out to me, as an efficacious remedy against such and such a disease, a plant, root or leaf, I will cause this object to be sought for under the inspection of the botanist and surgeon, and will have it submitted to a chemical analysis before its elements have undergone the chemical analysis before its elements have undergone the
changes from desiccation or moldiness inseparable from a changes from desiccation or moldiness inseparable from a
long sea voyage. If this operation reveals the presence of a chemical principle, an essence, or an alkaloid, explaining the curative virtues attributed to the plant by the natives, I will forward, to the schools of medicine and to the scientific journals, the wood, bark, or root, and the analysis, botanical classification and observations made during the processes carried on under our eyes. By this means, I hope to avoid delays in the admission, by medical men, of new efficacious remedies of which we are now deprived, and they are many, and further to prevent the disgraceful speculat
ereduliiy of invalids which prevail everywhere.
My itinerary does not contemplate crossing C
My itinerary does not contemplate crossing Central Africa where, thanks to the efforts of the distinguished Living stone and the recent voyage of your brave fellow country man, Mr. Starley, we may easily foresee that civilization will soon necessitate a political action which only a great nation could undertake. The perimeter of the African continent will furnish a field vast enough for the studies we have undertaken.
Finally, independently of ethnography, written impartially and without any prejudiced criticism of races, the Universal Caravan purposes to create a new science, namely, the art of enabling to travel advantageously, almost without danger and without great privations, a group of men of different nationalities, whose objects call for the good will and protection of civilized nations.

Bazerque,
12 Boulevard des Capucines, Paris.
Captain.

## The Bar at the Mrouth of the Mississippi

To the Editor of the Scientific American:
The bar at the mouth of the Mississippi is, as we all krow, one of the grest drawbacks to the commerce of the West that there is, and many plans have been advanced to obviate that trouble, among others, that of digging a canal from the Gulf to the river, some miles above its present mouth
Vessels of a large size cannot load to their full capacity and cross the bar; indeed they can hardly carry half a cargo. Now if it were so that large steaners could carry a full load, they could take freights cheaper; and, taking freights cheaper, they would cause most of the European shipments to be seat by way of New Orleans, particularly the grain and cotton. Indeed, I think three fourths of the grain and all Hee cotton shipped to Europe would follow this

To build a canal at the mouth of the Mississippi would cost many millions of dollars; the amount indeed would be incalculable, as it would be more troublesome to keep a sufficient depth of water in it than it is in the Suez canal; for instead of the shifting sands of the desert, we should have to contend with what is worse, the shifting mud of the Mississippi, which has already caused the bar at the mouth; and three of the most expensive dredge boats in the country can hardly keep a channel of fourteen feet depth of water on this bar. And it would be the same in a canal; for as soon as the sediment in the river meets the dead water of the Gulf, it will settle there and form another bar, which no number of dredge boats could clear away as long as th 'Father of Waters" empties into the Gulf of Mexico.
The only way that this difficulty can be overcome is b some sort of " marine camel." Instead of trying to dig the bar away, lift vessels over it, which, costing comparatively little, would do everything required of a canal. Let the in ventors of the country give us their plans for a "camel."
C. W. Stewart

Memphis, Tenn.

## Steam Pressure on Bollers.

To the Editor of the Scientific American:
Which is the right way? Must we multiply together the pressure and circumference, the pressure and half of the cir cumference, the pressure and diameter, or the pressure and half of the diameter, for the true answer? I believe that each of these methods has been held to be the true one, by men who certainly write as though they ought to know what they are talking about.
A boiler 100 inches in circumference, sustaining a pressure of 100 pounds to each square inch, would have upon each circle of the boiler of one inch wide, according to the first method, 10,000 lbs., according to the second, $5,000 \mathrm{lbs}$., ac cording to the third, $3,200 \mathrm{lbs}$., according to the fourth, 1,600 lbs. This is a serious discrepancy
If two men, each with spring balance in hand attached to cord, should test the strength of the cord by pulling against each other till each of the spring balances indicated 100 lbs., would it be held that the cord sustained 200 lbs .? It is, of course, clear that there can be no strain in one direction with out an equal resistance or strain in the opposite direction, whether the object tested be a steam boiler or a cord; hence, I consider that the semi-circumference method is the true one.
The breaking point of a strip of good boiler iron, one inch wide and one fourth of an inch thick, is about $13,000 \mathrm{lbs}$. It is well known that a well made boiler of such iron, 32 inches in diameter, will work safely at 150 lbs. to the square inch, which would be 200 lbs . above the bursting pressure, if the whole circumference method were the true one. On the ther hand, if the semi-diameter method were the true one, 150 lbs . to the square inch would be but about one fifth of he bursting pressure.
It seems to me that all of our practical dealing with steam boilers agrees with the semi-circumference method.
Worcester, Mass.
F. G. W.

Remarks by the Editor.-It is a well known principle in hydraulics and pneumatics that the pressure of a fluid on the internal surface of any vessel is exerted in any given direction with a total effect which is measured by the product of the insensity of the pressure by the projection area of that surface on a plane at right angles to the direction assumed. To determine the force tending to rupture a cylindrical boiler multiply the pressure per square inch by the diameter and divide by the thickness of metal which must be ruptured, to obtain the stress per square inch of metal; that is, divide this product by double the thickness of the boiler plate. Or divide the product, of the pressure per square inch into the radius, by the thickness of the sheet.
Our correspondent, B. F. McKinley, in the Scientific American of December 21st, 1872, gave a correct statement

## Steam Statistics.

To the EXBtor of the Scientific American:
The following figures relating to steam may be useful: One cubic foot of water weighing $62 \cdot 5$ pounds, converted nto steam of one atmosphere, gives a volume of 1,728 cubic feet of steam. If 62.5 pounds give 1,728 feet, then one pound gives $\frac{1728}{62}=27.67$ cubic feet.
A displacement of 27.67 cubic feet is made by one square foot, $=144$ square inches, traveling a distance of 27.67 feet lineal. Now, a pressure of one atmosphere, $14 \cdot 7$ pounds,
on a surface of 144 square inches, through $27 \cdot 67$ feet gives a result of $27 \cdot 67 \times 144 \times 14 \cdot 7=58,572$ foot pounds; this divided by 772, the number of foot pounds equivalent to one degree of heat Fahr., gives $\frac{585}{7} \frac{5}{2} 2=75 \cdot 87$ degrees of heat represented.
It appears to be a very singular fact that if one half of this $75 \cdot 87=37 \cdot 93$, be added to $212^{\circ}$, the temperature of one atmosphere, we have $212^{\circ}+37 \cdot 93^{\circ}=249 \cdot 93^{\circ}$, the temperature
of two atmospheres. of two atmospheres.
Add to this $\frac{1}{3}$ of the same, $\frac{75.87}{3}=25.290$, and we have $249 \cdot 93+25 \cdot 260=275 \cdot 22$, the temperature of three atmo spheres, and so on. If we add together the fractions $\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\frac{1}{5}+\frac{1}{6}=\frac{87}{60}=1 \frac{27}{60}$, and multiply this by 75.87 , we
have $75.87 \times 1 \frac{27}{60}=110^{\circ}$; this added to $212^{\circ}$ equals $322^{\circ}$, the temperature ats six atmospheres. Thus it seems that the fractions above denote the rate of increased temperature as the pressures pass through that of the number expressed by the denominator of the last fraction used.
Is there any known mathematical analysis of the relations
of heat, pressure and volume of steam? If so, what is it?
B. F. McKinLey.

Insensibility-owhen Complete.
Much has been written upon the question whether pain follows, or intelligence remains, after decapitation. As positive proof is impossible, unless spiritualism be true, one man's opinions are likely to be worth about as much as another's. Facts, in the history of living persons, throw light on every subject, and, I think, on this.
The stoppage of the breath from any cause is immediately followed by insensibility, both of body and mind. This is susceptible of daily proof. The victim of foul gas in wells falls insensible. This is why so few are rescued in such cases. Any one choked sufficiently to stop the breath immediately becomes insensible. I may be asked how do I know his? I learned it, when a boy, in this manner.
In sport, one evening after school, I drew my "comforter" tight around my neck, and a " big boy," to further the sport, drew it tighter, when I dropped insensible as quickly as if struck by lightning. The comiorter was loosened and I im. mediately recovered and felt no inconvenience resulting. This to me has always been a proof of the foregoing assertions. No one can suppose that consciousness would have returned without returning breath. I have often wondered where the immorial part of me was during that brief period. The barbarous practice of neck-breaking, under the pretense of hanging, to produce death, is sometimes talked of as quickening one's journey to the other world and making the passage painless. It makes it sure, but, in my opinion no passage painless. It makes it sure, but, in my opinion no
less painful, as in either case, if strangulation is complete, here is entire exemption from pain and entire insensibility. The motions of the hanging man are entirely involuntary, and are no indication of pain felt any more than are the contortions of one in a spasm. I have known a child, badly burned on the fet with a hot brick during a spasm, to have no consciousness of it at the time or recollection of it afterwards. The humanitarian, who only desires an execution for the benefit of society and a neck broken for the benefit of the party directly interested, would accomplish his end as well, and the end ot he person as effectually, by sim end as well, and the end ot he person as effectually, by sim
ple strangulation, as by a six foot drop and a broken neck.
E. H. R.

## The Prevention of Fires <br> To the Editor of the Scientific American:

In view of the terrible destruction of life and property by fires in our cities, it is surprising that more pains is not taken to prevent such disasters. One of the simplest of all means is to have a stand pipe connected with the service pipe from the city mains carried up through the building to the top, and provided on each floor with a cock, to which a hose can be instantly attached, in case of need. In hotels hose can be instantly attached, in case of need. In hotels
and factories, there should be a hose for each floor, and it should always be connected, so that the turning of a cock would supply the water at once. The pipe should be located in a hall, or some place from which a hose could be laid to any of the rooms on each floor-the hose, of course, being long enough to reach any room, and being provided with a nozzle and stop-cock like those used for street washing. I have such an arrangement in my own house, and would never think of building one without it, where water could be obtained. In those cases where there is no water supply, or where it will not rise to the top of the building, a cistern should be located as high as possible and
receive the water from the roof, or it might be supplied with a force pump, operated by a windmill or other power.
Such an arrangement, with a hose, I consider far better han the plan which has been suggested, both recently and years ago, of placing all through the building perforated pipes for flooding it with water in case of a fire: because with hose, the water can be thrown just wher it is needed, while in the other case it will fall only at certain fixed points, and would flood the house in parts remote from the fire. A net work of perforated pipes in a factory or large building might answer; but as a general thing, the other plan will be found far more practical and much cheaper. Some such safeguard ought to be required by law in every building where it is possible.
W. C. Dodge.

Washington, D. C
Remarks -The method suggested by our correspondent is excellent, and has long been in use in large buildings in New York and other cities. This plan is employed at the Fifth Avenue Hotel in this city, and its excellence was demonstrated during the recent fire in that building. In thirty seconds after the fire was discovered, the hose was stretched and the water was playing upon the fire.

## Aniline Inks.

## To the Editor of the Scientific American

An article in a late number of the Scientific Americar appears likely to induce a great use of aniline inks. It. however, ought to be known that, as a rule, these inks are the least permanent of any in common use. Still, further, in view of recent great conflagrations, it is to be noted that no inks have been so generally destroyed, where used on books or paper subsequently charred in fireproof (?) safes, as the various aniline inks. A very extensive experience in restoring charred paper in the Chicago, and now in the Boston, fire has convinced me that these inks, as a class, are beyond the power of the chemist to restore to legibility when exposed to a high temperature.
Boston, Mass.
C. Gubert Wheeler.

