A (NEEKLY JOURNAL OF PRACTICAL INFQRMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

NEW YORK, APRIL 4, 1874.

fire extinguishing apparatus for buildings.
Illustrated in the annexed engravings will be found a novel and, it is believed to be, a most efficient device for protecting buildings of every description from fire. The invention consists essentially in a peculiar form of tank roof, which may'be entirely submerged through its connection with a system of water pipes running through the edifice, as illustrated in our engraving. By means also below des cribed, the outer walls may be kept constantly wet by a thin stream of water pouring down their faces. Perforated pipes are laid through the building, in order to afford a supply of water to the different stories ; and finally, by suitable hose connec tions on the roof, streams of watermay be thrown upon ad joining structures.
The roof arrangement is shown in Fig. 2 , and consists of a flat sbeet metal watertight covering, having around it a lange, A, within which is a partition, $B$, the two portions forming the eaves. The flange, $A$, supports a cornice, the lower edge of which stands out from the wall for a distance of about an tighth of an inch. Perforations are made in the outer flange, so that, whenever the water in the gutter rises above the orifices, it will escape and flow down the and flls. valls

A suitable waste pipe, C, Fig. 1, connects with the gutter, and ordinarily carries off the water to the sewer ; but when it is desired to cause an overflow through the perforations, as above noted, the shutting off of a cock, at $D$, accomplishes the object.

Under the lower Boor, and inside the walls of the building, it is de signed to placs four distributing mains, one of which is shown at E, Fig. 1. From each corner, formed by their junction, rises a stand pipe, $F$, to and through the roof, terminating in a hose coupling, Fig. 2. Under the roof horizontal pipes, G, connect the stand pipes together, and these, as are also the mains, E , are provided with suitable stopcocks, by means of which water may be delivered at any one or more of the stand pipes upon the roofs, or without pressure through all the pipes. One stand pipe terminates at the plane of the roof, and serves to conduct water therefrom except when flcoding is desired, when a stopcock at the lower part of the tube is closed. At the planes of the joists of the several floors, the stand pipes are tapped with couplings with which to connect perforated pipes extending across the building, for the purpose of throwing spray between the floors and ceilings to extinguish fires occurring therein. Tbese spray tubes are provided with stop valves at each end, so that no water need be used unless required.
In the center of the roof is a pipe, H, extending through the same and having hose couplings at both ends. The upper extremity may be connected by a hose with one of the stand pipes; and, by hose attached to its lower portion, water may be delivered at any point within the upper story. The stand pipes are provided with external couplings at the several floors, which project through the outer walls to receive lines of hose from fire engines, as shown in Fig. 1.
The inventor suggests that the device will prove a valuaable safeguard in theaters and other buildings liable to sudden conflagration. He proposes to make the sides of 'proscenium boxes, and also the railing of each balcony, of galvanized metal with perforated surfaces, so that a flow of water may be instantly secured, which will flood the auditorium
Patented January 20, 1874. For further particulars re
garding sale of rights address the inventor, Mr. John C. $\mid$ death of the larger insects, they fall around the roots of the Schweizer, with Kramer Brothers, 264 and 266 Madison street, plants as if to fertilize them, but the smaller Hies remain Chicago, Ill., or Francis Probst, 51 Liberty street, New York aity.

## Carnivorous Plants.

Ina recent number of the American Naturalist, Mrs. Mary Treat gives an interesting account of her observations of the habits of the plant known as sundew (drosera filiformis), habits of the plant known as sundew (drosera filiformis),
which she found in July last, in Atlantic county, N. J. These icking to the leaves.
Careful and repeated experiments during several days re vealed the fact that on some days the plants work much bet ter than on others. Whether it was the electrical condition or amount of moisture in the atmosphere is yet to be ascer tained.
I experimented with three species of these plants-d. fili
I experimented with three species of th
formis, d. longifolia, and d. rotundifolia.

July 11, 10 o'clock, A. M., I pinned some living flies half an inch from the leaves, near the apex, of d. filiformis. In forty minutes the leaves had bent per ceptibly toward the flif s At twelve o'clock the leaves had reached the flies, and their legs were entangled among the bristles and held fast. I then removed the flies three quarters of an ineh further from the leaves. The leaves still remained bent away from the direction of the light toward the flies, but did not reach them at this distance Whether the action of the flies' wings may have created sufficient force to bing the leaves near enough to entan gle the flies, is a ques tion I have, not isfactorily own mind, for dead flies did not seem to have the same power as living ones.
Fifteen minutes past ten of the same day, I placed bits of raw beef on some of the most vigorous leaves of $d$. longifolia. Ten minute oast twelve, two of the leaves had folded rround the beef, hiding t from sight. Half past eleven of the same day I placed living flies on

## RE EXTINGUISHING APPARATUS FOR BUILDINGS.

the leaves of $d$. long
plants appear to be most remarkably endowed. To all the folia. At twelve o'clock and forty-eight minutes, one of usual functions of plants, certain animal instincts and pro- the leaves had folded entirely around its victim, and the pensities are added, such as the power to seize, kill, and suck the blood of insects, and to grasp and eat raw meat, etc. Our author says of the plant: It was in full bloom and growing as thick as it could well stand, on either side of an extensive cranberry plantation. This charming plant, with its pretty pink blossoms, together with the dew-like sub. stance exuding from the glands (the glands surmount the bristles or hairs which cover the long thread-like leaves), was one of the most beautiful sights I ever beheld. From

former observations I had supposed this plant caught only small insects, but now found I was mistaken; great asilus flies were held firm prisoners, innumerable moths and butterflies, many of them two inches across, were alike held captive till they died-the bright flowers and brilliant, glistening dew luring them on to sure death. But what is the use of this wholesale destruction of insect life? Can the use of this wholesale destruction of insect life? Can the
plants use them? Upon examination I find that, after the
other leaves had partially folded and the flies had ceased to struggle. By half past two, four leaves had each folded around a fy. The leaf folds from the apex to the petiole after the manner of its venation. I tried mineral substen ces, bits of dry chalk, magnesia, and pebbles. In twenty four hours neither the leaves nor the bristles had made any move like clasping these articles. I wet a piece of chalk in water, and in less than an hour the bristles were curving about it, but soon unfolded again, leaving the chalk free on the blade of the leaf
The bristles around the edge of the leaf of $d$. rotundifolin are longer than on those of $d$. longifolia, but the leat of the former does not fold around a fly as it does in the lattersimply the bristles curve around the object, the glands on the ends of the bristles touching the substance, like so many mouths receiving nourishment.
Half fast 10, A. m., I placed raw beef on some leaves of $d$ rotundifolia; by 1 o'clock the inner bristles were curving about it, and the longer bristles, on the outer edge of the leaf, were slowly curving upward. By 9 o'clock, in the evening, all the bristles of three of the most vigorous leaves were clasping the beef, almost hiding it from sight, while an equal ly vigorous leaf made no move like clasping a bit of dry chalk. At 10 o'clock in the morning I placed bits of raw ap ple on some of the leaves of the last named species; by 9 o'clock in the evening part of the bristles were clasping it, but not so closely as the beef. By 10 o'clock next day, twen ty-four hours, nearly all the bristles were curved toward it but not many of the glands were touching it. So it would seem that these plants are really carnivorous, that they pre er and absorb avimal substances through their leaves. And Mr. Darwin says that by pricking a point in the leaf of dro sera, he can paralyze half of it, and this indicates nerves!

## Srientifir Ammerian.

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## Kig PRIMI

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the scientific american as a preventive of BOILER

Our readers, in their kind letters of commendation of the Scientific american, very frequently tell us that the in. formation they derive from its columns is of the greatest value to them in their several callings, and every day we are told that a single hint put in practice is often the means of making or saving considerable sums of money. Of course these flattering testimonials are very gratifying to ourselves, and we are glad to know how the muney was saved or earned whether, in fact, the writers measure the amount of prac tical information they gain in dollars and cents, and then are unable to think of any sum which will adequately express its value, or whether from its columns they obtain ideas which enable them to improve the quality of their work, and so derive increased incomes; or whether, in some special instance, a direct gain can be traced or an accident avoided. Sometimes, however, a correspondent enlightens us, and sends an item which is not only interesting to the editor, but serves a useful purpose to others. A letter now before us is an excellent example in point.
Mr. S. E. Worrell, of Worrell, Hannibal county, Mo. writes that he has read the Scientific American for fourteen years, and that he has learned more from its pages than during the period he attended school. In perusing a recent number. he goes on to state, his attention was attracted by the report of boiler inspections by the Hartford Boiler Insurance Company. "On glancing over the article, I remembered," he writes, "that I had not heard the eseape of steam from our safety valve for some time. Upon going to the mill the next morning and on making an examination I found that the valve would not rise even with the steam gage standing at 120 pounds and the weight off the lever. I even had to knock the lever up with a hammer, and then could not get it back until the steam was entirely out of the boiler. I afterwards found the valve stem had become rusted in the cover of the valve. Our boiler is only a small one, but its explosion might have caused the loss of a number of lives and of much property.'
We congratulate our correspondent on his narrow escape from a probable casualty. We commend him for his careful attention to what he reads. If every mechanic, on receiving a number of the Scientific American, would tho. roughly consider its suggestions, and seek to apply them to bis individual case, there is no doubt but many of the disasters occurring in the use of machinery would be avoided. Tue information imparted by practical men in their various callings in the correspondence columns of this paper is of great value to all classes of readers, coming, as it does, from the experience and observations of those willing to impart hints beneficial to others, expecting, in return, that others will communicate information of benefit to themselves.
We would suggest that this feature of the paper may be made still more useful and interesting, if every subscriber will take the trouble to communicate some new fact or discovery he has made, whether by accident or experiment.

A few lines of such information from the workshop are frequently of more practical value than a volume of essays on some abstract science by the most learned author. Certainly every subecriber can furnish during the year at least one $\mathrm{it} \in \mathrm{m}$ of interest. This will give nearly fifty thousand facts from as many different sources, which would furnish, in the aggr

## THE BROTHERHOOD OF LOCOMOTIVE ENGINEERS

Those of our readers who are familiar with the course vents during the strike of railroad engineers, which oc curred, principally on western lines, some two months since, will remember that the demonstration elicited a strong let ter of disapproval from Mr. Charles Wilson, Grand Chief Engineer of the Brotherhood of Locomotive Engineers. This document, which went the rounds of the public press, while unreservedly condemning the movement, also stated that such action on the part of members of the above named association was in direct opposition to the principles and practices of their organization. To the opinions thus plainly ex pressed, at d to the influence exerted by Mr. Wilson, the failure of the uprieing may be in no small measure attributed; and hence to his good sense, moderation, and just views is mainly due the prevention of imminent losses to both contending parties. It would naturally be thought that the men engaged in the controversy, even if rendered somewhat
irrational at the time by the incident excitement, would on irrational at the time by the incident excitement, would on
sober second reflection perceive the sound reason in Mr. Wil. sober second reflection perceive the sound reason in Mr. Wil amount of gratitude for his clear-headed advice, would at least tacitly recognize the justice in the position he had assumed. But not so the locomotive engineers. Having called a convention at Cleveland, Ohio, recently, they proceeded to arraign the course of their president. So far as we can learn from the reports of the ineeting, the discussion was carried on priffipally by noisy individuals who had been foremost among those fumenting the past disturbances. However this may be, the result of the deliberations was far from evidencing either the common sense or the justice of the delegates; for, by an almost unanimous vote of 120 io 18 . the acts of the strikers were approved and Mr. Wilsen requested to resign his presidency of the order.
The locomotive engineers of this country are as a rule an able and thoroughly reliable body of men. To their hands are entrustsd immense responsibilities, and from them are required the exercise of an amount of skill, cool judgment, and, at times, absolute heroism which raise them far above
the average mechanic. Of how uniformly they have met and do meet all these requirementa, their past record, coupled with the small percentage of railway casualties yearly occurring in this country (considered in relation to those happening elsewhere) offers abundant tentimony. It is in view of these very facts, however, that we find oureelves at a loss for an explanstion of the action above noted. Are we to nnderstand that the men to whom are hourly entrusted hundreds of lives and property of untold value mean deliberately to endorse themalicious acts of the wretches who misplaced switches, who shot workmen down at their posts, who diea bled macbinery, and committed other wilful and malicious orimes against not merely their employers, but againat the en tire community? If such be the inference, (and we can form no otherfrom the strong evidence of the vote, on the one hand and the letter which gave rise to the convention, on the other), then the Brotherbood of Locomotive Engineers as it now stands has as an organization manifestly survived its time of usefulness, and the sooner it disappears from the public gaze the better. It has suak down to the level of those who perpetually seek to promote disorder by the threadhare arguments of eternal antagonism between employer and employed, and to have submitted itself to the leadership of the violent extremists who somehow contrive to creep into the counsels of nearly every trade organization.
Mr. Wilson, we understand, proposes to appeal to the Brotherhood as a whole, against the action of their delegates, and invites such members as do not acquiesce in the course of the latter, to join him in forming a new society on the old basis, as expressed in the letter referred to in the beginning. We trust that this invitation will meet with a cordial response from every right-minded man in the Brotherhood; and that for their own sakes, if only to relieve their reputations from the slur which the convention has cast upon them, the large
majority of the members will hasten to repudiate the disgraceful vote of their representatives.

## THE MARVELS OF MECHANICS.

During the last siege of Paris, the inhabitants from time time effected communication with their friends beyond the German investing lines by means of carrier pigeons. In fact, a regular pigeon post was organized, having one of its receiving stations in London. Here the written messages for Paris were received, and, by photography, reduced to microscopic size, each letter being reduced so small as to be invisible to the eye except as a speck. Some two thousand of these specks were then printed on bits of tissue paper about an inch and a half square, which was rolled and carefully attached to one of the tail feathers of the pigeon. On the arrival of the bird in Paris, the postal officials placed the paper under the microscope, which enlarged the several specks into readable communications, which were duly copied in writing and delivered to the persons to whom they were addressed. The total postage received for the transmission of one of those tiny bits of paper frequently mounted to two thousand dollars.
Small as this photo writing seems, it has been surpassed by mechanism. In a recent number of the Lens, Dr. J. J Woodward, U.S. A., gives an enlarged photograph of mi croscopic writing done by machinery on glass, by means of a diamond, executed by Mr. William Webb, of London. The glass, within a the Lord s Prayer, which fourth part of an inch in length by one four hundred and fortieth part of an inch in width, or a space perhaps equal to the dot in this letteri. The photograph given by Dr
cupy a space of about two inches long by one and a hal inches broad. All the words are brought legibly out on the photograph, the total number of letters being 227; and such is the exceeding fineness of the original writing that 29,431 , 458 letters written in the same way would only cover one square inch of glass surface. The combined Bible and New Testament contain in all $3,566,480$ letters; hence it would be possible for Mr. Webb to write the entire contents of more than eight bibles within the space of one square inch. Two specimen plates containing the microscopic writing above alluded to have been supplied by Mr. Webb for the United States Museum at Washington. Their cost was fifty dollars each.
The Webb machine, however, does not equal, in the fine ness of its writing or perfection, the prior instrument of Mr N. Peters, a wealthy banker of I,ondon, who, as long ago as 1855 , was able to write nearly three times finer than Webb So perfect was the Peters machine that it was competent to engrave the entire contents of the Bible and New Testament twenty-two times over within the space of a single square inch.

## METROLOGICAL SCIENCE.

The American Metrological Society, the first session of which was held during December last in this city, forwards us a copy of its constitution and by-laws, in which the obects of the association are fully set forth. These, briefly are to improve the system of weights, measures, and mon eys at present existing among men, and to bring the same a far as practicable into relations of simple commensurability to each other. The universal aduption of common units of measure for the expression of quantities which require to be stated in presenting the results of pbysical observations or investigation, and for which the ordinary systems of metrology do not provide, is also to be advocated, and it will be the effiort of the society to secure, in regard to the denominominations of weight, measure, and money, the acceprance f the decimal system.
President Barnard, of Columbia College, has been elected President, and the names of several well-known scientific gentlemen, including Professors Hilgard, Newton, Cooke Elliot, and Thurston are among the officers and council. The association has already begun its labors and has pre pared two memorials to Congress which are now open for signatures of all persons interested in their objects. In 1866, Congresslegalized the use of metric denominations, and in the recent coinage act the weights of all silver coins of the United States, except the trade dollar, are thus set forth. The first memorial prays that means be taken by suitable legislation to introduce the metric system more di rectly into, while not interfering with, the general busi ness of the people. The passage of laws is urged, rendering the system obligatory to the Post Office Department; in re ports of public works conducted under authority of the Fed oral Government; in all statistical or other documents in volving statements of quantities, issued ander similar sanc tion; and in the estimation and computation of custom du ties of the United States.
The second memorial refers to the legal weights of our gold coinage, and asks that the pure gold contained in the dollars shall be exactly one gramme and a half. The Engi neering and Mining Journal, in commenting on the subject adds that it is only necessary that the fineness of standard gold should be everywhere nine tenths (as it is everywher already, except in Great Britain), that the weight of pure gold in coins should be given on the coins in metrical units, and that the mints of civilized countries should do honest work: when the immediate results would be that the gold coins of nations adhering to the plan could safely be made egal tender in exact proportion to their weigbt.
The gramme of pure gold would thus become the world's unit of money, and the problem of an international coinage thus quickly and easily settled.

## THE DETROIT RIVER TUNNEL.

An interesting history of the attempted construction of the unnel under the Detroit river, between Detroit and Wind sor, on the Canada shore, is given in a paper read by Mr. E. S. Chesborough, C. E., at the last annual convention, and published in the Transacticns, of the American Society of Civil Engineers. Up to July, 1872, it seems that the prospects of the work were quite favorable; but in the latter part of that month, when excavation at the Windsor end had progressed about 250 feet through hard ground, a sud en irruption of sand and water occurred, which threatene to fill the tunnel out to the sump and choke the pumps Three bulkheads were built, each nearer the shaft, and the ast one quite close to the same, before a successful stand was made. After a delay of sevtral days, operations were resumed; but hardly had thirty feet of new tunnel been made when another irruption ensued, and again bulkbeads were resorted to. After beginning once more, a third biea followed, and finally a fourth, when the contractors, finding that the work was costing four times the price they re ceived for it, determined to make a lift shaft at the end of the drift on the Windsor side and start a new drift 10 feet higher than that of the drainage tunnel. This was done but the irruptions again appeared, coming from the bot tom instead of the top of the excavation, there being a vein of sand at the level of the top of the lower drift. Finally after advancing 370 feet from the shore shaft, it was decided to abandon progress in that direction.
On the Detroit side, other difficulties were being encounered. At 1,180 feet from the shaft, the ventilating appara ind two of the workmen were killed. At 1,220 feet (new machinery having been established) the
influx of water became so great as to require more powerful pumping engines, and then the contractors, discouraged sought and received permission to rellirquish the work.
Then the directors attempted to continue on the Windsor end by means of two parallel trial drifts, and to begin a second one at the shore shaft, at a level 10 feet above the grade of the drainage tunnel, leaving the later to be used as a eand holder in case of further irruption, the idea being that, in either one or the other drift, some progress might be made. Experience, it seems, had shown that a stream of sand and water flowing into the tunnel at one point would never be accompanied by a troublesome one flowing in at another. It is unnecessary to enter into the details of the last effort. The actual alvance in new ground during the last two months was only 64 feet, and the cost about $\$ 7,500$, or more than $6 \frac{1}{2}$ times the contract price, and the directore, in turn dieconraged, abandoned the enterprize.
Mr. Chesborough answers various criticisms on the mode of carrying on the work, and states reasons why the orifices through which the irruptions occurred could not be stopped. A sbield, he remarks, could not be used to advantage, nor could success have been assured by the pneumatic process. The causes of the irruption were springs and water courses, having their source $1 i 0$ feet higher than the tunnel, and much above the level of tide water. Mr. McAlpine notes a similar case in the building of the dry docks at Brooklyn, N. Y., where fresh water came in with a head of 50 feet higher than that of the salt water. The water entering at Detroit was sulphur water, and without doubt owed its origin to Sulphur Springs at Sandwich, below Detroit, where the level rises from 30 to 40 feet above that of the river.

## A HILL OF SULPHUR.

One of the most remarkable deposits of native sulphur, as yet discovered, is a great hill composed of the almost pure article, found some two years ago at a distance of thirty miles south of the Union Pacific Railway and nine hundred miles west of Omaha. This marvelous deposit is found to consist almost wholly of sulphur, cantaining only 15 per cent of impurities. The best deposits heretofore available are those found in Sicily. The principal supplies for the manufacture of sulphuric acid come fiom there; ihe deposits coutain 35 per cent of impurities and 65 per cent of sulphur. Our western sulphur hill, therefore, is much the most valuable, and promises to become ere long of great importance to the country.

## the ladnch of the city of pering.

The country has good cause for self.congratulation in the efforts which our prominent shipbuilders and capitalists are putting forth io regain the commerse which, during the war, passed from under our flag. Another great vessel has been launched, one of the largest ships ever constructed, Eave the Great Eastern, which is to form part of the Pacific Mail steamship line; a second vessel of similar proportions is on
the stocks, and the same builders, we learn, are maturing plans for a line of European steamers. The City of Peking, plans for a line of European steamers. The City of Peking,
which was recently successfully launched at Cbester, Pa., was which was recently successfully launched at Cbester,Pa., was
constructed by the Delaware River Iron Shipbuilding and Engine Works, of which Mr. John Roach is Preeident, and is without doubt one of the most magniticent vessels, in construction, form, and fittings, ever built. Her length is 420 feet, beam 47 feet 4 inches, and tunnage 6,000 tuns. She has compound engines of 4,500 horse power, and a Hirsch four bladed screw 20 feet 3 inches in diameter. There are four decks, with accommodations for 2,000 passengers, fitted up in almost palatial etyle. No improvement in interior conveniences has been omitted; the machinery, soo
is said to be a masterpiece of workmanship.
The ship is entirely of iron, five million pounds of the metal being used in her hull. She has four masts, three of which are of iron and are used as ventilators, and she spreads
33,000 square feet of canvas. Her estimated consumption of 33,000 square feet of canvas. Her estimated consumption of
coal under her ten boilers is estimated at between fifty and sixty tuns per twenty four hours, and her speed will be ebout fifteen and a half knots.
The ceremony of launching was made the occasion of a holiday in Chester, and the town was thronged with vieitors from New York, Philadelphia, and Washington. Large numbers of prominent men were present, including senators, representatives, chiefs of bureaus and other government ofticials. The ship, as the last shore was removed, glided into the water in splendid style, and was duly christened by the daughter of the builder, breaking the traditional bottle of wine over the bows. Speeches were afterwards made by $S_{t}$ nators Cameron and Bogy, and by Mr. Roach, the latter gentleman detailiog the operations of the company since its formation two years ago. The City of Peking will be commanded by Captain Jeffersqn Maury, and will shortly bs brought to this city to receive her machinery at the Morgan Jron Works.