BY relying on our own resources we acquire mental strength; but when we lean on others for support, we are like an inalid who, having accustomed himself to a crutch, finde it difficult to walk without one.

## GLEANINGS IN SCIENCE AND ART.

## Regeneration of Limbs.

If a lobster's claw is broken off below the third joint, another will soon appear in miniature at the end of the stump. About the third year it will overtake in size the one on the other side. This explains why the pugnacious creatures are so frequently noticeable with one large and one very small pair of fighting shears.

At a particular season, the males engage in ferocious combats, cutting each other in pieces if they can. Nipping off the sword arm of an opponont is a point of sanguinary ambition. They quarrel worse than a congregation of tailors on a strike.
When, by accident or otherwise, a Brazilian lizard's tail is missing, another crops out immediately, requiring consider able time, however, to develop into full proportions. It is to them as indispensable an appendage as a balancing pole in the hands of a rope dancer, in maintaining their centers of gravity while racing through the top of a tree in pursuit of prey. Could a fox run without a tail? But a second one never grows, so he is crippled for life when that is gone.
Some of the newts have a new eye generated, if gouged out, which will ultimately exactly correspond with the old one in color, function and visual perfection.
All the mammalia, including ourselves, have something of that remarkable regenerating property-particularly exhibthat remarkable regenerating property-particularly exhib-
ited in the re-union of broken bones, which shows a graduaited in the re-union of broken bones, which shows a gradua Such are the deductions of science, unwilling as some may be to embrace the doctrine of evolution.

## Pulmonary Consumption.

An admirably written volume was published not long since by Longmans \& Co., London, on that destructive mala dy which almost defies medical treatment in its amelioration. Dr. Henry MacCormac, of Belfast, Ireland, is the author. Were it republished here, it would lead to reforms in regard to preventing a disease which is often actually induced by violations of the laws of health. Consumption is mowing down the young and the promising before they are prepared for the responsibilities of life. There are two forms of consumption,namely : that which is hereditary, being transmitted from parents to their children, and that which is induced. The latter is the main topic discussed by Dr. Mac Cormac, which, he is persuaded, has its origin in re-breathing expired air. Those of a delicate organization should sleep alone, and if possible in spacious rooms. That would insure a larger supply of pure, uncontaminated air. On re tiring, never omit raising the window sash slightly. When the dormitory is small, if not carefully ventilated, oxygen, the essential element that supports life, is quickly exhaust ed, and the individual takes back into the lungs carbonic acid gas, which destroys life. Thus the whole system becomes deranged, the air cells ulcerate, and, with the destruc tion of those, the whole bronchial region falls into disease.
Fresh atmospheric air was intended to be inhaled. It the source of vitality; therefore, be in no apprehension from exposure to its influences. When the air is charged with excessive humidity, avoid unnecessary exposure; but clear weather, a bright sun and airy sleeping rooms promote health and longevity.

## Borax.

Besides having many uses in the arts, borax is an antiseptic. M. Jacquez has been before the French Academy of Sciences with an elaborate paper. The sub-borate of am monia, too, according to the results of that gentleman's experiments, is of marked importance to the world of science.
A solution of five parts of borax in one hundred of water is represented to prevent the putrefactive process in meats for considerable time. Flesh dipped in the mixture and then dried resists the usual processes of decomposition.
For dissecting rooms, the taxidermist and those engaged in preparing cabinet specimens of animal tissues, the announcement of M. Jacquez should command attention on the score of econumy if on no other account, it being no way dangerous oz iable to involve assistants in painful accidents, not unfrequent with arsenic, which is commonly employed in
modern embalming and in securing anatomical preparations against the depredations of vermin.

## Vital Mechanism.

It has been assumed by those competent to form an opinion that there are twenty-five thousand muscles in a silkworm. There are eight thousand in the trunk of an elephant, and in most of the serpents perhaps more than a million. Through the instrumentality of those organs the flexibility of the boa constrictor depends. By an act of will-that is, instantly charging the muscles with an extra force-the great python of Africa crushes a living lion into a shapeless mass $f$ r swallowing. Every bone is ground into fragments, so that no opposing obstacles in the form of splinters or projecting points can injure the throat on the way to the snake's immensely large elastic stomach. Neither art or science has yet discovered a method for generating such power by apparently such a simple device.

## Musical Sounds.

The longest and largest pipe of the great Harlem organ, thirty-six feet in length, when sounded, actually jars the whole edifice. If there are less than thirty-two vibrations in a second, it is a noise analogous to the flapping of the wings of a huge bird. The human ear recognizes no music in that. All vibrations above thirty-two are musical, till they reach
thirty thousand in a second.

Such is the perfection of our auditory sense that the mind in excited, charmed and exalted by acoustic undulations which
are transmitted to the brain through a small, soft cord, carcely larger than a single silk thread.
Reflecting on the laws of sound, the extreme delicacy of the mechanism by which it is received, transmitted and an lyzed in a moment of time, who can doubt the existence of a Divinity whose works, independent of moral attributes, are self-evident propositions.
Guinea Pigs.
A writer of distinction says those little, plump, clean ani mals should be used for food. A mistaken notion is entertained generally that they are a kind of rat, and therefore an unjust prejudice ought to be overcome, since they are excellent eating. Guinea pigs are not pigs. They are harmless, timid, vegetable feeders. Their flesh is nutritious and delicate. If once received into our markets, being easily raised, they would soon be prized for their many desirable raised, they would soon be prized for their many desirable
dietetic properties. Being prolific, too, they might be raised in vast abundance, their food being an item of no expense, a few cabbage leaves, roots or waste parings being all they would require to grow into proportions to fill vacancies in a gourmand's stomach.

## Electric Cautery in Surgery

Surely the world is moving. One of the last and perhaps Surely the world is moving. One of the last and perhaps
greatest improvements in surgery is a new method of cutting away formidable tumors in some of the cavities by electricity. Where it is almost impossible to secure bleeding vessels on account of reaching them, for example in detaching a fungous growth far off in the nasal cavities, throat, etc., a wire is passed round the base, the battery set in motion, and, presto, the tumor is separated without loss of blood, the vessels being seared as it were with a hot iron. Better still, under the lulling effects of chloroform or ether, the patient experiences neither pain nor loss of strength from hœmorrhage.

## Fatal Flybites.

Deaths very frequently occur from slight punctures made by flies in warm climates. Occasionally such cases occur in emperate zones, but the cause of such a melancholy result from a slight wound in the skin does not seem sufficient to produce excessive swelling, pain, discoloration and other exraordinary appearances which are quickly exhibited. It is, therefore, possible that the insect which makes the tiny wound has its proboscis charged with an active poison from some source where it had recently been foraging, which, introduced into a bleeding wound and rapidly carried by the absorbents into the system, is followed by death.
Observation on those forms of ophthalmia so common in Egypt, ending in blindness of one if not of both eyes, leads to the opinion that the dreadful malady is propagated by flies, carrying,on their feet and feeding tubes, purulent matter from diseased organs whence they are kept away with difficulty, to sound ones, where they are attracted by moisture on the margin of the lids.

## Rapidity of Muscular Contractions.

A dragon fly balanced on its wings at the side of a car speeding its way over the rails, at the rate of forty miles an hour, appears to be almost motionless. But to keep up with the car, its wings must vibrate many thousand times a second. The eye cannot detect their up and down action, so exceedingly rapid are the contractions and relaxations of the muscles acting upon them. All at once they dart off at a right angle so quickly that the retina cannot have an impression remaining long enough to retrace their course. Therefore, those same muscles, too small to be seen but by powerful microscopic assistance, must be urged to still more rapid action. Such intense activity far exceeds the vibration of musical chords, and therefore exceedingly perplexes entomologists, because the nervous system of insects is so extremely minute. The question is: How much power is generated for keeping a dragon fly's wings in uninterrupted motion for many hours in succession without apparent fatigue?

## Transplantation of Trees and Shrubs.

Vegetable life depends as much on vital functions for its preservation as animal life. But the way trees are treated cates a very limited knowledge of physiological laws.
Plants repose at night like higher organizations, waking in n the sunlight of morning, invigorated and refreshed. Through the long, tedious months of winter, they sleep profoundly. While the leaves are green and vigorously performing a series of labors, preparations are made for a coming season of cold, ice, snow and other influences which reduce the vital force to the lowest point without destroying it. That is the best time in the life of a tree for transplanting it. That business is admirably managed in France. They don't think of waiting for a mere stick to grow into a broad, spreading tree. No, they select splendidly developed trees, with waving branches, and place them where their rand appearance will be admired
In tine squares of New York, the Park Commissioners are now pursuing the proper and only promising plan of suc cess by bringing in from the country well grown trees, dug up out of the frozen ground, with all the roots covered with two or three feet of the earth in which they grew. Being set
out in their new positions, the cardinal bearings being the same, in the spring they will rouse up like refreshed laborers, and bud and blossom as they did before. That is the true system. It may be accomplished at any period if the roots are never injured or exposed but clothed, thickly and securely, with their own attached soil. Never cut off a limb or twig till they have a secure foothold. Leaves are the breathng organs of trees. Most persons make a fatal mistake in
trimming trees when transplanted. They die because they trimming trees when transplanted. They die because they
cannot breathe, oxygen being thrown off and carbon abcannot breathe, oxygen bein
corbed from the atmosphere.

## Phosphorus in Medicine.

Besides being extensively used in making matches, aston shing audiences when legerdemain performers blow fire from their mouths, and a prominent source of surprise in chemical laboratories, the physicians are prescribing it. One bun dredth of a grain is secured in suet, supposed to be a fire proof covering; thus secured, the dangerous enemy is swal. lowed. According to the testimony of enfeebled notabilities, these fireballs, small as they are, made them feel as lively as political candidates for office. No patent medicine can be successfully introduced till endorsed by the clergy, say the proprietors. It remains to be seen whether medical practitioners of eminence, those who are conscientious laborers in the vineyard of humanity, will sanction the phosphoric practhe vineyard of humanity, will sanction the phosphoric prac-
tice, even if fortified by certificates from lame, halt and blind, tice, even if fortified by certificates from lame, halt and blind,
whose imaginations, as often as otherwise, run away with whose imaginations, as often as otherwise, run
their judgments. Happily they are not patented.

## Life and Matter.

Nothing remains at rest. If a sirgle particle in a living body were quiescent, a chain of disastrous consequences would quickly follow, terminating in death. Such is the fact respecting the necrosis of any part of an injured bone. When the circulation and deposition of new ossific materials is in terrupted at any particular point or region, mortification, gangrene and a throwing off of the dead portion immediately commences.
We are perpetually supplying the system with new life material. That is accomplished by food in the stomach. It is there put in a condition to be wafted all through the body. On its route a particle is dropped here and there, and at the same instant an old one is removed. As soon as the vitality of the new piece has been imparted, it becomes from that inof the new piece has been imparted, it becomes from that in-
stant useless. Thus we are perpetually being renewed, and by eating and drinking the supply is equal to the demand. Thus may be explained a law of the animal economy, how it is that we have neither the same bones nor the same flesh to-day that we had years ago Although identi cally the same individuals, our bodies have been renewed repeatedly in the course of an ordinary lifetime. Whenever that process of assimilation is interrupted-in other words, when neither new matter is supplied nor the old can be removed, as when in health-death is inevitable.
Therefore, it is self-evident that every particle of nu triment is charged with a definite amount of vitality. An aggregation of these elements eventuates in a life-force. Variously arranged, they result in particular organic forms, and who can say that this may not have an important bearing on the gradation of intelligence from one type to another in the ascending scale of animal forms from creeping things to man?