## the character of metals as exhibited by

 their fracture.In an article published in the Scientific american of January 17*, a series of finely executed engravings illustrated the value of an inspection of the fractured surfaces of test pieces of metals broken by torsion as a means of judging of their character.
During the research there referred to, of which the results are given at length in a paper now in course of publication
by the American Society of Civil Engineers, in the " Transactions" of that society $t$, the effect of various changes of

condition, in production of alteration in the characteristic of fracture, ha
useful study.
Referring to that article, the reader will observe the marked difference between numbers 16 and 22 as exhibiting the effect of a difference in thoroughness of working, the former being a good iron badly worked, and the latter being he most perfectly worked piece of iron which has ever come ander the observation of the writer. Nos. 23 and 30 show he difference between a cast iron highly charged with carbon nd a specimen containing a minimum percentage, while till other illustrations exhibit the low steels $58,68,71$, con taining only iron and a low portion of carbon, and the mal leableized cast irons, 33,35 , which are steels which retain the impurities of cast iron, and are somewhat irregular in acture.
The effect of cold upon the properties of iron has been but ittle understood. One party of experimenters claim to have proven an increase, others a decrease, of strength with decrease of temperature. In a paper, originally prepared for the Iron Age" and since republished by several other periodicals, $\dagger$ the writer collated such information, as then existed from both scientific and engineering authorities, which showed that the general effect of low temperature seemed to be a decrease in power of resisting blows and an increase in power of resisting a steady strain, these seemingly contradictory effects being the consequence of increased tenacity accompanied by a simultaneous and yet greater decrease of ductility. Subsequent experiments by the writer, with the autographic testing machine designed by him for the Stevens Institute of Technology, in which errors of observation are avoided by so arranging the apparatus that the specimen tested shall write legibly its own story, have to some extent confirmed those deductions, but have revealed some reversals of the rule and have indicated that good materials are better in both resgects at temperatures not far removed
The paper referred to was called forth by the request of the editor of the paper in which it first appeared, to whom Mr. Oliver Williams had forwarded a specimen of metal which had been broken at one point at a temperature of $75^{\circ}$ Fah., and at another place when at a temperature of $20^{\circ}$. This specimen was afterwards placed in the cabinet of metals and minerals, in the lecture room of the writer, at the Stevens Institute of Technology. The methed of fracture is stated to have been precisely the same in each case. The difference in appearance is very remarkable. The fracture
at $70^{\circ}$ is a strikingly perfect illustration of the fibrous, as at $70^{\circ}$ is a strikingly perfect illustrat
that at $20^{\circ}$ is of the granular, fracture.
Judging from general experience, I should be inclined to consider this iron far less reliable in cold than in warm weather. Careful experiment, however, is daily convincing engineers that the distinction, here so well shown, is a far ess reliable indication of the strength and ductility of iron than was formerly supposed.
A kind of fracture which is probably always indicative of brittleness is generally, and possibly correctly, termed crystaline. It is supposed to be produced by a long continued succession of shocks, which, straining the metal to the elastic limit, permit the crystaline grouping of molecules to take place. Dr. Percy, the leading metallurgical anthority of the world, seems to have bee日 fully convinced of the possibility of the formation, in this way, of true crystals; but direct experiment is still desirable to fully determine it. A singular instance of this peculiar moiecular action recently occurred at the Morgan Iron Works, New York. While a powerful steam hammer was at work upon the red hot end of a very largeshaft, originally designed for the engines of a large naval steamer, a piece of the opposite end, which was cold, and which was supposed to be strong enough to transmit several thousand horse power, dropped off. This was an extraordinary event, but not unprecedented. In all such instances, the fracture seems to follow a plane passing through a com. paratively sharp angle at the side of a collar or at the end of a journal.
The effect of cold is not always observable, particularly with ductile iron, of which two specimens were tested, one, at $10^{\circ}$ Fah., and the other at $70^{\circ} \mathrm{Fah}$. The metal was a cheap grade of wrought iron, quite cold-short, and very irregular.
Two specimens from the same bar of good tool steel, were also tested, one having been broken at $18^{\circ}$ Fah.,and the other at $70^{\circ}$.
The purest irons and low steels, and even the shear steels, do not usually show a change in form of fracture with change of temperature. At all temperatures likely to be experienced in this latitude, at least, they are equally reliable.
Two specimens of copper were also tested. The first was cast in dry sand and broken at $10^{\circ}$ Fah., the second was cast in green sand and broken at $70^{\circ}$. The beautiful crystaline structure of the former is apparently due, principally, to low
temperature. The unsound structure of the latter is the temperature. The unsound structure of the latter is the
consequence of using a damp mold, and exhibits the advisa. consequence of using a damp mold, and exhibits the advisa-
bility of using dry sand whenever possible. The two are very characteristic specimens. Copper is strongest at low temperatures and seems to lose none of its ductility. Forged specimens of copper, in all but color, resemble, when fracured, the toughest and most ductile kinds of iron.
The wonderful difference in properties of steel, under dif. fersnt methods of treatment, is shown by two specimens from the same bar of fine cast steel. The first has been carefully annealed, the second as thoroughly hardened. The
close resemblance of the former to the low steels, shown in

## - Iron $4 g e$, Jane, 1873.


he former communication, was at once noticed. It does not appear like a true steel, not having even the faintest resem blance to the hardened specimen, which presents the uneven racture and fine grain characteristic of the best tool stecls. Still another illustration of a peculiar modification of iron produced by special methods of treatment is seen in a piece of iron which had been subjected to the process of cold roll. ing. The effect of this action is to produce a marked increase of strength and of elasticity. In precisely what way this effect was produced was long a disputed point. No change of density had been detected, and some of the most talented and distinguished scientific men and engineers who had occaion to examine this singular material, as members of the nternational Jury at the Vienna Exhibition, found it exceed ingly difficult to credit the claims made for it, although sustained by reports of experiments made upon it by well known authorities at home and abroad.
It has lately been shown by the' writer that the effect of cold rolling is to render the iron more perfectly homogeneous and to produce such a disposition of internal strains as to greatly increase its elastic resistance.*
The thready appearance of the side of the broken specimens, and the toughness and compactness, of which good vidence is seen by an inspection of the end of the test piece, are the peculiar characteristics of this material. Those of he readers of the Scientific American who bave occasion to adopt the method of testing metals, described in the issue of Jaruary 17, will be interested in learning the effect of varying the proportions of copper, tin, and zinc, in brocze, brass, and other compositions.
An alloy of ten parts copper to one pay tin has two thirds the strength of iron and about one half its ductility. Such a metal is very valuable wherever strength and tougbness are required in a cast metal. An increased proportion of tin produces increased hardnees and a loss of ductility. Sirty aine parts copper to thirty-one parts tin is an alloy which is very hard and as brittle as glass. Increasing the proportion of copper gives greater ductility at the expense of strength, and castings become liable to uncoundness.
Zinc is a brittle metal of crystaline structure, and vastly different from tin. Yet an alloy of zinc and copper may be made of considerable strength and of great ductility, as ts the case with wire brass where the proportions are about two of copper to one of zinc, and with an unusually beautiful special grade of brass made at the Stevens Institute. This specimen exhibits characteristics common to all the more ductile alloys as well as of the metal tin. The curious, irregularly wary appearance of the exterior, and the half fibrous, half granu lar fracture, are seen in gun metal, soft brass, oroide, phos phor bronze, and many other alloys which have been tested Metal workers often make a free working and fine looking alloy by uniting copper, tin, and zinc. For some purpose such a mixture is well adapted, but it often happens that, without suspecting it, the workman seriously injures his material by adding,for appearance sake, zinc to a bronze in proportions seemingly too small to effect its mechanical pro-

## erties.

The writer has found the addition of but a fraction over one per cent of lead, to a good brass, to reduce its strength nearly a half, and to cause a corresponding loss of ductility, thus making it but about one fourth as valuable in resisting blows as the clean alloy.
A good bronze, containing about ten of copper to one of tin, to which less than three per cent of zinc was added, was also tested in comparison with a brass in which lead was thus a component. The former is a metal of fine looking axterior, works well and takes a good polish. Its strength is slightly increased by the addition of the zinc, but its duc tility is hardly a sixth that of the pure copper and tin alloy The fracture shows this change to the eye with unmistakea ble clearness. Instead of the toughness and extensibility shown so plainly in the specimen with lead in it, is exhibited a ragged, dull, irregular break like cast iron.
Such experiments as these are exceedingly instructive and every worker in metals, every iron and brass founder would find himself well repaid for time expender in such researches by the discovery of the mixtures best fitted for his work; and if each were to make public the results of his work, whenever evidently important, he would benefit the world without loss to himself.

## Dr. Arnott.

The decease is announced of the celebrated Dr. Neil Arnott, at the advanced age of eighty-five years. He was not only a physician of eminence, but an author, a scientist, and an nventor. His "Elements of Physics," published in 1827, was largely circulated, and greatly promoted the study of the sciences. His researches upon warming and ventilation, and his inventions of stoves and ventilators, have greatly added to human comfort, and have led the way to various other important discoveries. Dr. Arnott was the recipient of many honors, and no one more justly deserved them. His ife was a most useful one.

## TO NEW SUBSCRIBERS.

It has been our custom to commence at the beginning of the year, all subscriptions received previous to the first of April, and to send the back numbers from the first of January. Hereafter the paper will be sent from the date of receipt of subscription; but to those who wish them, the back numbers from the commencement of the volume will be furnished, and the subscription dated from the first of the year.

THE PALEOTHERIUM MAGNUM.
The palæontological collection of the French Museum of Natural History has recently been enriched with a new fos sil of the highest scientific interest. It is an entire skeleton of the palcootherium magnum,found incrusted in the quarries of the palcotherium magnum,found incrusted in the quarries
of Vitry sur Seine. Our engraving is reproduced from a of Vitry-sur Seine. Our engraving is reproduc
photograph taken in the galleries of the excavations by means of the electric light.
I'he animal was first described by Cuvier, and was a mammifer, now entirely extinct and indeed without any actual representative among existing creatures. At one period its species was extremely abundant. Modern geologists classify it with the rhinoceros, the tapir and the horse; but their views have heretofore been based only on thedetached bones, which have based only on the detached bones, which have become common objects in almost every collec-
tion. The examination of the complete skeletion. The examination of the complete skele-
ton, now for the first time discovered entire, shows that even Cuvier was wrong in ascribing to the animal the proportions and conformation of the tapir. So far from being massive and heavy in build, as has been supposed, the palæotherium was a light,graceful animal, with a neck longer than that of the horse and closely resembling in external form that of the llama. Three toes are counted on each foot, and there is a snout or rudiment of a trunk. The femur is a snout or rudiment of a trunk. The femur
has a third trochanter. The dentary system is has a third trochanter. The dentary system is
co nposed of six incisors, four canines and fourteen molars, the last being analogous to the similar teeth of the rhinoceros. The hight of the aninal was a little less than that of the medium horse. It was herbivorous, and existed in vast herds during the middle of the eocene period, as its remains are found in gypsum and equivalent rocks formed during that stage of thit world's history.

## Galvanic Electricity.

Put a rod of amalgamated zinc in a glass cell filled with dilute acid, and it will be seen that the apparent action is limited to the gradual production of a few bubbles of gas. On placing this copper wire in the cell beside the zinc, there is no change until I allow the two metals to touch, when you see torrents of bubbles are evolved from the surface of the copper wire. On substituting platinum or silver for the copper we get a similar effect, and that whether we per we get a s:milar effect, and that whetber we
join the metals within the liquid or at a point exterior to it. Thus, if I join the copper wire to this galvanometer, and connect the other end of the coil with the zinc rod, you see that the magnetic needle is deflected as long as contact continues; but immediately on breaking the circuit, the action on the needle and the evolution of bubbles cease instantly. Such an arrangement of two metals, in a liquid capable of acting on one of them, is called a galvanic battery, and by means of it, in connection with a very delicate galvanometer on the other side of the Atlantic, we are cate galvanometer on the other side of the Allan.
able to send telegraphic signals across the ocean.
able to send telegraphic signals across the ocean.
From the fact that the bubbles of gas are given off from the surface of the copper, we might suppose that it was that metal which was acted on; but if we were to weigh them, we should find that it was the zinc which had lost weight, while the copper remained quite unacted on. The dissolved metal is known as the positive, and the unacted metal as the negative; in fact, there is less tendency to solution on the part of the copper when connected with the zinc than in the absence of the lattir metal, which, on the other hand, is far more rapidly dissolved than it would be alone.-Lecture by A. H. Allen, F.C.S.

IMPROVED ADJUSTABLE THRESHOLD.
Prolific causes of cold feet, consequent colds, and soiled carpets, are cracks under doors, between the bottom and the

threshold. As a remedy for this trouble, a vary simple dethreshold. As a remedy for this trouble, a vary simple de-
vice has been suggested, and has, as we are informed by the mnnufacturers, been in use for some four years past in Cbi-
cago, with perfect success. It consists, simply, of a strip of
heavy rubber, $B$, let into hard wood pieces, $A$, and securely fastened, thus forming an arch in the center, as will be seen from the sectional view, Fig. 2. When the threshold is in place, the rubber arch presses gently on the bottom of the door (dotted lines, Fig. 2); when closed, across the whole width, entirely excluding, it is claimed, rain, cold, dust, etc.


## the paleotherivm magndm.

The device is said to be very durable, and to outwear wooden thresholds. It cannot get out of order and is easily swept over.
We learn that it is now being introduced in other sections of the country for the first time, and is meeting with ready application. Further particulars regarding sale of rights (State or county) can be obtainsd by addressing Wilson, Peirce, \& Co., 182 Clark street, Chicago, IIl.

Tooth-edged Cutting Scissors.
Dr. B. W. Richardson eays:I have recently had construct ed for my use a pair of tooth-edged cutting scissors, on the

plan shown in the diagram. The scissors are of the ordinary construction, in all respects, except in the cutting edge. The cutting edge of each blade, instead of being even and sharp, is divided into finely pointed teeth, each tooth being directed with a slight inclination towards the handle of the scissors. When the blades meet, the teeth cross each other; and as they pierce any structure that may lie between them, they crush also, between their surfaces.
If a piece of moderately firm substance be placed between the blades-a piece of paper or thin card, for example-the scissors perforate it in a series of perforations resembling what is seen in the postage stamp; that is to say, they do not cut clean through the substance, so as to leave it in two distinct parts at once. A little lateral or half-rotating movement of the closed blades is, however, sufficient to tear through the still connected lines of substanceand to complete the separation. The same occurs if the substance placed between the blades be a portion of soft animal structure, only that more force is required in the lateral or rotating movement to cause complete separation. The parts punctured are crushed between the teeth, and are separated by the twist or torsion.
I find these scissors useful in dividing, directly and quickly , structures in which there are many minute blood vessels, and which, when divided by the knife, bleed freely. These toothed scissors, as they can be made at one and the same time to pierce, crush, and twist, control bleeding remarkably.
I have put the scissors to a good test in a case of epulis. The tumor was increasing rapidly, and three teeth were invclved in it. It was very vascular, had a broad base, and might, at first sight, have been taken for a malignant rather than for a fiberous tumor. The three teeth being extracted, I found I could get a deep grasp of the tumor between the blades of the scissors. I carried the teeth of the scissors well through the base of the tumor, crushing some portion of bone in the way, and gently and easily twisted the mass off, and lifted it away upon the blades without the loss of any
blood whatever. The healing in this case was rapid and good. blood whatever. The healing in this case was rapid and good. -Medical Times and Gazette.

At recent meeting of the members of the London Architectural Association, Mr. Richard Moreland, C.E., read an important paper on "Iron Construction," in which he said that, with regard to cast iron pillars in long columns, the tranverse section had two duties to perform, namely, to support the load and to resist flexure, so that only one half of the strength of the pillar could be considered available for the resistance to crushing, and the other half for the resistance to flexure. In other words, one half was in compression and the other half in tension; and this was precisely the condition in which a girder was in; or it might be taken as a question of leverage, the length of one end being the diameter of the pillar, and the other half length of the column; but in the case where the pillar was large in comparison to its length, then the whole of the material must be taken to resist the compression of a considerable portion of its crushing strength. The working load on pillars should not exceed one tenth to one sixth of their breaking, and, under ordinary circumstances, should not exceed 25 diameters. Special care should be taken when the pillar was subject to transverse strains, where beavy goods of unstable form were piled against them, as a considerable strain might be produced from this cause; and aleo in the event of blows from rolling goods or other causes. Pillars in juxtaposition $t$ g brick walls took the whole load when they were strong enough to bear it; but masonry served to stiffen the pillar if secured to it; and if the wall was built in cement, and of considerable thickness in comparison to the iron pillars, they then possibly might assist each other. In cases where the brickwork was liable to be compressed, and the pillar unequal to its load, then obviously nearly the whole weight must be discharged on the pillar: but care must be taken, as possibly intense compression might take place at the base of the pillar. The basis should be as level as possible. Short columns under crushing force were deformed by pyramid wedges forming at the ends and forcing out wedges at the sides; this was aloo seen in the crushing of stone and other solid $\mathrm{m}^{\text {a terials. }}$ For various forms and sections of pillars, and also of different lengths, the strength of the material would vary considerably under the diverse conditions in which it was placed. For small proportions of length to diameter, cast iron was the strongest material, but its strength diminished, as he proportion of length to diameter increased, faster than wrought iron;and, in comparison of solid square or wrought iron pillars with solid round cast iron pillars beyond twentysix and a half diameters, wrought iron was stronger. For ordinary work no cast iron columns should exceed twentyseven diameters. The elasticity of cast iron was twice as great as that of wrought iron. The strength of girders to resist resilience was proportional to the weight of the beam, irrespective of the length, so that a beam twice the weight or twice the length would take twice the load to produce the same deflection. Rolled girders were only economical up to a given size and weight.

## PATENT BOTTLE.

Mr. Benjamin C. Odell, of Kingston, N. Y., is the inventor of the novel style of bottle represented in the annexed illustration. The object is to separate, within the same botle, two kinds of liquid, which can be separately removed, and this is effected by arranging a partition to form two compartments, each of which has its own disclarge or spout. It is a handy device for invalids traveling, as medicine might be carried in the smaller division and water in the larger, while a cup,similar to the kind generally accompanying "pocket pistols," might be fitted over the bottom. Any number of partitions may be placed in the bottle, with a corresponding number of spouts. Thus arranged, it might prove valu

able to physicians, by affording them the means of carrying quantities of several remedies in a single pocket receptacle.
The maximum cost of transporting railway freight, last year, between New York and Chicago, was 7 mills per tun per mile. The total cost of moving freight by canal (horse power being used for towage) is 5 mills per tun per mile.

## IMPROVED ADJUSTABLE SCAFFOLD

Painters and other mechanics, who have frequent occasion to use scaffolding in performing their work are, in the invention represented in the annexed engraving, provided with an adjustable extension truss which, according to the inventor, may be applied with'equal facility to various purposes. It serves as a truss for scaffolding, a common ladder, platform, and step ladder, and, from its simple construction, may be built quite cheaply. It may be compactly folded, and thus readily moved from place to place.

The two parts, $A$ and $B$, of the extension truss are hinged togetiler near the top by means of side plates, cross rod, $C$, and nut, as shown, so as to fold together or to be detachable from each other. The tops of parts A and B are united by lateral boards, $D$, one of which is hingtd so as to fit, when necessary, over the recess which holds the vertical cross piece, E, and Both is lined with metal plas. and adjusted at different hights, the front portion by sliding pieces, $F$, guided by suitable plates, I, F, guided by suitable plates, I,
one set secured to A, and embraone set secured to $A$, and embra-
cing $F$, and the other arranged in the opposite manner. Holes in the sliding pieces and pins serve to lock the former in any desired position. The top slide plates limit the upward motion of the sliding pieces, $F$, the lower ends of which project beyond the parts, $\Lambda$, and are provided with metallic sockets, produced with the angles of inclination of the truss to the ground. Both portions are conground. Both portions are con-
nected by rounds in such a mannected by rounds in such a man-
ner that they offer, in any position, a do uble support to the foot.
The rear part, B, is extended by means of slides, $G$, which move in guide recesses. Lateral pieces stiffen the fixed portion, while steps or rods serve the same purpose for the slides. The connecpose for the stido parts, $B$ and $G$, is tion of the two parts, $B$ and $G$, is
made by holes in both washer made by holes in both washer plates at the outer sides of part, B, and cross rods, $H$, witk screw ends and heads, by which the whole is firmly retained in any position corresponding to that of the part, A. The slides, f, also terminate underneath in suitable shoes or sockets.
The platform may be constructed as represented in our illustration, or the cross pieces, E, may be removed and longitudinal timbers laid between the opposite trusses under the lateral boards, D, and above those marked I. Heavy bolts passing through all secure the beams in place.
The inventor states that, when the device is folded up, the The inventor states that, when the device is folded up, the
boards connecting the trusses may be secured between the steps of the front part, A, serving thereby as a support for paint pots and other implements. In similar manner either half may be used as a suspended platform for painters in painting the outside of houses, while the detached front part may be applied as an extension ladder.
We are informed that a 4 feet 10 inch truss, as shown in the engra. ving, makes a scaffold that will reach ving, makes a scaffold that will reach
to a ceiling of 14 feet 6 inches in to a ceiling of 14 feet 6 inches in
hight. It also forms a step ladder of hight. It also forms a step ladder of
from 4 fett 10 inches to 8 feet, and of from 4 fett 10 inch
five distinct sizes.
The device may be used upon stairs as easily as on a level floor, by extending the front part two steps, or a suficient distance to accommodate the rise. It has no braces, is selftracing on top, and can never, it is claimed, spread or give way.
Patented through the Scientific American Patent Agency, November 4, 1873. For further particulars re garding sale of State rights, etc., ad dress the inventor, Mr. John Dillon, 405 Fourth avenue, $\mathrm{N}_{\text {ew }}$ York city.

## A NEW MAGNETO-ELECTRICAL INSTRUMENT.

A novel form of magneto-electric battery, adapted for use as an exploder, is represented in the annexed engraving, which we extract from the pages of La Nature. It consists simply of a horseshoe magnet, around the arms of whichare wound coils of insulated wire. To the poles is applied an armature of soft iron. The apparatus is a reproduction of a similar device used by Faraday in his experiments to show that, when the armature was suddenly removed from the poles, a current is almost instantly established in the coils, while, on replacing the iron, another current was engendered similar to the first, bat in the contrary direction.
In order to use the current thus obtained, in place of that of an ordinary battery for exploding charges, a high tension is necessary, and this is obtained by a simple and ingenious attachment. The key which moves the armature carries a small spring (shown on the left in the engraving) which touches a screw. When the armature is removed from the
magnet this contact. is broken, but not instantaneously, as
the parts touch until two thirds of the motion is completed. One of the conducting wires is connected with the lever of the armature, the other with the screw; consequently the carrent caused by the sudden break is kept within the apparatus during two thirds of the time of its production. This arrangement, which, at first sight, would appear designed to cause the loss of the effect of the greater portion of the current, really increases the tension, because the current which is delivered by the machine is no longer the magneto-electric induced current, but the extra current of the latter-in other words, a aecond induced current, which is produced at the moment of the rupture of the local circuit of the magnetoolectric current. In round numbers, the attachment aug. ments the current in the proportion of 1 to 5 , and gives a


## DILLON'S ADJUSTABLE SCAFFOLD.

spark which will explode ordinary hunting powder placed loosely between metal points.
This device is undoubtedly one of the simplest yet devised, for its purpose, as well as one of the easiest constructed. Its energy may be increased by using more powerful magnets, the Jamin, for example.
We should imagine that it might be advantageously substituted for the battery in short telegraph circuits; and in fact, it has been used for that purpose in the Vienna Exposition. The key of the instrument was manipulated exactly as that of the ordinary Morse machine, producing a series of currents alternately positive and negative, which operated Morse receiver having a polarized armature.
For military telegraphs, the device would be very useful on

Our readers will perhaps say: "This subject bas no interest for us, inasmuch as we do not possess such a luxurs, and ndeed consider such a structure entirely out of our reach." In this instance, however, if such have been your thoughts, readers, you have prejudged the case, for we intend showing how a splendid propagating house may be had at no additional cost to those who possess a small stove or vinery. We have seen this plan adopted in the gardens of a peer of the realm, and found that it answered admirably, and is worthy he notice of all who delight in their gardens, and have a love of plants, for by its use a good supply of young plants may be maintained for the decoration of the dwelling rooms and the dinner table, while no end of plants can be struck in spring for flower garden purposes. In the first place, then, readers, we will imagine you have a small vinery heated with hot water; that you have now, or will soon, start the vines, and will, therefore, have a nice gentle heat at command. Now our system does not consist in bring. ing in any large frames or hand ligh ts to take up the limited space, because, if you are economical and practical, you will have brought in a considerable number of straw berry plants to produce some luscious early fruit,one or two pot vines to help out the crop from the roof, a few pot roses, some spireas, lilacs, and other fragrant shrubs to delight the olfactory nerves; but it is sim ply to have some small narrow frames made to fit the troughs on the pipes, these narrow frames to be fitted with a glass top; the troughs in question, being kept filled with water, produce a splendid moist bot tom heat, which is one of the great desiderata in the propagation of most stove plants and all soft wooded things; the frames need only to be a few inches high; they should have some drainage material placed in the bottom, and the re mainder may be sand only or what we prefer for striking the majority of cuttings in, namely the refuse from cocoa nut fiber. In this material, and in such situations, cuttings of verbenas, coleus, geraniums, he liotropes, fuchsias, andany such kind of plants, may be rooted in a few days, while, as a matter of course, harder wooded plants will take a little longer. This is not a theory, readers, but has been reduced successfully to practice for many years, and those who would do more in the embellishment of their gardens, but for the want of a propagation house may, with a few such little frames, produce any amount of plants in the spring months for summer use, and we cannot too strongly urge them to give it a trial.-Land and Water.