## Catching Wild Ducks

In the published narrative of a traveller in Arabia, the author saw people catch wild ducks very successfully in the harbor of Jidda, an Oriental city, in the following manner: An Arab stripped himself and then cautiously waded into the water up to his neck. He then covered his head quietly with seaweed. When properly arranged, he walked off to where the birds were busily employed in swimming about, foraging on the surface. They were not in the least alarmed at the approaching mass, which was evidently regarded as floating weeds. Fairly in amongst them, he reached up and floating weeds. Fairly in amongst them, he reached up and
caught them by the legs till satisfied with the number for $\mathrm{t}^{\text {he }}$ occasion, which were thus secured, and then wended his way to the shore with extreme deliberation. Thus the ing enuity of man circumvented the watchful instinct of a quatic animals that are so vigilant for life and iiberty as to dive on hearing the click of the lock before an explosion of the charge takes place in the gun.

## Casting Metals in Vacuo.

With the ordinary process of casting, the air enclosed in the interior of the molds, not being driven out at the moment when the metal enters, forms between the casting and the mold a very thin envelope, which prevents the metal from taking the exact form of the mold, and which occasions air holes and other defects. These inconveniences are particularly felt in casting works of art, and to avoid them MM. Cumin and Martel, of France, have devised a process recently patented by them. 'This process is based upon the employment of a vacuum. At the moment of casting the mold is placed in communication with an air pump in such a manner that the air is drawn from the mold through the pores of the material of which it is made. The interior surface of the mold is, therefore, covered with a substance sufficiently porous to allow the air to pass, yet of ample resistance to guarantee perfection in the form of the object cast. The material employed varies with the nature of the metal.

1. For those very easily fused, such as type metal, the nventors employ fine plaster well dried.
2. For harder metals, such as bronze, they use plaster mixed in almost equal proportions with plumbago, alumina, and other substances of a similar nature, this mixture having been previously thoroughly dried, to drive off all the water from the plaster.
3. For more refractory metals, such as cast iron and steel, the sand mold is simply covered with plumbago, or other analogous materials.

The Battert, New York.-In connection with this favorite New York resort, it may be noted that a new pier is being constructed. The new pier will be 500 ft . long and 80 ft . wide, and it will be supported on 19 arches. These are placed upon foundations of kuge blooks of artificial
stone: stone:

NINE HORSE POWER COMPOUND BOAT ENGINE.
The use of small boats propelled by steam, upon our many inland lakes and rivers, is now so extensive that any improvements in the economy of working, or in the patterns for producing the machinery of such boats, will be interest ing to many of our readers. We have therefore engraved, from The Engineer, lustrations of a pair of English engines, designed for the purpose mentioned, which, have been found to operate with much satisfaction. These engines are built on the compound plan, and the launch or boat, at Portsmouth, England, in which they are used, is one of the fastest and most economical little crafts that there is afloat.

The engines are of nine horse power, built by A. Verey. of these engines; by this means space is saved and unusual he cylinders are of 6 inches diameter and 8 inches stroke. The strength imparted. All the working parts are very easy of troke of the slide valve is 3 inches; the lead, $\frac{1}{8}$ inch, and access, and the guides and general details are very well de the lap $\frac{7}{8}$ inch; area of steam ports, 2.65 inches; area of ex- signed and proportioned. The engines run at a high speed haust port, 8.5 inches; diameter of piston rod, $1 \frac{1}{8}$ inches; di. with great steadiness and absence of noise. The screw shaft ameter of valve spindle, $\frac{5}{8}$ inch; diameter of crank shaft, is fitted with a disconnecting clutch, by which the engines $2 \frac{8}{8}$ inches; length of connecting rod, 1 foot 6 inches diame- may be run alone to pump the boiler up, a matter of consid ter of guide rods, $1 \frac{1}{8}$ inches. The engines indicate 24 horse erable convenience. We look on these engines as very fa power when working with 60 lbs . steam cutoff at five eighths vorable specimens of the miniature marine engine which has of the stroke and making 300 revolutions per minute. It will be seen, on referring to the engraving, that wrought are either of the Field type or are horizontal boilers with re iron has been used to an unusual extent in the construction turn tubes.


NINE HORSE POWER COMPOUND STEAM ENGINES.

## DESIGN FOR BALL GROUND PAVILIOK.

The structures which are hastily nailed together and located on the banks of our public skating ponds, especially those of Central Park, can hardly be deemed ornamental, however useful they may be. The same is .true of the buildings placed for the accommodation of spectators and others on the borders of our racecourses and ball grounds; all partake of a crudeness of design and, even if intended as little architectural skill and a modicum of ar tistic taste infused in their plans would fully their plans.

We give herewith taken from the London Builder, excellent ele vation and plan views of a pavilion to be erect ed on the large cricke field of Nottingham England, which, to ou mind, is excellently adapted to its purpose It combines a hand some and finished ap pearance with the light ness necessary to such structures, and is spa cious and commodious without presenting the too common likeness of a poorly decorated cattle shed. The centra feature in the design is the pavilion, two stories in bight, the stories in hight, the ground floor being arranged for the purposes of dining and refresh ment generally. The upper apartment will form a balcony from which a good view of the: whole field may be obtained. The covered ways on either side of the pavilion may be used when a match is being played, and serve as excellent shelter from cold wind and rain. The seats in the wings are raised one above another as galleries. The front seats may be removable if required. In the rear are the kitchen and players' dressing rooms A fine view of the field will also be obtained from the open air galleries over the roofs of side wings, the floor of which will be on a level with the floor of the balcony. The details of the plan explain themselves.
Such a building as this might be advanta ouly permadugeously permanently located by the side of the lakes in our Central Park, or in any of the parks in other cities. The necessary accommodations of a boat house might be added, and landing places arranged along the plaeau on which it stande or our stands. ional base ball nines owning their own play grounds, would find it to their benefit to erect some such a structure for the convenience of visitors; or county towns in which fai
grounds are situated could employ a similar building for ex hibitions, seats for spectators of races, and scores of othe uses productive of profit.

## How to Insure Conflagrations.

Run your furnaces to their fullest extent; leave everything to servants and porters, says the Boston Commercial Bulle tin. The latter, in charge of boilers, engines and furnaces, have only to "fix the draft" and go to sleep. Of course, there is no need of any watchman; a boiler or engine, or in fact any apparatus, ought to run itself after being " fixed for the night."
It makes it all right to have the newspapers say, after a block of buildings have been burned down, that the "ine took in the boiler room," or the engine room, or use that
permanent edifices, a rough atemporary appearance, which a $\mid \boldsymbol{y}$ More vigorous care ought also to be used in merchants'
convenient paragraph "probably from a defective flue." The questions ought to arise: Who was in the boiler room? Why did it take in the engine room? Who was on duty? Boiler rooms and engine roomscan be made, in experienced hands, as safe as kitchen fire places, and we are inclined to the belief that a large proportion of the recent fires are due to the neglect of those whose duty it was to have prevented the possibility of their occurrence.



B. East Wing.
c. West Wing.
D.
E. Kitchen.

H. Lobby. I. Wil-hole to Celar.
K. Waiters L. ${ }^{\text {Coundta }}$

The famous tobacco of Turkey is cultivated in the following manner: The tobacco seed is usually sown about the middle of March, in small beds, and in a few weeks appears thick, like our lettuce beds; then begins the occupation of he farmer's wife or wives, as the case may be, and their numerous children, whose little fingers are engaged day by day in thinning the beds, care being taken to leave the mos healthy looking plants. The husband is engaged either in carrying water from the nearest well by the aid of his mule, or in pre paring the land for the reception of the plants. The beds are well watered before sunrise and after sundown When the young plants are about six inches is hight, they are removed from the small beds: and planted in fields like cabbages in this country, and are then left for nature to de velope them to a hight of from three to four feet; three leaves, how ever, are removed from each plant to assist its growth. The farmers calculate always fifty five days from May 1 for their crops to be ready for gathering.
When the leave show the necessary yellow tups, they are car riea to the house, and there threaded into lon bunches by a large flat needle, about a foo long, passed through the stalk of each. Thes are then exposed to the sun to dry, and some months' exposur is necessary before they are sufficiently matured for baling. Rain sets in at a later period, and the tobacco, becomin moist and fit for hand ling, is then removed from the threads and made into bundles or "hands" of about sixty leaves each, and tied around the stems These bundles are piled against the walls inside the dwelling rooms, and a carefully graduated pressure put upon them. The tobacco is next baled, the bales averaging in weight about 110 English pounds. The covering of the bales is a sort of netting made, by the peasants, from goats' hair; it is elastic, and of great strength. The Turk and his family, it will be seen, have, now been occupied upon their tobacco crop for nearly a whole year. The leaf is just becoming a bright light yellow when it falls into the hands of the merchant, and it is during this period that the process of fermentation or heating generally occurs, befor, which the tobacco can not be shipped. Thes bales having been

## DESIGN FOR BALL GROUND PAVILION.

tores and private dwellings. Employees and servants seem o have an idea that a furnace, stove, or fireplace, that they have tended all day, will take care of itself while they sleep, and the latter, to ensure themselves against the discomfort of rebuilding fires in the morning, pile on fuel and arrange drafts at night to ensure combustion, and retire with the utmost confidence for the next six or eight hours. That there are not more fires is due more to the strength of heating ap paratus than the care of those who run it.

A valued subscriber, in sending in the renewal of his own subscription with twenty new subscribers, says: "While I urvive, there are only two circumstances that will prevent me from taking the Scientific American, namely, poverty and blindness."
placed in the merchant's store, are left end up until a fermentation or baking has taken place, the ends being reversed every three or four days. In the course of a few rets a bale is reduced to about two thirds of the origina weeks a bale is reduced to about two thirds of the original size. It is then placed upon its sides to cool. When it iss
discovered to be cold, it is broken open by the native tobacco pickers, and every leaf sorted and classified. The patienco with which this operation is carried out is truly astonishing.

Dr Louvel has been awarded a prize of four hundred dollars by the French Academy of Sciences for designing ane apparatus for keeping grain in a vacuum, or rather within as essel in which the air is so rarefied as to kill any granivorous insect.

SCIENTIFIC AND PRACTICAL INFORMATION.
UTILIZING SUINT FOR tHE MANUFACTURE OF PRUSSIATE OF POTASH.
The suint, which forms almost the third part in weight of the raw wool, has been found to be an excellent material for the manufacture of yellow prussiate of potash, which is used for making Prussian blue and other articles of commerce, inasmuch as, after heating, it consists of an intimate mix ture of carbonate of potash and nitrogenous carbon. Formerly this suint was exclusively used for the production of potash. Havrez found, however, that it is three times as valuable when directly used for the manufacture of prussiate of potash. While 100 kilogrammes of dry suint, containing 40 kilogrammes pure potash, cost only $\$ 3,100$ kilogrammes of the potash of commerce cost from $\$ 14$ to $\$ 16$. Thus it will be seen that, by employing the suint, 100 kilogrammes of potash may be obtained for $\$ 7.50$.

## ALCOHOL FROM MOSS.

In the northern governments of Russia, large quantities of alcohol are at present produced from the mosses and lichens growing there in enormous quantities. This new industry originated in Sweden, and was subsequently introduced in Finland. Several large distillêries exhibited such alcohol at the recent industrial exposition in Moscow, where German, French, and English manufacturers praised its quality highly. The net profit is said to amount to 100 per cent.
frocess for purifying the condensation of engines

## FROM FATTY MATTER.

The steam condensing from engines always contains fat, resulting from the material used for lubricating. Cail \& Co., in Paris, collect the water of condensation in a common reservoir, and pump it into a receptacle provided with a powerful stirring apparatus, consisting of shovels, Archimedean screw, etc. This receptacle is three fourths full, the remaining space being filled with petroleum ; the apparatus is set in motion for five minutes, the water being allowed to settle for fifty-five minutes. Five minutes' time is sufficient to separate all the fat which is then contained in the oil, and the purified water can directly be used again. A hundred pounds of petroleum will absorb fifty pounds of fat; it hras then a specific gravity of 0.840 , but should be renewed when presenting a density of 0.810 . It is regained by distillation.

## aUSTRALIAN MINERAL CAOUTCHOUC.

This material (described on page 197 of our volume XXVI.) which is now being imported into Germany, occurs in Coorong in moderately thick layers on the sand. Analyses seem to indicate that it stands in a generic relation to petroleum, but why it has been deposited in that peculiar form must be left to future investigations.

## TO PROTECT CLOTH AGAINST MOTHS

Reimann, in his Fürberzeitung, recommends for this purpose steeping the cloth for twelve hours in a solution prepared in the following manner: Ten pounds of alum and twenty pounds sugar of lead are dissolved in warm water, the mixture being left undisturbed until the precipitate of lead sulphate is deposited. The clear liquor, now consisting of acetate of alumina, is then drawn off and mixed with $1: 0$ gallons of water, in which a little isinglass has been dis solved. When well steeped, the goods are dried and finished by pressure or otherwise.

## tartrate of manganese

The action of permanganate of potash upon organic matter in general is to destroy it. Not only is glycerin decomposed with violence when allowed to drop into a hot, concentrated solution of permanganate of potash, but alcohol, aniline oil, and other organic substances, including the organic acids, are decomposed, partially or entirely, by it. Notwithstanding this viclent action of the permanganate upon organic acids, Anton Fleischer has succeeded in preparing both a tartrate and oxalate of manganese. The neutral tartrate of manganese obtained was found upon analysis to
have the composition represented by the formula $\mathrm{C}_{4} \mathrm{H}_{4} \mathrm{MnO}_{6}$. It is slightly soluble in water, 1,000 parts of water dissolving only $2 \cdot 17$ parts of the salt. On adding alcohol, it crystalizes out. When moist, it is rose red; when dried over sulphuric acid, it has a lighter color; at the temperature of boiling water or above it, it is almost colorless. It dissolves readily in mineral acids. What practical use can be made of it re mains to be investigated.
electro-positive state of an insulated candle flame. discharg insulated flame is placed bet and negative conductors of an electrical machine, the flame is attracted towards the negative pole so strongly as to ignite a piece of phosphorus attached to that pole. If a piece of burning phosphorus be placed between them, the phosphorus on the
positive ball soon burns, and the long column of phosphoric positive ball soon burns, and the long column of phosphoric
acid vapor is also attracted to it and forms with it the phosacid vapor is also att
phate of the metal.

## COOLING WATER BELOW THE FREEZING POINT.

A glass tube closed at one end and blown to a bulb near the upper end, and the upper limb bent and drawn to a point, is filled to the middle of the bulb with distilled water
that has been boiled. The water is heated to drive the air that has been boiled. The water is heated to drive the air out of the tube, and the tube is sealed by the blowpipe. Another tu be of the same form, but not bent and drawn to a point, is filled with water that has not been boiled and hence contains air. The two are now placed in a freezing mixture, and after the water in the open tube has frozen, the other will be found to bo still liquid. On taking it out of th
hay mites.
Some time ago, there died a large number of horses in Nordheim, Germety, from inflammation of the intestines, the true cause not at first being known. At last it was as signed to the hay, in which, upon close examination, an im mense number of microscopic animalculæ were found. They belonged to the genus acarus frenarius, to which genus the mites living on dry fruit and in cheese also belong. In times of horse diseases it might, therefore, be proper to microscopically examine hay and straw, since even the best fodder, if stored in a damp place, is very likely to be infest ed by those and other parasites.

## testing water for hygienic purposeis.

One third of a fluid dram of the water to be tested is evaporated on the object glass of a microscope, on which a small reservoir has been formed by cementing a glass ring upon it. The temperature should be about $120^{\circ}$ Fah., not higher. The residue from pure water, when examined unhigher. The residue from pure water, when examined unly defined crystals of carbonate of lime. But if the water ly defined crystals of carbonate of lime. But if the water
holds organic substances in solution, the residue exhibits holds organic substances in solution, the residue exhibits
more or less imperfectly formed crystals of a yellowish or reddish color; and, if the impurities are considerable, it shows twin crystals and triangles with obtuse angles and other distorted forms. Experiments prove that less than a one thousandth part of urine or decomposing organic matter is sufficient to change the appearance of the residue considerably.
dURABLE CRUCIBLES FOR MELTING STEEL.
Such crucibles are prepared from a mixture of 10 parts ground and washed chamotte, 10 graphite, 15 asbestos, 3 quartz (not too finely powdered) and 22 fireproof clay. The asbestos, as a fiberous body, prevents the falling asunder of the crucible when cracking, and thus any loss can be pre vented.

## ORIGIN OF ELECTRICITY.

Dr. Louis Elsberg, of New York city, has communicated a new theory of the origin of electricity. According to this scientist, the number of vibrations executed by the mole cules of an electrified body are between those of sound and heat, namely, they exceed 38,000 a second (at which point the consciousness of sound ceases altogether) and are below 200 billions in a second.
effect of different colored light opon the amoun
of carbonic acid gas in respiration.
Two Italian investigators, Selmi and Piacentini, have instituted an interesting series of experiments to determin whether different colors affected the respiration of animal as they are known to affect plants. The animal to be exper mented upon was placed in an air tight box into which
light could penetrate except such as passed through glass of light could penetrate except such as passed through glass of
a given color. Air freed of carbonic acid was constantly ada given color. Air freed of carbonic acid was constantly ad-
mitted into the box, and escaped by a second opening, where it was passed through a vessel which contained some ab sorbent of carbonic acid, so that its amount could be accurately determined. Representing the quantity of carbonic acid respired by a dog, in a given time under white glass, by 100, the amopunt given off under black glass was 82.07 , under violet, $87 \cdot 73$, under red 92 , under blue $103 \cdot 77$, under green $106 \cdot 03$, and under yellow 126.83 . The difference was still greater when the experiment was tried on a pigeon and on a hen. The authors came to the conclusion that green and yellow rays, which are the most important to the vege-
table kingdom in taking up carbonic acid, are also most fatable kingdom in taking up carbonic acid, are also most fa-
vorable to the respiration of animals, that is, enable them to give off the most carbonic acid. Previous investigators hav reported in favor of blue glass, so that the question is no yet fully settled.

## ntimony an explosive metal

If a piece of copper foil be attached to the negative pole of a galvanic battery, and a piece of platinum foil to the positive pole, and the two immersed in a hydrachloric acid solution of antimony, the antimony will be precipitated as metallic mirror on the surface of the copper. After remov ing it from the liquid and carefully washing with distilled water, the brittle antimony can be removed by bending the copper back and forth. Antimony thus obtained will explode upon being rubbed in a mortar or struck with a ham mer, light and heat as well as detonation being produced by the explosion. The reason of this extraordinary action of only one metal is due to the rapidity with which it returns from the amorphous form to the crystaline.

## BENT WOODWORK IN CARRIAGE MAKING.

## by henry f. porter.

It is only recently that much attention has been paid to the bending of different wooden parts of a carriage. Not only in this country, but also in Europe, it has long been customary to saw out crooked pieces, and when lately we resorted in preference to bending, it was not only for the purweight and the greater durability of the pieces. The latter is a very important point. The saving of weight is twofold. In the first place, a piece which is to be bent can originally be sawn out in a reduced size, for the reason that the grain
will all run parallel with the sweep when the wood is bent, and thus such a piece does not require to be stronger at any particular point as a piece sawn cross-grain always must be. The second point in which weight is saved is that a ent piece requires for plating only one half the size of iron illustrate this with the example of a rockaway perch, or, in
other words, a perch for the heavier class of work. If such a perch is sawn out cross-grain, it will require to be plated on all four sides, thereby considerably increasing the weight without adding to the durability. We have seen many cases where the incessant vibrations and jerks, to which the perch is exposed under all conditions, have caused the wond to be chawed off by the ironing, occasioned by the exposure of the cross grains. If, on the other hand, the perch is bent a of the cross grains. If, on the other hand, the perch is bent a is no possibility of the wood getting damaged by it, as all the grains run parallel and present a smooth surface not easily attacked. The point of durability has long been recognized by leading eastern builders, and, on such work as the Concord coach, of which the proverb says "it wears but never
tears," we find the back pillars, bottom pieces, and most of tears," we find the back pillars, bottom pieces, and most of been exposed to such hardships as tne old overland stage, and it was early found that cross-cut parts could never withtand such trials as upsetting, rolling down ravines, etc., incidents so common on the old perilous overland route. When bent, such pieces, as a rule, never broke. This example goes far to show that it is preferable to bend perches, whenver practicable, instead of following the old method of cross sawing. Still, there is another and very material point to be obtained in making perches. It will frequently be noticed, on perch carriages, that it seems to have been the aim of the maker to conform the sweep of the perch as near as possible to the lines of the body; and this produces, in many instances, a very crooked perch, a circumstance which is rather unfavorable to durability.
In speaking of perches, it may not be out of place, although ot coming under the heading of this article, to say a few words with reference to straight double perches for wagons.
It has been customary to plate these underneath, by bolting It has been customary to plate these underneath, by bolting
a perch $\frac{13}{16}$ inch square with a $\frac{3}{16}$ bolt, which in reality leaves a perch $\frac{13}{16}$ inch square with a $\frac{3}{16}$ bolt, which in reality leaves
not sufficient strength in the wood to resist an extraordinary strain, such as may be caused by accidents, or even by ordinary wear and tear. It has been tried for this raason, and found to be perfectly practicable that these perches for wagons are not ironed through their whole length, but only sectionally at both ends, namely, nine inches on either side. In this way the inevitable vibrations can take place unobtructed in the middle of the perch, and the resistive power of the wood is not endangered or lessened by any holes. Plating in general is of no account after the wood has given way. Besides perches, there are other important pieces of
bent work connected with carriage parts, namely, bottombeds, futchels, back bars, and shafts. As for the bottombed, its arch is, in the firstinstance, conditioned by the hanging of the body, and next by the hight of the front wheels. If the body is to be hung low, the bed will have little or no arch; and if the wheels are low, it will require more arch on the bed in order not to get too high a carriage part. The exreme hight of carriage parts should never be more than welve inches for the heaviest work, which of course is coniderably reduced for lighter classes of work. The arch of he bed is also limited by the consideration of obtaining the proper position for the pole, and we cannot give here fixed measures, because they vary in almost every instance. What we wish to convey is that a bent bed, even when arched as much as four inches or more, is still safe, and that a bed sawn across grain, whose arch a contemporary
thinks should be limited to 2 tinches, is more unsafe than a thinks should be limited to $2 \frac{1}{2}$ inches, is more unsafe than a bent one with double this amount of arch.
Back bars, when they have to be arched, should always be bent. The curve required can be sawn out. In the case of bars, the grain of the wood is not exposed to friction, and herefore there is no danger of checking. Back bars have, inder certain circumstances, to stand a considerable strain. When the vehicle is moving on a sloping road, the whole Weight is thrown on one side, and the bar is thereby given a tendency to twist. The motion of the springs also is often not the same on each side, for instance, when one wheel meets with a resistance while the opposite runs on smooth
cround. Jerks thus caused are transmitted to the bar, with ground. Jerks thus caused are transmitted to the bar, with
a somewhat reduced force, it is true, but still with such insomewhat reduced force, it is true, but still with such iniages, the back bar will have to be plated with band iron, or made wholly of iron, as is now frequently done.
Shafts and poles for wagons have been bent for a number of years, for the same reasons which we gave for the other parts. Our intention has been to callattention to the decided advantages obtained by having all pieces bent over the old plan of sawing them out. The progress made in beinding during the last few years is worthy of notice, and proves the patronage and encouragement given it by the trade. It is only a few years since one of the first leading firms in this country experienced great trouble in bending double Nowadays they find no difficulty in bending perfectly, and without split, seven to eight inches. A further illustration is the advance made in the bending of rims. A rim bent at present is less in size and just as durable as a heavier rim was some years ago, both for the same size of work. It is made for top wagons at present $\frac{7}{8}$ inch deep, with $\frac{5}{8}$ inch tire. This progress was in a great measure brought on by ma chinery, and it is but just to say that, for all similar wants of our trade, requiring the ingenuity of others, we are materials. This fact in itself should be an encouragemen to us to keep on the road to improvement and perfection. The Hub.