A NEW MAGNETO-ELECTRICAL INSTRUMENT.

Floats for Ships, Boats.
The Marine Department of the London Board of Trade have been making experiments with the boats of coast ers, and find that any old boal can be converted into an efficient lifeboat by using air casings outside. The Marine Department have, for this purpose, used air cylinders, which they have specially designed, fastened outcide the boat by a netting; so that the boat can be used for an ordinary boat as long as wanted, and converted into a lifeboat when occasion requires it. The material used for these cylinders, and approved by the Marine Depart ment, is a combination known as Clarkson's. It consists of a layer of cork about a quarter of an inch thick between two layers of strong canvas One cubic foot of air space in these cylinders will support about 60 lb cylinders win support about 60 lbs The cylinders of this material are the account of its light weight, simplicity, and absence of batte- cheapest, most efficient, and most durable means yet invent ry. Another application which suggests itself is for counting either the revolutions of an engine or of a wheel in a vehicle, and transmitting knowledge of the same to any desired point. An eccentric might be arranged on the shalt the revolutions of which it is desired to know, so that at each turn the contact of the armature with the poles might be ruptured, and a current sent to a suitable receiver or counting apparatus, easily devised. Many other problems, it appears, mey be solved by this machine, and inventors will find in its further applications an excellent field for the ex ercise of their ingenuity.
C. G. V. P. says: "'The reason we have so many false
theories about ventilation is this: We have heard or read that carbonic acid is heavier than the pure air, and consequently must sink to the bottom, and should be discharged at the floor; but we forget that carbonic acid coming from our lungs has a much higher temperature than the surrounding atmosphere, consequently it rises. Make the discharge, therefore, in the ceiling or the chimney, and you are rid of it."
ed for converting an old boat into a lifeboat. M. Clarkson
has made the experimental cylinders on models furnished to has made the experimental cylinders on models furnished to
him by the Marine Department, and is, we believe, prepared to supply any number demanded. Air cases to place inside lifeboats, also made of this material, have been supplied to some of the mail steamers, and are much preferred by the Marine Department to cases of copper, iron, zinc, or wood, as they are practically indestructible, are not affected by heat, and are very light.-Nautical Magazine.

- Nothing can convey a more impressive idea of the power f water as a general agent than the wonderful cañons of Mexico, Texas, and the Rocky Mountains, where the torrents may be seen rushing along, through the incision it has cut for itself in the hard rock, at a depth of several thoueand feet between perpendicular walls. The greatest of there cañons, that of Colorado, is 298 miles in length, and its sides rise perpendicularly to a hight of 5,000 or 6,000 feet.

Dr. M. Wrman, who made the autopsy of Profersor Agassiz, states that the latter's brain weighed $53 \cdot 4$ ouncee.

## Comtegpondeuce.

Harmony of the Planetary Syatem.

## To the Editor of the Scientific American:

Allow me to remark that the so-called new harmonic law existing between the planetary distances and motions, published " to the world" in your issue of March 21, 1874, page 131, by Mr. Alfred Luther, as superior to Kepler's third law is only a deduction from the same, as is easily proved by ex pressing it in a formula.
The rule given by Mr. A. Luther is this: " The square roo of the quotient arising from dividing the distance of any ex terior planet by the distance of any interior planet, multiplied by the velocity of the exterior planet, shall $\epsilon$ qual the velocity of the interior planet." Calling the distances D and $d$ and the velocities V and $v$, then the formula corresponding to the rule is this: $\sqrt{\overline{\mathrm{D} \div d}} \times \mathrm{V}=v$. From this we deduce successively

$$
\frac{\overline{\mathrm{D}}}{\sqrt{d}}=\frac{v}{\mathrm{~V},} \text { or, by squaring, } \frac{\mathrm{D}}{d}=\frac{v^{2}}{\mathrm{~V}^{2}}
$$

giving the proportion $\mathrm{D}: d:: v^{2}: \nabla^{2}$, which means that the distances
According to Kepler's third law we have (calling the times of revolution R and $r) \mathrm{R}^{2}: r^{2}:: \mathrm{D}^{3}: d^{3}$, or, by extracting the square root, $\mathrm{R}: r:: \sqrt{\overline{\mathrm{D}^{3}}}: \sqrt{d^{3}}$
As the time of revolution is, for equal velocities, in the ratio of the distances, and for equal distances in the inverse ratio of the velocitiep, we have $\mathrm{R}: r:: \mathrm{D} \div \mathrm{V}: d \div v \ldots$.
By combining the proportions (1) and (2), we obtain
$\mathrm{D} \div \mathrm{V}: d \div v:: \sqrt{\mathrm{D}^{3}}: V \overline{d^{3}}$. Multiply with
$\mathrm{V}: v:: \mathrm{V}: v$; we obtain $\mathrm{D}: d:: \mathrm{V} \sqrt{\mathrm{D}^{3}}: v \sqrt{d^{3}}$, or

## $\mathrm{D}: d:: V \overline{\overline{\mathrm{~V}}^{2} \mathrm{D}^{3}}: \sqrt{{v^{2} d^{3}}^{3}}$

Squaring this equation, to eliminate the root sign, we have: $\mathrm{D}^{2}: d^{2}:: \mathrm{V}^{2} \mathrm{D}^{3}: v^{2} d^{3}$, a deduccion from Kepler's third law, in which velocity is substituted for time of revolution. Dividing Hence $V^{2} \mathrm{D}=v^{2} d$, or $\mathrm{D}: d:: v^{2}: \mathrm{V}^{2}$, showing that the statement that the distances are inversely' proportional to the squares of the velocities is nothing but one of the diegrises in which it is possible to clothe Kepler's third law. From this proportion, it follows directly that :
$\mathrm{V}^{2}=\frac{\mathrm{D} \times \mathrm{V}^{2} .}{d}$ and $\mathrm{V}=\sqrt{\boldsymbol{\mathrm { D }}} \times \mathrm{V}^{2}$,
which is the identical formula expressing the rule given by Mr. A. Luther.
P. H. Vander Weyde, M.D.

New York city.

## Calming the sea by Means or o1.

## To the Editor of the Scientifto American:

I have a suggestion to make which may be of muoh im portance to navigation in steamers. Although I have never tried my plan on so large a scale as is now proposed, I have tried it successfully on a small scale. It is simply to use oil in subduing or mitigating the force of the breaking wave. Some seventeen years ago, I fitted out a small iron steamer to go to the La Plata. She was of light construction and shallow draft of water, and was temporarily rigged as a three masted schooner. Her paddle wheels, minus one
half the buckets, were shipped and lashed; the deck or covering of the guards was omitted, so that nothing save the iron arms of the wheels and the supports of the guards, also of iron, remained to interfere with the sailing qualities of the vessel. She ieft Boston abont January 12, and arrived in the La Plata in sixty days, during which time the floats were occasionally shipped in full to carry her over calm spots. She had a keel put on with tap bolts, so contrived as to be taken off on arrival without docking, if required. Considering the stormy season of the year, and ignoring the fact that her officers and crew might more reasonably expect to be hanged rather than drowned, I made every provision for her safety; and among these, I lashed a half barrel of oil on the tatril rail and one on each side, and ordered the captain to allow a little to escape from the first in scudding, and a little from the one on the on the coast and in the Guif, and this afforded ample opportunity to test the calming effect of oil poured upon the tunity to test the calming effect of oil poured upon the
waters. It answered the purpose admirably, no sea ever waters. It answe.
breaking on board.
Now let me suppose a large cask of oil, stowed securely some ten feet, more or less, above the water line, on deck or under deck in an ocean steamer; attach to this a suitable hose of vulcanized rubber, with a emall orifice, perhaps half an inch, and let this he fitted to rig out by means of a spar something like the bowsprit of a cutter; have it fitted with guys and topping lift, and shove it out ahead thirty to fifty feet; to the hose attach a cock, to be under command of the officer of the deck, and let him discharge oil on the water whenever he sees a wave coming. Steam. ers going head to a heavy sea, as is well understood, must
reduce their speed materially and thus consume much time, or run the risk of getting heavy seas on board. Keen competition and the demand fur rapid runs cause the risk to be frequently incurred, and we hear of serious disasters every day. While I do not imagine that pouring oil on the troubled waters would keep absolutely dry the forecastle of a powerful steamer going head to a gale, I do religiously believe that it would do much to keep down the crest of a breaking wave, and that it would ena'le steamers to go directly against the sea, when, without the oil, they might
be compelled to take the sea "on the shoulder." No one
ever heard of a whaler with blubber about decks being boarded by a sea.
It would be certainly effective when the steamer is obliged to slow down to three or four knots, and also when laying to slow down to three or four knota,
to for repairs or cooling off bearings.
For light ships riding in exposed places, such as Nantucket South Shoal, Sandy Hook, and many other localities, the oil would be very satisfactory.
The only question in my mind is whether at high speed (for a gale and large sea), say nine or ten knots, the oil could be dropped far enough ahead to have the desired effect. The experiment can be tried very easily and at no great cost, by squirting out oil by a force pump, and if it should prove successful a more economical plan can be adopted. The cudding off the Cape, be deemed somewhat grease over in scudding off the Cape, be deemed somewhat Quixotic, and it
may be derided by some old salts who think they have nohing to learn. Let these go down to the Jersey coast and run a lifeboat off or on through a sharp surf, and they, being supplied with a bucket of oil, can be convinced of its ficacy in keeping the sea from breaking.
Milton, Mass.
R. B. Forbes.

## The Greatest Mine in the World-n-Ten Millions

 and a Halr in One Year.The Belcher gold and silver mine in the Comstock lode, Nevada, is without doubt the greatest bullion producing mine in the world. It has produced in the last two and a half years the imimense sum of $\$ 16,772,965$. In 1873 it produced $\$ 10,779,171$ and paid out as dividends $\$ 6,760,000$ dur ing the year, a large surplus being carried forward. By adding the dividends under the old organization and deducting the assessments levied, we have the following results up to March, 1874:
Dividends, June 1864 to May 1865 inclusive........ \$ 421,200 to 1872.
in Jan. and Feb. $18.7 \ddot{7}$.
Total dividends
Assessments Dec. 1865 to April 1871
Stockholders' profits. . . . . . . . . . . . . . . . . . . . . . . . . . . $\$ 9,744,800$
The cost of crushing the ore was $\$ 12.10$, and the cost of mining was $\$ 8.51$ per tun; total $\$ 20.61$. The number of tuns worked in 1873 was 154,664 ; the total receipts of bulion in 1873 were $\$ 10,779,171.07$; the average yield per tun in 1873 was $\$ 69.69$.
The bullion statement is as follows, from the stamped value of bullion as per assay certificates: Value in gold, $\$ 5,725,247.50$; value in silver, $\$ 5,009,520.51$; assay grains, $\$ 44,403.06$; total, $\$ 10,779,171.07$. Namber of ounces of re fined bullion, 4,173,535•74-100. Average fineness of gold, $66 \frac{1}{2}$ thousandths ;average fineness in silver, 0.929 thousandths. Value per ounce in gold, $\$ 1.37$ 19.100; value per ounce in silver, $\$ 1.20$ 2-100. Value of bullion per ounce, $\$ 2.57$ 21-100; average value per tun in gold, $\$ 37.16$; average value in silver, $\$ 32.53$; total value per tun, 69.69. This statement will appear strange to those who suppose the Comstock lode produces nothing but silver, as it shows that in this, the greatest producing line on the lode, the gold predominated.
This mine has no parallel in the world, the Crown Point, adjoining it, being the only one approaching it in richness. The mine produced in two and a half years nearly seventeen millions of dollars, and since its opening has paid nearly ten millions of dollars as dividends above all assessments. The success of this and the Crown Point has encouraged mine owners on the whole Comstock to pursue developments at greater depths. The circumstances connected with the development of the Belcher into 2 first class mine furnish an example for other mines in similar circumstances. After their ore gave out, they worked aystematically and uninter uptedly until they developed the largest ledge ever opened in any mine in the world.-Scientiflc and Mining Press.