Few things are impracticable in themselves, and it is for want of application, rather than of means, that men fail of

An American Doctor in London.
Dr. E. P. Miller is writing from Europe, to The Lavos of Life and Journal of Health, edited by Harriet N. Austin, M. D., and published at Dansville, N. Y., some very inter esting letters. From a lengthy letter from Dr. Miller in the January number, we condense the following extracts
There are some things in this world so vast that it is liter ally impossible for finite minds to comprehend them. It is true we are not quite so lost in thought in their contempla tion as when we attempt to search the boundaries of space or number the fixed stars, yet we are amazed to find how much there is to learn, and after all we have done, how little we know.
London is a world of itself, and it would require more than a lifetime to know it. There are more than $3,000,000$ human beings, crowded into an area of about 122 square miles. There are about 6,000 public houses, wine cellars, and beer saloons, where alcoholic liquors are sold, and these places dispense $43,200,000$ gallons of ale, $7,800,000$ gailons of wine, and 2,000,000 gallons of other strong drinks every year. As a result they have 129,000 paupers, and it requires 5,000 lawyers, 2,000 ministers, 3,000 doctors, and 500 under takers to take care of the criminals, sinners and sick people.
Nearly every street you traverse, and public or private building you examine, has a history of its own-many of which date back hundreds of years.

THE LONDON UNDERGROUND RAILWAY.
Dr. Ellis kindly invited me to visit the Crystal Palace with him on the day following my arrival, and I gladly embraced the opportunity of accompanying one so familiar with the grounds. The Crystal Palace is about six miles from my hotel, and the most convenient mode of reaching it was by the Underground Railway. I had wanted an opportunity to examine this subterranean enterprise, and was both surprised and delighted with its workings. It has become one of the indispensable necessities of London. They could no more get along without their underground railway than could New York without horse cars. Trains pass on these roads every ten or fifteen minutes, and a train often carries four or five hundred passengers. The stations are frequent and convenient, and the cars are so constructed that a stoppage of not more than one or two minutes is required to load and unload an entire train. The cars are well lighted and frequent openings of the roadway to the surface secure tolerably good ventilation. The engines in use condense their own steam and consume their smoke, so that these nuisances are almost entirely avoided.

## the cristal palace.

The train I took stopped at the Crystal Palace grounds; and, as I stepped out from the depot, at a short distance in front and above me stood that magnificent temple of glass and iron glistening in the sunlight, while all about, for acres, was one grand parterre of flowers and fountains. I can never forget the sudden change in my feelings as I passed from that subterranean passage of darkness to the magnificent scene which was the very perfection of light. I was liieral ly chained to the spot. It was like a fairy vision, so beauti ful; I thought of the Bible description of "the Holy City coming down from God out of Heaven prepared as a bride adorned for her husband," and of the time when " all tears shall be wiped away and there shall be no more death, neither sorrow, nor crying, neither shall there be any more pain, for the former things shall be passed away." It seemed to me that all the beautiful things that were ever thought of in Paradise were concentrated here. I do not think it possible to find another place where can be seen more of the beauties of nature and of art in three or four hours' time than at the Crystal Palace.

The interior fulfilled the promise of the surroundings. Outside there are acres of flowers, tropical plants, trees, shrubs, and vines, native products of different countries and climes, growing in all their freshness and beauty. Acres of fountains, in glass and out of glass, picture galleries of ancient and modern masters, statuary, architectural products and manufactured articles, pictures and wax representations of all the different nations and tribes of people, and of the different beasts, birds, fishes, and insects. I am quite sure Noah's ark was not half as large, nor did it contain half as many curiosities, or cost half as much to build it.
A concert is given in the Crystal Palace every afternoon. The view of the fountains in full play, when seen from the balcony of the Palace, beggars description. There are hundyeds of them of every conceivable variety and form. the witer being supplied from towers 260 feet in hight, which are erected on the grounds.
The Crystal Palace cost about $\$ 6,000,000$, and not far from $\$ 3,000,000$ are annually expended in supplying it with new curiosities and defraying the running expenses. May it always stand an emblem of the ingenuity, industry, enterprise, intelligence, and refinement of the English people!
I must confess my opinion of the English people was essentially changed by an acquaintance with them. They are a great people. They are proud of their race, and justly so. They are honest, industrious, and educated. They are above the average of the human race in health, physical strength, and endurance. They are fond of out-door life, of sports, of physical exercise, and social enjoyments.

## remedies for sore throat and nasal catarri.

Dr. Ellis gave me a simple recipe for throat and lung affections with which I propose to close this article. Upon my remarking on my tendency to such affection, he said "Now, Doctor, you may go home and thank God for having seen me, for I will give you a simple remedy that will be the means of prolonging your life many years. Get a silk rib-
until worn out and then replace it, and continue to do so." I confess I was a little surprised to find a man of Dr. Ellis's intelligence relying with so much confidence on such a remedy, and I asked an explanation of its virtues, but this he was not prepared to give. If any reader tries this or the followng remedy, I should be pleased to know the result.
A remedy for nasal catarrh which I think of some value, I will also give. Many cases of catarrh are caused by inability of the liver to perform its function properly. In such cases there is often a too alkaline condition of the blood. When this is the case, the liver does not take out as much of the carbon and other substances as it should, and the mucous membrane of the nose becomes a dumping ground for the foul matter. If persons thus aflicted will squeeze the juice of a good sized lemon into half a tumbler of water and drink it without sugar just before dinner, they will, if they live it without sugar just before dinner, they will, if they live
hygienically, be surprised to seen how soon the catarrhal hygrienically, be surprised to seen how soon the catarrhal
difficulty will diminish. When it fails to do so, it may be considered as due to other causes.

## New Apparatus for Testing Quality of Lubricating oils.

This machine, recently patented by R. H. Thurston, Hoboken, N. J., affords a means of making a combined dynamometrical and thermometrical test of the lubricating value of any lubricant, and also of determining, at the same time, its power of sustaining heavy pressures and its durability under any required pressure.
A journal, on a shaft running in a securely mounted frame, is grasped by a clamp and the boxes are set up to any desired intensity of pressure by a powerful screw compress ing a spring; the pressure is known from the reading of a suitably arranged scale.
The pressure being adjusted as desired, the clamp swings about the journal and, by compressing a spring or by rais ing a weight, determines the exact amount of force required to overcome friction, by the reading of another scale.
A thermometer, set in the journal brass, indicates the commencement and progress of any heating of the journal. The time required to beccme heated and to burn off, under given pressure, will indicate the durability of the oil where it may be exposed to such a pressure.
Several forms of machine are described for special classes of lubricants, as for heavy oils for locomotives, at the one extreme, and for the light oils used on sewing machines and other light machinery, at the other extreme.

## The Spread of Fires in Cities.

A correspondent, R. B. V., of Md., says :
" It strikes me that the greatest cause of the spread of fires is the falling of the walls of the houses as they are burned out, a dread of which, in very many instances, keeps the firemen back from the work. If that dread was removed
they would rush forward and subdue the enemy; but as houses are now erected, many of the valiant men are crushed to death by falling walls; and not this only. Who has not seen rows of houses all on fire in a few minutes from end to end, just because they were so built that the partition walls, one after the other, had fallen, thereby permitting the fire to go from house to house with such rapidity that all efforts to save them were in vain? To prevent this, permit me to suggest: That the walls be of brick (it is the most fireproof material) and of reasonable thickness, with as few windows as will afford the necessary light and air, with tight iron shutters to each. In all the walls on which girders or joists are to be placed, put good substantial upright fastening that will not burn, for the ends of every girder and joist to fit on ; so that each of them, while laying horizontally, will be a reliable stay to keep the walls in their proper upright po-
sition, and will be so constructed that, as soon as each girder sition, and will be so constructed that, as soon as each girder and joist is either burned or brokenin two, they will fall out of the wall without injury to it; for, after all that has been said on the subject, the walls are thrown down by the great leverage given to each girder and joist by the present plan of putting them in the walls. When the falling of the walls is obviated, the standing ones will screen the surrounding prop erty, and the damages of fire will be much less, and can be
repaired with less than half the expense of labor, time and money."

## Vaccine Virus.

M. Chauveau has succeeded in separating, in a pustule of vaccine, a serous matter and molecular granulations, in order
to inoculate with each, separately and comparatively. He has found that the vaccinal serum is not virulent, and that the activity of the virus resides in the solid granulations. On the addition of water, the granulations deposit themselves, and so long as the mixture is in repose, the water is naffected. If, however, the liquid be agitated, the granu ations expand and communicate the virulent property to the whole. It has been determined that vaccine thus weakened with fifty times its weight of water is as certain in its action
as if in concentrated form. M. Chauveau therefore conas if in concentrated form. M. Chanveau therefore con-
cludes that in the pus of the variola and of the morbid affection, as well as in the vaccinal liquid, the specific activity which constitutes virulence resides exclusively in the ele mentary corpuscles held in suspension by the humors.

## An African Steam Gage.

H. A. M., an esteemed Southern correspondent, sends us the following anecdote: Not many miles from Panola county, Miss., a certain wealthy planter has a cotton gin run by steam. Upon one occasion, heinvited a mechanical friend ap into the gin house to see it work. After showing the premises, he called out to his old Ethiopian fireman: "Sam are you ready to start ?" The old man ran his hand back
ward and forward over the surface of the boiler, and, witb a face important with grave judgment, replied, "No, Marse Abe, I don't tink she quite hot enough yet." "Good Lord," exclaimed the mechanical friend, "is that your steam gage?" and he left the gin house. Fact, gentlemen.

## Forests and Drought.

T. S., of Pa., writes to say that it lies with us to decide whether our oontinent shall retain its present luxuriance and salubrity to remote ages or not. He regrets the rapid diminution of our forests, and the decrease of moisture in the interior parts of the country; and concerning the latter point he states that, in some parts of the country, where five feet
inches.
'Sardinia and Sicily, once the granaries of Italy, have suffered the penalty of their thoughtlessness in exterminat ing their forests. Two thousand years ago, those lands were celebrated for their wonderful productiveness, and were said to be the most beautiful in the world. In 1800, Humboldt visited Venezuela, South America, and was informed by the natives living in the valley of Araguay that they had noticed, with great astonishment, that a lake which lay in the middle of the valley had decreased in volume every year; the cause of this is clearly traced to the felling of a great number of trees which grew on the surrounding mounains. In Hungary the periodical droughts are universally attributed to the annihilation of the forests. In Cairo, Lower Egypt, a great many years ago, rain fell but seldom, only once in three or four years; but since the time of Molammed Ali, twenty to thirty millions of trees have been planted, and the result is now that the people have from thirty to forty rainy days every year. Surely these few of the many examples are warnings sufficient to put us on our guard.'
Facts for the Ladies.-Mrs. D. Magra, Saratoga Springs, N.Y., has used ince 1860 , and earned annually about $\$ 500$, with no expense for repairs. See the new Improvements and Woods' Lock-Stitch Ripper.
Inventions Patented in England by Americans.
「Compiled from the Commissioners of Patents' Journal.
From December 5 to December 11, 1872, inclusive.
From. December 5 to December 11, 1872, inclusiv
OIIS, ETc.-F. Kersting, Grand Rapide, Mich.
Carifyiva Oils, ETC.-F.Kersting, Grand Rapids, Mick
Gutting Pliers.-N. Thompson, Brooklyn, N. Y.
GAS or Liquid Meter.-D. B. Spooner, Syracuse,
Horse Shoe Nails.- A. Alden, Cambridge, Mass.
Instlating Compound.-Z. G. Simm
Lamp.-J. H. Irwin, Philadelphia, Pa.
Lamp.-J. H. Irwin, Philadelphia, Pa.
Middings Purimier.-W. W. Hun
itddings Purifier.-W. W. Huntly, A. P. Holcomb, A. Heine, Silver
Creek, N. Y.
RDNANCE, ETC
Ordnance, etc.-W. E. Woodbridge, New York city.
Railroad Coupling.-H. C. Kibbe, San Francisco, Ca

## PATENT OFFICE DECISIONS. <br> ODMAN vs SCRIRNER-INTREFRRN. THE EOARD OF EXAMINERS-IN-CHIEF.

In an interference between an application and a patent, where it ap peared
that the patent had been ranted during the pendency of the appliation
without in interferene. Held, that the parties should be treatedaz if both
vere applicants. Goodman's patent sustained. Consined clevis pin and wrench--LLoyd vs. angeman.-INTERFERENCE.
 mrinary Examiner.
The mere exchange of ature of a device for a different but not novel
one of the same kind, to be used in the same way, does not indicate inven-
ion.

An arrangement of rooms in a d delling, ralilway car, or other structure is
ot a proper subject for patent ; such arrangement does not




practice in interperences.
Rule 59 , relating to interferences, 18 herebry amended by Inserting at the
end of the first pargrap the words here italicized, so that as amended the
paragrinh will read as astollows:

 December 30, 1872.

## decisions of the courts.





United States Circuit Court--Northern District of nunnols.
" airbten" lantern deflegtor.-James f. dank, william webtlake, [In Equity, - Before Judge Blodgett.]

gemovable globr lantern.-James f. dant et al. ve. chioago mandfac Tin Equity bing oompany





## 

 Onder this neading 200 shall publishnent home and forelon patents.

Rooking Chair Fans.-Otto Matzke, Durant, Miss.-The invention con sists in the mode of operating a fan pivoted in an overhangingrocking chair by means of a single lever and cord. When a person is sitting in the chair and rocks forward, the lever will work upon its fulcrum, and its back end
will be depressed, which will draw down the cord and throw the fan outward will be depressed,whtch will draw down the cord and throw the fan outward
or operate it in one direction. When the fan is thus thrown from the perpendicular, the back motion is produced by its own gravity. A rocking motion of the chair is thus made to operate the fan and produce an agitation of the air, which 19 pleasant and agreeable to the operator.
Bench Plines.-Jacob Lehner, Galena, Ill.-This invention consists of a eombination of screw rods, nuts, and an adjusting bar, with the plane stock ing the nuts on the screw rods, the latter being attached to the plane stock nation of a tightantis rod with the wedge and plane b: for securing and releasing the sutuer; the said rod passing from the heel of the plane stoc through the plane bit and its cap, which are slotted at the center for the purpose, into the wedge, in which it screws, and the plane bit having two other
slots, one ateach side of the center slot, for the screws, by which the cap is secured to it, to allow the tightening rod to pass through the center slot. Cesirp.-Dantel L. Akers, Evansville, Ind.-In this particular kind of chair
(the hand platted bottom chair), the bottom has been usually atached to (the hand platted bottom chair), the bottom has been usually attached to
and supported by the rounds or stretchers, which renders it necessary to eomplete the chair, which made it too bulky for shipment. To overcome this difficulty the inventor makes the seat separate, and attaches it to the front legs. The bottom is supported by these gains, and when the chair is put together with glue, or is otherwise f
oupported in a most substautisa manner
Frame for Shade awnings.-Joseph Drechsler, New York city.-This tnvention has for its object to furnish an improved frame for connecting
the lower end of a window shade with the lower part of the window casing or frame in such a way as to adapt the shade to be used as an awning, and which shall be readlly detached, and which may be folded together upon the lower part of the shade; and it consists in a frame construe
it to be applisd to a window frame or casing and to the shade.

Vramtable Gratrr.-John Keagy, Newark, Ohio.-This Invention coí sists of a connection of the hollow sheet metal punched grating cylinder to the shaft detachably, for taking it off readilly to clean it, by flanged ends of the spider arms itting against the inside of the cylinder, and clips of shee The latter are inserted between the clips and the cylinder by moving the cylinderendwise along the flanges, or the spidersalong the cylinder. They are kept in position by a fixed collar on the shaft for one spider and washer and pin for the other.
Apple Parkr.-Willam A. C. Oaks, Reading, Pa.-This invention has for that the parings will fall clear of the working mechanism of the parer, so that they may all be recelved in a vessel set beneath, and cannot clog the le to throw the upper part of eandard or frame made with a bend or an to allow the parings to drop clear of the operating mechanism of the parer The knife begins to work close to the shank of the fork, and moves forward as the apple is revolved. When it comes into a position opposite the fork, and has thus completed the paring, the lower end of an arm strikes a guld and holds it back untll the sald arm has passed beneath the shaft and has come to the place of beginning, thus allowing time for the pared apple to e removed and an unpared apple to be placed upon the fork.
Disi Washer.-Augustus $W$. Thornton, Mendocino, Cal.-In using this apparatus after it is attached to the sink or vessel, the dishes to be
washed are placed in such sink or vessel, and bolling water is poured thereon, and they are then pushed through between two bars covered with sponges and held together by springs. The grease, betng softened or d1s
solved by the hot water or suds, will be wiped off clean. The dishes are the Insed in hot water, and then drained and dried automatically by means of the heat absorbed from the bolling water.
Mold for Casting.-William B. Robinson, Detroit, Mich., assignor to imself and Jefferson Wiley, of same place.-This invention consists of a like, of a gate mold of sand adapted to retain a surplus quantity of molten eetal above the metallic mold, to How into the latter as the metal theretn cools and shrinks, to compensate for
he exact size of the metallic molds.
Vapor batr.-Warren Estabrook and Samuel J.McDonald, Gallatin, Mo. which the case employed ts provided wit. 1 top and side adapted to open to receive the patient, and with a perforat.e.eat and a vaporizing furnace and the invention consists in the arrangement of heat fenders or screens
with relation to a seat and foot support, and of a receptacle for containing furnace. the same being provided with a sliding cover, whereby the intenity of the furnace fire may be lessened or Inclosed so as to exclude the al
barrel stave and Venerr Sawing Machine.-John McGrew, Ravens tage after each hoed is cut, by means of a seroll
Detachable Drip Cup for Bottless.-The invention relates to the cup orctrcular trough which has heretofore been applied about the necks of botcles in order to recelve the drip or waste liquid which exudes from the lways been blown. cast or otherwise formed in one plece with the articl a
owtch they were attached. This invention consists in forming them sepachable, as occasion may require.
Bale Tir Fabtener.-Robert S. Sayre, Stilebborough, Ga.-The object of this invention is to furnish efficient and convenient means for lessening the
abor and time now required to bale cotton and similar material; and it onsists in a lever with a slotted swinging plate attached thereto, and in a etached slotted hook plate so arranged as to draw the two ends of the
band together and fasten the same in a few seconds of time and with but light power.
insect Trap.-Chauncy W. Curtis, Obborn, Mo.-This invention consist a a pedestal and standard, the latter of which contains a socket in which
its a spindle attached to a top plece. Sald top plece may be freely rotated, nd serves as a place of deposit for food, etc., which is protected from Bridis.-James H. Wilson, Brentwood, Tenn.-The invention consists in single strap having branches passing through rings of the bit and attached of the horse.
adtomatic Car Brakr.-James B. Pelton, Mt. Pleasant, Md.-The inven on consists in a new mode of giving a yielding pressure to the shoes; in a Fith one of the axles; and in a novel means for moving the windlass or
rum to or from the wheel to clutch or unclutch it.