## Pacific ocean Deep soa Soundinge.

At a recent meeting of the California Academy of Sciences, Profemsor Davidson announced some of the results of the soundings made by Captain George T. Belknap, of the United States steamer Tuscarora, during last year, with reference to the projected laying of a talegraphic cable from this coast to Japan. This work had accomplished a remarka ble development of the depths of the Pacific Ocean, which had no parallel in the plateaus of the Atlantic. The Tusce roza first started in her line of ooundings from the entrance to the Straits of Fuca,across that portion of the North Pacific designated as the Gulf of Alaska, toward the Asiatic coast. After leaving the entrance to the straits, the bottom slope gradually to a depth of 100 fathoms, and then a sudden de scent occurs, which reaches a depth of 1,400 fathoms, at a distance of 150 miles from the coast. The temperature of the water at the greatest depth on this line of survey was 34 degrees.
Commander Belknap then returned, prosecuting off and on soundings all along the coast to the entrance of San Francisco Bay. This work determined the fact that the sudden descent at the bottom of the Pacific to a great depth is continuous down the entire coast, varying from twenty to seventy miles out. In the latitude of San Francisco Bay, the great bench is reached a short distance off the Farallones, where the bottom suddenly descends to a depth of two miles. Off Cape Foulweather, the bottom descends precipitately from 400 fathoms to a depth of 1,500 fathoms, and then the plateau continues westward for bundreds of miles, and comparatively as legel as a billiard table. Off Cape Mendocino, where shoals have been erroneously supposed to exist, from the seaward jutting of the mountains, a depth of 2,200 fathoms
reached eighty miles from the shore. Thirty miles off the Golden Gate,the bottom is reached at 100 fathoms; at 55 miles, it has descended to 1,700 farhoms; and 100 miles out, ithout reaching bottom

## Improved Shifing Engine.

A new improvement on the shifting engines on the Pennylvania Railroad has been introduced, which is in great avor with those running them, and fully meets the expectaions of the company, at whose shops in Altoona they were constructed. The ordinary tankless "dinkey" bas to be upplied three times a day with coal and water, wbile enough fuel can be stored in the tank of the improved engine to ast three days, and water enough to supply the necessary team for a day and a half. The engine is also supplied with the steam bell, an invention perfected at the shops of the Pennsylvania Railroad Company. By pulling an appaatus in the cab by the engineer, the bell rings and continues to do so until he pushes it back to its natural position. The tank of the tender connected with the evgine has a capacity of 1,200 gallons of water and about three tuns of coal. The engineer is also enabled from his position to see the brakeman while coupling, which has a tendency to diminish accidents.-American Railroad Journal.

## Tunnels.

The completion of the Hoosac tunnel and the rapid progress of the Sutro have caused the miners both in the East and in the West to look with interest upon what has been and is projected in connection with tunnel driving. It is in Germany, says the Mining Journal, that the great tunnels have been construcced, and these have been made exclusively for mining. There is the great tunnel at Freiberg, twenty-four miles long; the Ernst-August and the Georg at Clausthsl, miles long; the Ernst-August and the Georg at Clausthsl,
thirteen and a half and ten and three quarters miles respect thirteen and a half and ten and three quarters miles respect
ively; the Joseph II. at Schemnitz, nine and a quarter miles; the Rotschonberg at Freiberg, eight miles; the Mont Cenis, seven and a balf miles, which about courpletes the European list. In the United States we have the Hoosac, in Massachusetts, five miles long; the Sutro, in Nevada, for pening up the celebrated Comstock lode: this tuncel, at though only four miles long, will, with its ramifications to the various mines of the district, prove one of the most important in America: the Sierra Madre tunnel at Black Hawk, commenced during the present year, and which will be twelve miles long, as well as San Carlos and Union Pacific tunnels, which are under two and a half miles. The Erast-dngust unnel was driven at the rate of a mile per annum, and it will be interesting to notice how long it will take the Americans, with all the approved appliances at present at command, to complete the nearly similar Sierra Madre turnel

## The New Geyser Basin.

That a new and most important geyser basin has been dis covered in Eastern Montana, seems now unquestionable. It was visited last fall by the well known mountaireers. Jack Baronett, John Dunn and John Allen. It is represented as much moreextensive than any of the already explored basins, and to contain geysers of much greater force and volume than any yet described by tourists. One of these newly discovered geysers is estimated to throw a volume of water forty $f \in \in t$ in iameter over five hundred feet high, and to continue in erupion from ten to fifteen minutes. It is also reported that in this newly discovered basin there are " mud volcanoes" far surpassing in volume and eruptive force those on the Upper Yellowstone. This unexplored spot of the most wonderful of all our natural wonders is about twenty-five miles southast of the summit of Mount Washburn, from which point the reater geysers, when in action, when the air is clear, are visible to the naked eye.-Avant Courier.

In a recent article upon "Swindling Patent Sellers," allu sion was made to a concern styled the Western Michigan Patent Agency, formerly of Albion, Mich. Messrs. G. L. Jocelyn \& Co., of Grand Rapids, proprietors of an establishment at that place entitled "Western Michigan Patent and General Collection Agency," write to us, requesting that our eaders may not confound their enterprize with any of the swindling concerns intended to be exposed by our article. The similarity in name, they fear, may lead to misapprehen sion, and they wish it understood that theirs is an honest and reliable concern, in proof of which they send us certifcates from leading citizens of Grand Rapids. These documents peak well of the personal and business merits of the Messrs. Jocelyn, and indicate that they are engaged in a usefu line of operations. Individuals who can so fully command the confidence of their fellow citizens as do these gentlemen have, we think, little reason to fear that the public will couple hem with the professional cheats against whom our former rticle was especially directed.

Object for the Polariscope.-Rev. William Law informs the English Mechanic that the following are two of the finest subjects for the polariscope which animal tissues can supply: Thin slices of the upper part of a pig's claw, cu transversely, and of the paw of the polar bear. Both are in describably beautiful. They are, when cut, dropped into strong spirits of turpentine and mounted in Canada balsam. The bristles of the hedgehog also form very beautiful objects for the polariscope.

The Optic Nerve.-By a microscope examination of the etina and optic nerve and the brain, M. Bauer found them o consist of globules of $\frac{1}{2800}$ to $\frac{1}{4000}$ of an inch in diamear, united by a transparent viscid and coagulable gelatinous luid. $-E$. Lovett.

Loiseau's Artificial Fuel Manufacture.
Mr. Emile T. Loiseau, of Mauch Chunk, Pa., the inventor of a very complete and, we believe, etficient process for the manufacture of artificial fuel out of coal waste (which, it will be remembered, was not long ago illustrated and described
in these columns), has recently obtained five patents through this oftice which cover the essential points of his improved machinery and system.
Mr. Loiseau, we also notice, has lately delivered an excel lent and able lecture on the subject of "Artificial Fuol" before the Franklin Instituse in Philadelphia, which has been printed in the Journal of that association. The subject has created considerable interest among those practical coal miners and owners of mines who realize the important problem of utilizing the immense quantities of coal dust which now cumber the ground in the vicinity of our mines.

The first of the patents above referred to relates to the entire process of manipulating coal waste to convert it into a conveniont fuel form by first mixing it with clay, then molding into blocks, drying, and finally applying a waterproof coat ing. Mixing and molding separately is the subject of a second patent, which covers machinery used to combine the coal dust with clay and lime water in suitable proportions, intro ducing it into a pug mill in a plastic state, and then deliver. ing it to compressing cylinders in a broad sheet. Within the cylinders, it is divided and pressed into blocks or lumps convenient for use anl passed to an apron to be dried and further prepared for use. The mixing apparatus, consieting of a tub in which are a number of arms and shafts constituting a movable spider in combination with a stationary one, is made the subject of a third patent. The various arms in this machine are su arranged that they revolve without interfering with each other while every portion of the material is submitted to their action. The fourth patent refers to the drying oven in which are a number of belts arranged one above the other, and connected by a system of gearing to carry the material back and forth and finally deliver it near the bottom. The belts are strengthened by ropes which carry a series of me:al balls which engage in recesses in drums, serving as cogs to propel the belts.
The last patent covers the waterproofing device, by means of which the fuel is coated with a material which renders it impervious to moisture. The machine has an endless belt which dips in a tank, and is guided therein by balls entering suitably inclined grooves. The lumps delivered on the apron are carried througn the liquid and are thus covered with a wa.erproof covering which dries upon exposure to the air.
Mr. Loiseau has also obtained foreign patents on his in
entions, and parties interested in mines at home or abroad ventions, and parties interested in mines at home or abroad
are invited by the inventor to examine into his system of are invited by the inventor to examine
utilizing what is now a waste substance.
The experimental trials, conducted some time ago to rest the heating powers of the product, indicated a very fair rate of power, and considerable cohesion. These qualitios were fully tested at the exhibition of the American Institute, and whery form question of cost, the inventor states that the
tured for about one dollar per tun.

## The Early Education of Children

In a lecture, Professor Walter H. Smith, of Boston, Mass., said that the want of accuracy in children should be no source of sorrow. He considered it more desirable that they should be dull and stupid at first, that their process of education might be more gradual and thorough. A rapid development should be checked rather than encouraged. One plan of instruction which was followed with success was a
course of study of lines and frrms, requiring the pupils to draw from description and dictation. Simple forms and objects should be selected first ; and when the purils are sufficiently advanced, more difficult and comples forms could be substituted, each step being so gradual that no perceptible improvement is shown at the time, but which, wheo looked upon afterward, will denote rapid progress. This plan, he said, insured perfect attention on the part of tis rupil, and developed an absorbing interest in the work.

## Now Process for Iron Making.

F. W. Gerhard has completed a new process which is attracting coasiderable notice. The invent:on consists in the manufacture of puddled iron direct from the ore, the use of the blast furnace being dispensed with. Instead of using pig iron, Gerhard uses a compound which he calls "iron coke," and which consists of a mixture of ore (or any substance containing iron), the necessary fluxes, and the equivalent of carbon. A lump of this compound is put into the furnace, and by the single process known to the puddler as "balling," a "heat" may be obtained in considerably less time and with considerably less labor than under the old meihod; the process of " melting" and "boiling" being ertirely dispensed with. The most important feature of the invention is the great saving which it effects in fuel. Bell estimates that $5 \frac{1}{2}$ tuns of coal are required to produce a single tun of bar iron, but Bennett Aitkins puts the amount at six tuns seven hundredweight. Taking the average at six tuns, it may be reckoned that two tuns are consumed in the blast furnace, and the remaining four tuns in the fin-
ished iron works. The protoxide of iron containing 77.78 ished iron works. The protoxide of iron containing 77.78
per cent requires 21.43 of carbon. The magnetic oxide containing $72 \cdot 41$ per cent requires $32 \cdot 17$ of carbon. Admitting that the three descriptions of iron ores were employed in the making of cast iion, by the new process, then 30 lbs. of carbon would suffice to produce 100 lbs . of cast iron; or a tun of iron, weighing $2,400 \mathrm{lbs}$., would require 750 lbs , carbon, a
aaving of $3,760 \mathrm{lbs}$. carbon as compared with the ordinary nethod. It is obvious tiat when heavy pieces of solid pia ron are placed in a puddling furnace to be melted, the greater portion of heat is wasted, and after it is liquefied a
much longer time is required to eliminate the carbon which it contains and other extraneous elements of which it is com pused, with a continuation of an immense waste of fuel. On the contrary, when the "iron coke" is thrown into the heated furnace, the carbon which it contains immediately acts upon the oxygen contained in the ore. Even the Bar row hematite-one of the most refractory of ores-is ready for " balling" with a much less expenditure, of time, labor, and fuel, than by the old process. These statements have been abundantly verified by experiments made in the pres ence of practical ironmasters and ironworkers, who spea
very highly of the merits and importance of the invention.