Gin Filing Machine.-Lewis Monroe Asbill, Ridge, s. c.-The invention onsists in providing the flle holders of a gin saw filingmachine with certain
inged plates, fle plates, spring plates, and slides, whereby the whole operation of sharpening is made more uniform, the necessary time curtailed and the whole operation greatly facilitated.
Portable Show Seat.-David C. Price, St. Paul, Minn.-The invention pending, on a subjacent detachable and folding together; and also in sus These improvements not only render the seats much more agreeable to spectators but enable t
ventently transported.
Reversible Screw Fan.-William h. Goyne, Shamokin, Pa.-The objec rinctple, which shall be adsh a rotating fan, constructed upon the screw purposes; it consists in a series of spirally shaped blades or buckets conined between a closed drum on a rotating shaft and a surrounding cylinder or casing. The sides of the drum and cylinder are parallel, and the buckets blades conform thereto. The drum is closed, but the cylinder is open a ooth ends so that air can be forced in elther direction. This fan may be lated to exhaust the air from a mine or to force air in by simply reacring me motion.
Pioture Nail.-Cecil B.Jenkins, New York city.-This invention consist n having the hole through the bottom of the cup which holds the porcelain
head a ittle smaller than the nall shank, with numerous radial slots extendang from it to separate the metal into sections capable of springing so as to pinch and bind upon the shank as to hold the head on with sufficlent round it , a short distance from the end, for the ends of the spring to fall into. An inverted cup, with a hole in the bottom coinclding with the hole of the outer cup, is placed inside of the latter to prevent the porcelain ead from coming down to the bottom, so as to maintain a sufficient space between the outer cup and
DUMb Waitrr.-Louis Carrier, New York city.-This invention relates to a new manner of suspending and balancing dumb waiters, with the objec acts as balance for the dumb waiter. The invention consists in such an arrces which of sald rope, and in such a manner of placing the pulleys and de ng, lowering, and balanclng the dumb watter, the balance welght always olding it tense. The invention also consists in a new style of double act able hight.
Dry Goods Rack.-David Keiser, Reading, Pa.-This Invention has for its which lotters impe the construction of the improved dry goods rack for same Inventor, to make it more conventent in use whlle betng more capaclous; and it consists in the combination of the detachable partitions or
bent rods. By suitable construction, by removing the rods the upper platforms or partitions may be lifted off the standards, or ralsed to any desired supported by the sald standards. In the free ends of the platforms and in the corresponding ends of the partitions are formed holes to recelve stops, slip upon the sald platform or partition while drawing out a plece above and near to it .
Boot for Horses.-Joseph Fennell, Cynthiana, Ky.-The object of this terference" in horses, or to prevent ill consequences when interference or verreaching occurs; and it consists in a boot constructed in two parts, connected together by a flexible ligature. This lower portion of the boot, or is curved from end to end vertis made somewhat with the tex on the haside, orse cannot Injure himself when going at a high rate of speed by overreaching or interfering.
Chatn Proprller.-John Neumann, Brooklyn, E. D., N. Y.-This invention consists of an endless carrier of wire ropes, chains, or belts running the whole length of the boat, over a drum at each end, in a channel along
the center of the boat, at the top, the ends, and the bottom, with numerous the center of the boat, at the top, the ends, and the bottom, with numerous
buckets extending across the belt or carrier and projecting from it at right ngles, with braces for supporting them, which bear upon the belt while in a traight line, but which are not attached
atter to bend in golng around the drums.
Folding Chatr.-Francls B. Fabri, New York city.-This invention rerojecting construction of folding chair. The chair seat is pivoted by of the side bars of the chair back are pivoted to the supporting legs. These legs are at their upper ends provided with projecting hooks or pins that enter longitudinal grooves in the under side of the chair seat. and bear, when legs stand inclined, ing supports for each side of the seat, and are braced by short standards. hen the chair is to be folded together, the back is swung on the plvot in ne with the legs. The hooks are thereby withdrawn from the grooves, liberating the seat, which can be folded against the legs. Finally, the stana-
ards are also folded against the legs. Mandfacture of Wrovatit Iron.-Pierre Eymard Jay, st. Jean Bapast iron of all qualities for converting it into wrought iron, the same consisting in the addition of certain proportions of nitrate of sooa, oside of anganese, and oxide of iron to a mass of melted cast fron, anu in the emloyment ofa blast of atmospheric air impinging on the surface of the liquid etal during the time it is belng subjected to the intense chemical and mephosphorus, and arsenic are eliminated along with the corbon, leaving the Iron in an approximately pure state, and forming a scum npon the surface
of the melted fron, which, upon cooling, becomes scoria or slag. The funcof the melted iron, which, upon cooling, becomes scoria or slag. The functon of the blast is mainly to se
Manufacturing Cast Iron.-Pierre Eymard Jay, St. Jean Baptiste, Can-ada.-This invention relates to the combination of slag (the residue of the
burning of cast fron with oxide of manganese, nitrate of soda, and oxide of ron), with iron ore placed in a furnace, to be converted by heating into cast iron. The invention also relates to the employment of an air blast pipe connected with the upper part of the furnace, so as to blow down on
the liquid metal the gases arising from the ore, and also exert a certain de號
breast Strap for Horses.-Charles P. Holmes, Gouverneur, N. Y.-The vention consists in forming a stiffener for the inside of Hexible breast straps, out of several metallic plates or strips hinged together so that the
breast strap will be flexible and may adjust ftself easily to the various sizes of shoulders in different horses without changing the points of bearing thereon.
Mixiva Spoon.-Wiliam S. Clarke, Ishpeming, Mich.-This invention has or its object to furnish an improved spoon for preparing medicines, mixrojecting and for other purposes, and it consists in the spoon made with a forations in the side parts of its bowl. In using the spoon it is placed upon the edge of the tumbler or other vessel, the sugar or other substance is medicines or other ligulds to be mixed are dropped or poured into it one or more at a time, as may be desired.
dumping Wagon.-Edward Williams and Adolphus Kinney, Potosi, Wis. -This invention relates to wagons constructed so that the contents or loads and a lever for dropping the botlom, and in a lever for raising the bottom after the load has been discharged. The driver has the means within his
reach for raising or replacing, as well as dropping, the bottom. Portable Gate Post.-Wiliam A. Dillon, Middletown, Mo.-This inventlon has for its object to furnish an improved gate post which shall be so
constructed as to be portable and not allow the gate to sag. The lower end of the main post is framed into or otherwise secured to the ground sill, which is placed upon the ground in line with the gate when closed, and the as a step for the gate to be plvoted to. A cross sill is halved to the sill, a as a sep the the gate the be pivoted to. A cross sill is halved to the sill, a
ittile in the rear of the lower end of the post. The side braces are secured main sill, and to the secured to the opposite sides of the rear end of the by a number of rounds to recelve the ends of the ralls or boards of the fence, the weight of which willoverbalance the weight of the gate, and thus prevent it from sagging. Upon the upper end of the main post is formed a tenon, which enters the slot of the cap, the inner end of which projects fo
the gate to be plvoted to, and which is adjustably secured in place by a wedge driven through the outer part of sald slot along the outer side of the post. The cap is prevented from rising by a pin.
Car Coupling.-Thomas P. Clines, Louisville, Ky.-This invention relates new attachment to cars which are provided with ordinary link and pin couplings; and has forits object to permit the raising the Hnks in posi-
tion to fit the approaching drawheads :without exposing the attendant to njury between the cars. The invention consists in hanging sald bar in lotted ears so that it may yilel back when caught between the drawhead, and thus be preserved from being bent out of shape.
Apparatus for Molding bung Bubies.-James More, New York city. This invention has for its object to furnish an improved apparatus for made with a wood screw thread upon thetr outer surfaces, to enable them o be screwed into the bung hole. Ii consists in the employment of leadin screws for withdrawing the screw patterns from the sand, and in the employment of match plates for molding the screws
flanges of bung bushes concentrically in two half flasks.

Latie.-Hezekiah T. Nickerson, Atchison, Kansas.-This invention relates to an arrangement of levers, knives, and springs, forming an improved attachment to a wood turning lathe for turning balusters, bedstead posts,
and other analogvus articles. The carriage sildes on two ralls, which contitute the top of the lathe frame. The wood to be turned ts held in the wo head stocks in the ordinary manner, and fits through a hole in the carriage. To the carriage is rigidly afflxed a knife for cutting the wood down to the requisite diameter. Knives are pivoted to the carriage, and provided
with handles, respectively, and with springs. These springs hold the pivotwith handles, respectively, and with springs. These springs hold the pivoted knives away from the wood. To the carrlage is also pivoted a catch to
lock it in notches, witich are cut into one of the rails. As the carriage is fed along the ralls it is locked by the catch or catches in the successive notches, and whenever it is so locked one of the plvoted knives is swung

against the wood to impart to it the desired shape at that place. In this manner the wood can be quickly shaped with a proper degree of smooth| $\begin{array}{l}\text { ness and } \\ \text { turnang. }\end{array}$ |
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## 

A. S., of Richmond, Va., says: What are your ideas concerning a cupola, consisting of a cylinder
within another, the space between sealed at elther end, within another, the space between sealed at either end, keeping the space between these cylinders flled, and dolng away with bricking altogether, the blast to enter as in any other cupola? Again, can you give me some
method of mixing plaster of Paris, so as to increase its strength, that it may be worked into patterns, etc., or any new composition suitable for such uses? Answer:
We should fear that your water backing would chill the We should fear that your water backing would chill the
metal and also cause a greater expenditure of fuel. Try mixing your plaster of Paris with good hydraulic cement,
using as little water as may be possible, molding quick ly, and leave to set Just as long as possible. We hope to
hearmuch, in the future, from our Virginia "Birming. hearmuch, in the future, from our Virginia "Birming-
ham" whose facilities for manufacturing are hardly surham" whose facilities for
passed on our continent.
P. C. N. asks: Can an ice boat, with no other diving power than the wind, acquire greater ve-
ocity on the ice than the wind by which it is driven, lowing the wind to blow from an y direction, and regard-
less of the relative position of the ice boat to the wind? Answer: Yes. Theoretically an ice boat salled on a prope angle to the wind will make more than double the veloci-
ty of the wind, and in practice this velocity is approached ty of the wind, and in practice this velocity is approached
but not wholly realized, owing to the friction and imperfections of make. When an Ice boat salls directly before the wind it will move with the same velocity as the
wind minus the friction of the boat on the ice. But When the boat is salled at the proper angle to the wind, velocity of the boat Increases until its resistance equals
the wind pressure on the salls. It is on the same princlthe wind pressure on the salls. It is on the same princl.
ple that the extremittes of the arms of a windmill are ple that the extremities of the arms of a windmin are
made to travel faster than the wind by which they are driven.
J. T. W. asks: Why is it that it is always darker just before the break of day than it is one hour
previous? Answer: It is not darker just before the previous? A
break of day.
Querist says: 1. On page 387, last volume, is an illustration of a button hole cutter whtch you say
was "suggested" by H. Walker, of London, etc. This article was evidently patented, as well as "suggested,"
by somebody, more than a year stnce. One of your readatent ; I think it an Upon the decision pends a year's subscription to your paper at a news dealer's. Answer: The description was
copted from an Engulsh paper, and is only an example of on the other side of the Atlantic. The device in question is the invention of John G. Howell, of Philadelphia, Pa., nd was patented in this country May 9th, 1871-2. On page 385, same issue, is an account of a torpedo craft, the
dimensions of which are stated to be "about thirty feet long and three inches wide." Into this queer craft must go "motive power, machinerss electrical apparatus, ex-
plosive shells, and 500 lbs. of powder or nitro-glycerin, plosive shells, and 500 lbs . of powder or nitro-glycerfn,
etc." As stevedores, we are entirely at sea over this etc." As stevedores, we are entirely at sea over this
statement in our favorite journal. Añwer: Read it three feet wide instead of three Inches, and return to the
solid land. -3 . The article of Van Bibber in same issue elative to the dangerous properties of bisulphide of caron rather disconcerted us, as we had been innocently
and extensively sniffing at a bottle of the "fragrant" and extensively sniffing at a bottle of the "fragrann
which he so condemns. We shall give it a wider berth which he so
J. C. says: There aretwo boilers supplying o the minute at 75 or 80 , runsing to the fnch 80 revolution on the minute at
0 inches by 14 feet, $w$ thh 55 three inch flues in each shell, five sixteenths of an inch thick. They are connected on
top by a drum, 20 inch diameter, size of connections $4 \% / 8$ op by a drum, 20 inch dlameter, size of connections 4 4
nches; they are not connected at the bottom, and are fed by separate pumps, and have no mud drum. They are
leaned out once a week, and burn 70 or 80 bushels of Ohio oal per day. They have about 50 square feet of grate arface. The grates are set 14 inches from the boller within 4 Inches at the smoke box. They had not been in se five months when the plates starteda crackfrom the edge to the rivet holes, then across between the holes in
the first joint, and the rivet holes in the second joint ere 4 flues taken out, 2 out of each botler; they we put back in thetr places after the patch was pition, when, on Iring upand running two days, theystripped the bear
oft of two of the flues. What is the matter with the
oillers? Answer: Such cases are diffcult todcetde up. wollers? Answer: Such cases are diff cult todcelde up-
on without personal knowiedge of all the circumstances
sfecting them. We suspect that the effect described is ane to the expansion of metal over a hot fire and covered
in its inner side, possibly, with earthy deposit, and Put In mud drums and a feed water heater, and thus
avold this alternate expansion and contraction as far as possible. Suchanaction is a frequent cause of disastrous explosions, and the botlers described are, probabiy,
very likely to furnish another example. To leave the
cause of danger undetermined would be criminal.
J.T. asks: How are the sizes of governor balls etermined, for governors intended for different horse of the cone in which the arms must revolve are deter mined ? I think, without such a rule as this, the rules for anding hight of cone and number of revolutions are mere
fallactes, because I think it is possible for the balls to so light that they would not shut the valve at all; and if It is , 1 it is also possible for them to be too large, requir ing too much power to drive them. All our celebrated englneers talk about governor balis resembing the pen
dulum of a clock; if this is so, take the pendulum dulum of a clock; if this 18 so, take the pendulum
of a clock off and put a heavier one on, and it will lose time, put a lighter one on and it will gain time, prov-
ing the rule $I$ ask for. Answer: The proper size of balls ing the rule I ask for. Answer: The proper size of balls for the fiy ball governor can usually be determined only
by experiment. The resistances offered by different by experiment. The resistances offered by different
valves and connections vary so greatly that there can be no rellable general rule. The rules for determining the
hight of cone are reliable and their use is indispensable in designing governors. The difference in the power required to drive a governor with heavy or with light balls
is principally due to difference in the amount of friction and, usually, is an exceedingly small percentage of the power of the engine. Many of our best engineers prefer
a pair of small balls (driven at a high speed, and weighted down to the proper hight of cone by a weight on the
spindle) to a pair of larger balls
D. L. M. asks: What is the cause of the loud humming or rolling nolse heard on telegraph wires? Is it caused by the electrictty in despatching messages,
or by spontaneous electicity, or is it caused by the wind ? The sound is heard when it is wind-still and also at night When no operators are on the line. Answer: The sound
Is caused by the wind. A very gentle breeze will pro-
duce it. The princtple ts the same as that Follan harp, which produces musical sounds on being placed upon a window
pass over the strings.
E. M. asks: What difference of pressure per square inch will there be (at the end of the stroke) sure of steam, one cylinder being 12 inche in diameter and the other 6 inches, both plstons working to within
one sixteenth of an inch of the cylinder head?
i believe he pressure in both cases would be the same per square er in my friend thinks the pressure would be the great-
er targer one; which is right? Answer: The presure would be the same in each cylinder.
W. G. B. says: As it is not the design of aulowad to critictess your dectsion on the balanee wheel
question, page 394 of Volume XXVII. R. says a balance Wheel (which is always a heavy wheel) may be keyed on Ing the steadiness, except from its resistance to the air. You admit the tendency of the wheel is to turn Itself at
right angles with its axis. In other words, one side of the wheel will pull its end of the shaft one way, and the other side will pull its end the other way, which would
be equivalent to two pulleys, of a certain weight and certain distance apart, with the weight of one all on one
side of the shaft and the weight of the other all on the pposite side. I will give you a case in point, which may be a hint to some who have pulleys to balance. I once
saw a binder pulley which shook so when running at high speed, whether in contact with the belt ornot, that it was always working its fastenings loose. It was only
a ten inch pulley, with eight or nine inches face, and in the very best of standing balance; but instead of runought, it kept up a vigorous rattling and shaking. The trouble was that, at one end of the pulley, the rim was wilce as thick on one side as on the other, and the per-
son who balanced it put his counter weight in the other son who balanced it put his counter wetght in the other
end, making both ends out of balance, though they balsright. He is rhen standing reply to S. W. H., in last is right. He is referred to the reply to s. W. H., in last
week's paper, on same subject, and to an editorial in
this Issue, which will, we think, dispose of the subject satisfactorily.
J. A. K., of Allegheny City, Pa., is desirous fhat we should understand that that illustrious munici-
pality is not a part and parcel of the neighboring village of Pittsburgh. It is his firm belief that the Observatory Will remain in Allegheny, notwithstanding the puny
efforts of the smoky Pittsburghians to gobble it up. Al-有
A. J. S. asks: What is, in your opinion, perpetual motion? If a machine is so constructed as to fur-
ntsh its power and run with no other obstruction than self motive power? Answer: Such a machine as you describe, we should style a perpetual motion. Many The simplest form is the tub. When a man places himself from the ground, then he has produced a successful perpetual motion. All such machines necessarily operate on the same princtple, and, until an individual is enabled to operate the simple form above described with
success, it will be useless for him to expect that he can work a more complicated perpetual motive machine. The addition of cog wheels and levers will not help the
S. Y.O. asks if adding to the running weight of a clock will cause it to gain time, every thing else
eing equal? Can the action of the verge on the pendulum be made to quicken its vibrations by thus adding to drive the pendulum independent of gravitation. Anothr question is: If it takes a force of one pound to run a balance wheel at a given rate, what would be the effect
of the application of a force of two pounds? I say that of the application of a force of two pounds? I say that
in order to double the motion, the power must be quadupled. Consequently the balance wheel would only rupled. Consequently the balance wheel would only
move at about one third greater speed. Answer: The escapement of a clock may be so constructed as to cause its effort to turn, under the impellingaction of the wetght, to accelerate the motion of the pendulum, and it is fre-
quently, probably generally, so made. The effect is very silght, however, and the intention 18, we presume, rather to make it certain that the verge shall not retard the
motion of the pendulum than to secure a means of inreasing the rate. The balance wheel question can be most satisfa
[OFFICIAL.]
Index of Inventions For which Letters Patent of the United States were granted. For the week ending December 17, 1872, and each bearing that date.


Motion, rotary, D. F. Mosm
Organ bellows, H. W. smith.
Orgau case, G. Woods....
Packing case, L. Selling..
Paper and cloth, uniting, G. K. Snow
Paper bags, making, B. Cole..............
Parer and corer, apple, H. S. Leonard.
Pavement, E. Gomez...
Pavement, H. A. Lacey
Plano printing attachment, G. Heydrich
Pile driver, Hall and Badger
Plpe cutter, R. S. Sanborn.......
Plpe, fish guard for, A. R. Youn
Planter, corn, C. Busch
Planter, cotton, F. E. H
Plow, sulky, J. Worrell.....
Press, hay and cotton, J. B. Pug
Printing press, , W. Watson.........
Printing press, etc, E. L. Ford...
Printing press, etc, E. L. Ford
Pulley, Hummer and Stover
Pump, J. Bean...............
Pump, oll, A. P.Odell.
Pump, shlp's, S. F. Paullin
Pump, steam jet, J. D. Toppin..
Rallway water column, R. T. H. Stileman
Rake, horse hay, G. E. Burt.
Rake, horse hay, D. z. Lant
Refrigerator, E. L. Allen...
Roofing felt, preparing, G. W. Pond. Sash fastener, R. E. Beck with Saw mill, w. S. Colwell.........
Saw mill, block for. C. Leddel Saw setting device, A. Greeley Sawing machine, B. C. Cham scale and platform, J. Cobletgh. scraper, cotton, C. Marsh, Jr. Sawing machine, J. A. Hous Sewing machine, D. E. Rice. Shaft coupling, W. W. Crane.. Shingle machine, N. H. Bolton...
Shuttle box motion, B. H. Jenks Shutter fastening, s. Mowry.. Signal light compositions, N. J. Holmes. Skates, B. Geiger.
Smelting gold, etc., W. O. Davis sockets, forging metallic, Fitch \& Shaffe Spark arrester, R. D. Grant Spinning frame, B. H. Jenks spinning ring, B. H. Jenks Spoke machine, N. H. Davis...............
Spring for furniture, W. T. Doremus Spring seat, W. T. Boremus...
Steam generator, D. Renshaw Seamer, culinary, H. J. Gale. Steel converter, A. L. Holle
Stove drum, Stove heating, E. M. Deey Stove, reservoir for, Waters and Lascel Stove polish, J. W. Birch Telegraph, electro magnet, w. E. Davi Thrashlng machine, J. T. Watkin Toy $\quad$ pring gun, M. Ferrant
Trap, fly, J. Fletcher....... Trap, fly, J. Fletcher.
Tube clasp, E. A.Day
Tube clasp, E. A.Day....................... Talve and strainer, J.Large Vehicle brake, W. A. Per. Vehicle, pleasure, C. w. Saladee Vehicle, pleasure, c. W. Saladee
Vehicle pring, C .
W. Saladee Veneer cutting machine, c. W. Spur Wagon brake. G. W. Jackman....
Warp setting frame, J. W. Higgins Warp setting frame, J. W. Higgin Washing machine, A. Haynes.
Washing machine, Spangler and Relch
Water wheel, E. D
Wheels, polishing, F. W. Gesswein
Whip lash and snap, E. B. Light...
Wire fabric, weaving, D. J. Powers.
Writing fuid, N. P. Slade.
APPLICATIONS FOR EXTENSIONS. Applications havebeen duly flled, and are now pending,
for the extension of the foilowing Letters Patent. Hear for the extension of the following the days hereinafter mentioned:
23,291.-Metallic Bale Band.-G. Brodie, March 5,1873
 23,643.- F glt Disintegrator.-J. F. Greene. March 26,
1873

## DESIGNS PATENTED.

6,288 to 6,290 .-CARPETs.-R. R. Campbell, Lowell, 6,291 to $6,294 .-$ Carpets.-J. M. Christie, Brooklyn, N.
 6,299 to 6, ,501.-CARPRT.-D. McNair, Lowell, Mass. 6,502-- Boos Cover.-C. F. Metzger, New York clty.
$6,303, \& 6,504 .-\mathrm{CARPETs}$-C. Righter, Philadelpha, Pa. 6,503, \& 6,504.-CARPETB.-C. Righter, Philadelpha, Pa.
6,305.-PARLOR STOVE.-R. Scorer and R. Ham, Troy, N.Y.
 6,s12.-RANGE.-N.S.Vedder, F. Ritchie, Troy, N. Y 6,313.-Cooring Stove.-N. S. Vedder, F. Ritchie, Troy.
6,314 to $6,317 .-$ Stoves. T. Heister, Lansingburg, N. Y.
6,118. - RANGE. $-A . J$. Gllbert, New York city.

6,319.-WASE STAND.-J. R. Lancaster, Morrisanta, N.
e.
TRADE MARKS REGISTIERED. $1,082 \& 1,083 .-$ Hass, ETC.-R.Beresford \& Co.,Cincinnati.
$1,084 .-$ PAINTERS' SUPPIIRS.-E.D. \& W.A. French,Cam-1,084.-PAINTE
den, N.J.
1,
1,085.- Baising Powdir.- -Steele \& Price, Chicago, ill. 1,086.-Frlting.-Salamander Felting Co., Troy, N. Y. F.
1,087.-Derovstator.-J. T. Tyler, Wheeling, W. Va. aen-CormsTa ror.-J. T. Tyler, Wheeling, w.

## VALDE OP PATENPS And How to Obtain Them.

Practical Hints to Inventors.

"期ROBABLY no investment of a small sum expense incurred in obtain!ng a patent even when the invention is buta a small one. Large ventions are found to pay correspondingly ell. The names of Blanchard, Morse, Bigeow, Colt, Ericsson, Howe, McCormick, Hoe nes from their inventions, are well known. and there are thousands of others who hams from their patents. More than Fifty Trousand inventors have av themselves of the services of MUNN \& Co. during the
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## 

 ry letter, describing some invention which comes to this fllce. A positive answer can only be had by presentingcomplete application for a patent to the Commisiong of Patents. An application consists of a Model, Draw ngs, Petition, Oath, and full Specification. Various.
offclal rules and formalities must also be observed. The offclal rules and formalities must also be observed. The
efforts of the inventor to do all this business himself are generally without success. After great perplexity and
delay, hets usually glad to seek the ald of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable
men, the inventor may safely confle $h$ ts men, the inventor may safely confle his ideas to them;
they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.
How Can I Best Secure My Invention? This is an inquiry which one inventor naturally asks
another, who has had some experience in obtaining patents. His answer generally is as follows, and correct: Construct a neat model, not over a foot in any dimen-ston-smaller if possible-and send by express, prepatd,
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description of Its operation and merits. On recelpt description of its operation and merits. On receip advise you as to its antentability, free of charge. Or, if
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to the prospect of $a$ patent will be recetved, usually, by eturn of mall. It is sometimes best to have a search made at the Patent Offce ; such a measure often saves
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