## Launch of the Cable ship Faraday.

The new cable steamship Faraday, which has been built by Messrs. C. Mitchell \& Co., Newcastle, England, for the Mesers. Siemens Brothers, for the purpose of laying their Atlantic cable, was launched on the 17th of February last.
The vessel has been built to the order of Messrs. Siemenis Brothere, London, for the purpose of laying their Atlantic cables, and in every requisite the ship is certainly one of the most perfect of its kind. The steamer is 360 feet long, 52 feet beam and 36 feet deep. Her grcss register tunnage s a bout 5,000 , and her dead carrying weight about 6,000 tune The iron hull, built under the inspection of Llogds' agents will be accorded the higbest certificate of classification. From her peculiar structure, the vessel receives enoraous strength in addition to the usual requirements of Lloyds' rules. Sup. porting the sides of the vessel are three enormous cable tanks, constructed of plate iron, and forming a series of double arches. 'i hese are united together, and attached to the general fabric of the vessel by five icon decks. For the comfort and convenience of those on board, the upper and main decks are supplemented by the usual decks of wood. The Faraday is double bottomed, and in the space below the two bottoms is a net work of iron girders for carrying the cable tanks, and these give also a longitudinal strength to that portion of the hull. Water ballaat is also carried in this space, by which the ship may be trimmed as the paying out of the cable is carried on. This arrangement has likewise the advantage of dispensing with cargo or other dead weight beyond fuel. For the purpose of filling and emptying single compartments of the double bottom, or for flooding any one of the cable tanks, a complete and well devised system of valves, cocks, pipes, and auxiliary engine power has been introduced; and the systen, which is worked from the engine room, is under the control of the engineer. The bow and stern of the ves sel are of the same form, and in this respect she is unlike othe vessels in outward appearance. Rudders are provided a each end, and she can thus be navigated ahead or astern, as may be desired when paying out or picking up a cable Each rudder, to provide against accident, is supplied with manual power and the gear, worked in the usual manner by steam engine placed amidships. Harfield's steam windla works the anchors and cable chains, and steam apparatus, placed in various positions along the deck, performs all the heavy labor about the vessel. The rigging is after th most approved manner of ocean tion is provided of the most complete nature, for the large sta of oticers, electricians and crew, numbering about 150 persons. In addition to the multifarious appliances of a cable ship, the vessel will be fitted up with all the cabins and appliances of a large passenger steamer, and will be propelled by machinery of the compound, surface-condensing principle, which has been constructed by Messrs. T. Clark \& Co., of Newcastle To obtain increased steering or manœuvring power-an im portant condition in cable laying-the steaner will be pro vided with two propellers, commonly termed "twin screws," which will be worked by two separate sets of engines, place vertically over the shaft, each with two cylinders, one at hig and the other at low pressure. By this means great regularit of motion will be obtained, and by a high degree of expan sion, in working the system, fuel will be greatly econo mized, to an extent that would have been considered im practicable a few years ago. The deck machinery for the paying out of the cable is being manufactured by the Vulcan Foundery Company, who are experienced in this branch of work. It is needless to say that the Faraday has been called after the great English chemist and natural philosopher of that name.

English and American Rallways.
The London Railioay Nevos has some interesting com. parisons of English and American railway returns, and in the matter of rolling stock and train earnings is surprised to find the American roads more economically run than the English. Taking four roads in each country, aggregating about 4,000 miles, it is found that the American road has only 0.33 of a locomotive and 6.72 freight cars per mile, while the English has 0.93 of a locomotive and 28.83 cars. The New York Central,'with a heavier traffic than ؛he London ond Northwestern, has half the locomotive per mile. The English refuse to believe that the superior size and strength of American locomotives account fully for this difference. The earnings, for instance, of an American locomotive are 70 per cent more than
those of an English, and the entire rolling stock, which in those of an English, and the entire rolling stock, which in England barely pays for itself in a year, in this country pays for itself and 65 per cent more. The Necos also discovers that, while passenger fares are 30 per cent lower than in England, the earnings per train here are 4 per cent more, and o freighi trains 15 per cent more, than on the Engliah roads.

Plpe Way Transportation.
Pipe way transportation is coming into favor in theoil regions of Penngylvania, to carry petroleum from the wolls to sta ions on the railway. The longest pipe way is 15 miles, vercoming 400 feet of elevation by steam pressure at the antrance to the tube This system of transportation is so in dependent of weather and bad ronds, and so preventive of leakage, and gives such thorough satisfaction without any rawbacks that public attention is directed to many other prac ical applications of the same system.
Twenty-five years ago, on the national road between Cum berland and the bituminous coal field beyond, we-saw a smal rivulet turned to similar account in the cheap transportation of coal. A zigzag, ti inch board flume followed the tortuous course of the petty stream and carried 6 inches depth of water and 12 inches surface. A dam collected water enough to make two runs of coala aday. Each run bore in its current 30 tuns of coal, fed from a chute with a rake. The distance is under miles; the fall was at least 20 feet to the mile. The coal floated along with ease, carrying with it chunks of slate and con glomerate rock. There were chutes for its reception or the turnpike. These had screens, over which the coal passed, being perfectly cleansed and polished before entering. All day long wagons were seif. loading under these chutes. The cost of transportation over the water way was merely nom.

It was an easy step for invention to suggest pipe ways for similar tiansportation of fluids, and for mails and ackager, by pressure of condersed air, as now used in London It is not generally known that, in France, the pipe way ays em has been used for ten years past in transporting bet juice from the field to the sugaries. The sugaries at Cambri work up annually 246,000 tuns of beets; they are supplied with beet juice through 62 miles of pipe, now being extended to 100 miles, in many ramifications.
At points central to cultivation, works are erected for rasp ng beets and expressing juice. Milk of lime is immediate y added to prevent decomposition; and after inspection and measurement, the saccharine stream is turued into the pip way and delivered at the terminal sugaries, the long contact with lime and the thorough agitaion puriffing the juice more perfectly than usual. It is estimated that, during 1874 there will be a total length of such pipe ways of 560 miles, doing service between thescattered beet fields and the condensed sugar works of France.
The pipes are placed two feet eight inches below the surface, nd steam engines compress the air as desired. All degrees of elevation are thus surmounted. The juice has a gravity of one degree Baumé on entering, and the same when dis harged.
This pipe way system so economizes sugar making that it wonderfully multiplies the sugaries. No investment excels hat concerned in this production. Farmers find it far better than other crops. Pipe way stocks are in high favor, and su garies pay best of all.
If new industries are needful to the future progress of California, here is one that should beconsidered. It offers a wide field for expansion, without risk of oversupplies: and if the right soil be selected, the crop is sure, and the profits of su ar-making
ntific Press.

Norwegian Antiquities.
at a recent meeting of the California Academy of Sciences, R. E. C. Stearns read an interesting translation from the re ports of the Society for the Preservation of the Norwegian Antiquities. It described the excavation of an ancient ves sel, of the Viking period, found in the parish of Tane, Nor way. It was the custom of the Vikings to convert one of their vesselsintoa sarcophagus, on thedeath of a greai warrior The vessel was conveyed inland, the remains of the hero de posited in the hull, with his armor, weapons, the bones of his war chargers, and the whole covered with earth. These tumull have been discovered and excavated in various parts o Norway, and the peculiarities of ancient marine architecture exposed for inspection.

## Good Work in Canada.

Mr. A. Davis, of Belleville station, on the Grand Trunk Railway of Canada, forwards us a list of twenty one subscribers, obtained among the 132 workmen under his charge This is an excellent showing both for our correspondent avd his men, as it indicates on his part a desire to benefit those in his employ, by placing within their reach information of practical value in their callings. while the workmen them selves exhibit good sense and intelligence in availing them selves of the advantages offered.
Mr. Davis tells us that more names are yet 10 come, and adds: "I take much pains in having my men first claes." We think,from the fact of his obtaining so many subscribers out of the comparatively small number of men uuder him that Mr. Davis supports his claim for the good qualities of his men.

Prebervation of Wooden Labels.-The following method of preserving wooden labels that are to be used on trees or in exposed places is recommended: Thoroughly soak the pieces of wood in a strong solution of sulphate o iron; then lay them, after they are dry, in lime water. This causes the formation of sulphate of lime, a very insoluble salt, in the wood. The rapid destruction of the labels by the weather is thus prevented. Bast, mate, twine, and other substances used in tying or covering up trees and plants when treated in the same manner, are similarly preserved. At a recent meeting of a horticultural society in Berlin wooden labels, thus treated, were shown, which had been con. stantly exposed to the weather during two years witbout

IMPROVED STOVE FOR SMOKE HOUSES.
The invention represented in the annexed engravings is a stove or furnace in which it is propose3 to generate smoke by burning twigs or other suitable fuel. The device is to be used in the ordinary smoke house for curing meats, and is so constructed as to produce a large volume of smoke, regulate its production, and insure safety against fire.
The body, which may be made of any suitable material, is provided with perforations on top and also at the sides. Within is the grate, A, shown through the broken-away portion of Fig. 1, and in the sectional view, Fig. 2, which is formed with inclined sides and a horizontal middle portion provided with aper tures closed by the damper, B, Fig. 2. By this arrangement, it is claimed, the admission of air to the fuel, and the combustion thereof, can be regulated with great exactness, to suit dry or green wood, or any other cause of variation in the smoke-producing circumstances.
In the upper part of the chamber is placed a partition, $C$, also having inclined sides through which are a number of perforations. These apertures are governed by suitable dampers, the handle of which is shown at D, Fig. 1, and which regulate somewhat the combustion in the grate below, according to the condition of the wood or the draft.
The device is quite simple and is said to be very efficient in operation. It is covered by two patents, dated October 15 1872, and December 2, 1873.
Further particulars may be obtained by addressing the inventor, Mr. Isaac $N$ Deardorff, Canal Dover Tuscarawas coun. ty, Ohio.

## MPROVED TURBINE WHEEL.

The invention herewith illustrated is an improvement in the gates and chutes of a turbine, in order that an unbroken sheet of water may be admitted to strike the wheel without becoming expanded or interrupted, and this whether the gate be fully or partially open. The issues or guide chutes are opened from their inner ends, and the water brought at once in contact with the buckets of the wheel. By this means, it is claimed, the greatest possible percentage of power with a partially drawn gate is obtained, and it is said that there is no de crease of power when the gates are partially closed. The inventor asserts that, if there be any loss, it must be when the issues are fully open.

Fig. 1 shows the device in perspective, and Figs. 2 and 3 are respectively vertical and hori zontal sections. A, in the latter illustrations, is a rotating gate placed between the top and bot tom plates, and resting on the top of the tail water tube, as represented in Fig. 2. In this are made openings, B , which correspond to the buckets of the wheel and form thwarts for admission of the water. To one side of each aper ture are kejed the adjustable wings, $C$, which uide the water in connection with the curved guide D. The later extend in part, curved cbutes, $D$. The latter extend, in part, along the circumference of the wheel and then turn out-
wardly. On the inner periphery of the gate, A, is a rack, in which a pinion on the vertical rod, E, engages, by which mechanism the gate is rotated so as to open the orifices, B, more or less, as desired. The wings are guided by pins, $F$, when the ring, $A$, is turned, and thereby the equal flow of water for the different positions of the latter is secured, it is claimed, without break or interruption.

This construction, it will be noted, is quite simple, and obviates the use of considerable mechanism. The whole curb, it is stated, by suitably reversing it when down, can be applied to either a righ or a left hand wheel. The two sets of patterns ordinarily required for casting either description of wheel are consequently not needed, thus adding to the economy of the apparatus. The gate will open under high heads about as readiIy as under low ones, as the only force to be overcome is the mere weight of the ring which supports the pressure. The appliance, being thus balanced under all heads, is well fitted
for the application of a governor. The device is also claimed to be free from danger of injury or obstruction from anything that can come into the guides. The chutes also cannot interfere with the gate and prevent its operation. The invention is said to be applicable to any and all of the class of wheels called vertical, whether they discharge the water dowtward, centrally, or outward.
The use of the internal circular gate also, it is believed, permits of the constructing of a cheap wheel of wood, by setting the guide chutes of blocks of that material between the floor of the flume and the upper curb of plank, and gri-

## Fiq. 1



## DEARDORFF'S STOVE FOR SMOKE HOUSES.

ping with scantling frame. The ring may be made of square bar iron rolled in circular form, and plates of boiler iron cut to required width and length, and fastened to the circle by rivets. In time of drought, the quantity of water used may be regulated by attaching strips of plank upon the faces of he guide chutes.
Patented through the Scientific American Patent Agency September 9, 1873. For further particulars address the in


## HERRIMAN'S MMPROVED TURBINE WHEEL

entor, Mr. Angus A. Herriman, Owen Sound, Ontario, Ca nada.

To Improve the Adhesion of Gum Arabic.-It is a well known fact that gum arabic will not cause some kinds of blotting paper to adhere. This may be remedied by adding, to eight ounces of the concentrated solution, 16 grains of aluminum sulphate. Alum answers also, but not so well. placed in it.

Electro-Sympathetic Clocks.
Among the many objects of interest in the recent Art Exhibition of Dundee, perhaps few things excited more interest among the visitors than a clock worked by electricity in connection with a normal or master clock. Messrs. Ritchie and Sons, of Edinburgh, whose names are familiar in connection with the time-gun signal, introduced the system some time since, and this system the present clocks are intended to illustrate. The master clock, which is one merely of an.ordinary kind, requiring to be wound up periodically, is placed on the platform of the large hall. The oscillations of its pendulum are used to complete contact between the poles of a galvanic battery on the top of the clock case. There are two cells of the ordinary Daniell's sulphate of copper battery, one pole of each being placed in metallic connection with the gas pipe, and the other pole terminating in a slender spring, against which the pendulum rod impinges; and while contact is thus obtained alternately withone or other spring, a current of positive or negative electricity is sent through the pendulum rod, along the insulated wire connected with it to the other end of the hall, where the sympathetic clock is placed. This differs from previous electric clocks, and is provided with a magnetic pendulum, consisting of a wooden rod hav. ing a bollow coil or bobbin of insulated copper wire, the ends of which are attached to the suspension springs on which the pendulum is hung. A double bundle of permanent magnets is fixed in the center of this bobbin, their similar poles being placed to. wards each other. An attraction to and rewards each other. An attraction to and re-
pulsion from the poles of the magnet hung in the center of the coil is caused by the passage of the currents of electricity throurh the wire coil of the pendulum, in which motion is thus produced and maintained. The makers have constructed a simple but effective escapement, or rather propelment, by which two arms are alternately raised by the pendulum out of action with the record wheel of the clockwork, and when released, by mere force of gravity, push forward the wheel work and hands by sudden and decided steps, which are thus registered by the hands of the clock. There is such a pecu. liarity in the construction of the pallets that no probable force can push forward the hands beyond the fixed stops, and no power less than the weight of the gravity arm will drive the wheel work back wards.
The difference between this system and that which works electric clocks hitherto in use is that the passing currents of electricity are employed merely to maintain motion in the pendulum, which is effected by a very weak battery; and from the great momentum, these currents may be intermitted or the wire cut for even two minutes at a time without destroying the coincidence of time shown by the sympathetic clock, which is dependent on the motion of its own pendulum, and not in any way upon the power of the battery. This allows the opportunity of causing several clocks attached to the same wire circuit to report their accuracy by making each clock at a certain second to cut the wire connection during that second, and thus the flow of the current is prevented, By means of a galvanometer placed in the wire these dropped seconds are observed, and the correctness of the re. spective clocks guaranteed. Whatever the number of clocks placed on the same wire circuit, all of them will, of course, act in unison with the beat of the normal or master clock.-1 he Engi. neer.

## Coffee and milk as an Aliment.

The stimulating and tonic effect of coffee alone is well known, and also the value of milk alone as analiment, and of them both when taken alone at long intervals. Abbé Moigno states, however, that when mixed they form a compound absolutely indigestible and unassimilable He attributes this to the fact that coffee is rich in tannin, and that its mixture with milk transforms the albumen and casein into a sort of indigestible and imputrescible substance, as is formed in the tan vat when animal tissue is


## A NEW BIRD OF PARADISE.

Three species of birds of Paradise, hitherto unknown to ornithologists, have recently been discovered in the islands of the Malayan archipelago, the aboriginal home of all the tribe. Weillustrate herewith one of the thin billedkind, named (after the eminent naturalist Elliott) the epimachus Ellioti.
Before presenting this interesting novelty to our readers, we may glance for a moment at the other members of the family to which it belongs. It is but of late years that birds of Paradise have reached us in a perfect state, although for more than a century the natives of the Molucca Islands seem to have befn aware of their value, and to have employed them as articles of commerce. The British Museum, in common with other collections, still contains examples of Paradise birds with mutilated wings and without feet; and this was so generally their condition that two skins of Paradieea papuana, in that national collection, were thought to be splendid examples in their day, since they actually possessed the latter.
Che specimen we here with illustrate forms a second species of the genus epimachus, the only repre sentative of which was $e$. speciosus, from New Guinea, a bird which, if remarkable for its plumage, was at for its plumage, was at
least one of the oldest and least one of the oldest and
beat known of the birds of best known of the birds of
Paradise. It is therefore of great interest to procure a second and thoroughly distinct species after the lapse of so many years. It is easily distinguished from its ally by its violet or pur ple tail, in addition to its emall size: and, regarding ite plumage, we quote (says the London Field, from which we take the illustra.
tion) the following remarks tion) the following remar
from Mr. Elliott's work:
from Mr. Elliott's work:
The epimachus Ellioti is only about two thirds the size of its large relative ( $e$. speciosus); but it is possessed of far more brllliant colors in its plumage, and in the sunlight must present a beautiful appearance sent a beautifulappearance
indeed, as its rich velvety indeed, as its rich velvety
feathers show off their feathers show off their
changeable hues of purple and green, with the metallic colors of the tips of the side plumes flashing on the eye as the bird raises them tremblingly over its wings. The broad tail feathers, with their amethyst dyes, look not unlike watered look not unlike watered
silk, and are of a velvety silk, and are of a velvety
coftness, as is indeed the Eoftness, as is indeed the
entire plumage of the body.

## Essential Olls.

Essential oils are volatile, and may be distilled without d $\in$ composition ; without $d \in$ composition;
they are the product of they are the product of
flowers, plants, fruits, or flowers, plants, fruits, or
the juice of certain odorifethe juice of certain odorife-
rous woods. Essential oils differ from the fixed oils obtained from fatty substances; for while the latter are compounds of glycerin and fatty acios, the former are generally hydrocarbons, but sometimes contain ailso oxygen and suiphur. The fixed oils combine with al kalies to form soaps, but the essential oils do not. All essential oils have powerful odors, and many of them have a hot, aromatic taste. The odor is sometimes agreeable, and at other times repulsive. The most fragrant are (il of rose, jessamine, tuberose, orange flowers, heliotrope, violet, bergamot, and lavender. Paper is rendered permanently transparent by an application of fixed oils; but only temporarily so by the use of volatile preparations. Essential oils are soluble in alcohol and ether; but only partial ly so when immersed in water. Many of them are found ready formed in plants, and give the peculiar odor to the leaves, flowers, and fruits which make the acquaintance of our olfactories.
The volatile oils are, in many instances, isomeric, that is, composed of the same elements and the same proportions, but with different properties. Chemical science, however, has not yet been able to convert the one into the other, most probably on acccunt of the different groupings of the same number of elements.
Oil of lemon and oil of orange peel are obtained by placing the rinds in a linen cloth and subjecting them to a powerful
pressure between iron plates. The vessel in which the pressure is applied should have a discharge pipe at the bottom. The oils thus obtained are impure, but extraneous matter is separated by careful filtration. Orange flowers, or neroli, has the same chemical composition as the above, but is possessed of more fragrance. In obtaining the last named, more care is necespary, and the petals are subjected to distillation with the vapor of water. Oil of orange flowers, when fresh from the still, is almost colorless; but by age and exposure it soon acquires a red color. It is easily rendered soluble in alcohol, and is extensively used in the manufacture of cologne wa$t_{r}$ Oil of rose is the most expensive as well as the most flagrant of all the essential oils. There are two varieties of this article, one of which is obtained from the East Indies, and is the product of the rosx moschata; the other comes from the Levant, and is obtained from rosa sempervirens. In from the Levant, and is obtained from rosa semperviren.s. In
the east, the petals of the rose and other flowers are collected, immersed in spring water, and afterward exposed to the direct rays of the sun. In the course of a few days yellow


## A NEW BIRD OF PARADISE

There are said to be over one hundred varieties of essential oils, very similar in chemical properties, but differing greatly in taste and smell. The oil is bidden away in little cells which require to be broken before the tlower exudes its real fragrance. Violet, heliotrope, and several other delicate perfumes are subjected to infusion and absorption in melted tallow or lard, and in this manner their oil is secured.
Jessamine, tuberose, and other flowers that are injured by heat are subjected to absorption alone. This process is extensively used in several parts of France, and is termed en. fleurage. Oil of camphor is obtained from the wood or gum by distillation with water; it is subsequently purified by repeated sublimation. The wood, however, is the most generally used for this purpose. It is insoluble in water, but easily soluble in alcohol, ether, and the fixed oils. Oil of turpentine is obtained by distillivg the crude juica alone or in water, and is made pure by repeated rectification with water. It is a colorless liquid with a strong aromatic but disagreeablo odor. It is of great value in the arts, and for medicinal purposes. Oil of juniper has a different composition, but is obtained from fresh berries after being pounded thoroughly and macerated several hours in water. The subsequent process of distillation is much the same as in respect to turpentine. Oils of cassa. fras and hemlock are obtained in a manner sixilar to the distillation of most woods and barks, bat require very cartfill preparation, as well as spplication of the required means to obof the required means pain satisfactory and profit-
tain tain satisfactory and profit-
able results.-- Nein York Merable results.-- Ver
cantile Journel.

Dry Plate Photography.
Mr. H. Houlgrave gives the following formula: He mixed thirty grains of crystallized bromide of cadmium and fifteen grains of pyroxglin with one ounce of etber and one onnce of alcohol, cotton giving a powdery collodion, not succeedirg like one that gave a tough film In a level stereo-d.epe'oping glass dieh, he poured one ounce of the above, and, after leaving it for about two hours to set, he filled up the dish with his bath solution of silver, of about seventy grains strength. After a time he raised the film with a silver fruit knife to allow the solution to flow underneath, and left it to soak a little longer. After pouring off the bath solution he poured on his first washing water, which, from constant use, contained about five grains of silver to the ounce. This was left on the film about balf an hour, and then saved for future use. The dish was then filled up with rain water, leaving it two or three hours, and washing again until all milkiness bad disappeared. After well drain. ing, the film was hung up to dry by artificial heat, as it took too long to dry otherwise. The pellicle was then of a very horny nature, and of a very horny nature, and
could be cut and kept till could be cut and kept till wanted; of course the wash.
ing had to be conducted in the dark room. With one drops of oil collect on top, and are taken up by a bunch of cotton tied to the end of a stick. Wben sufficient is gathered adding equal quantities of ether and alcohol, and to that in this way, the oil is pressed out of the cotton. In some sections the whole flower is subjected to distillation, the calyx remaining entire as it is plucked from the stem. In Egypt the petals of flowers, and especially roses, are subjected to distillation with water in copper stills. Some manufacturers of essential oils place alternate layers of rose leaves and sesame seeds in a vessel, where they are allowed to remain about a fortnight, when fresn layers of roses are added, and this operation is repeated several times, or until the seeds have absorbed sufficient oil, when they are subjected to pressure, the rose oil collecting on top, and the oil of the sesame seeds separating and settling to the bottom. Oil of rose is a thick yellow liquid, which solidifies at a low temperature, and becomes a viscid mass. When concentrated, its odor is so strong as to cause headache, and it is only when diluted that its fragrance can be best appreciated. Its sweetness is not injured by the action of sulphuric acid.
quantity he added forty minims of a sixty. grain tannin solution. When the pellicle dissolved-which took some time unless constantly shaken up-he coated his plates, placing them at once in his drying box without any further washing, using no substratum. He preferred an edging of india rubber solution before pouring on the emulsion. In develop. ment he first moistened his plates with pure alcohol, washed with water, and then developed with a three-grain solution of pyrogallic acid, adding one drop of a twenty.grain solution of bromide of potassium and one drop of a sixty-grain solution of bicarbonate of ammonia.

DURING the past ten years, the screw has entirely replaced the paddle in transatlantic navigation, the weight of marine engines has diminished one half, the steam pressure has quadrupled, and the consumption of coal has decreased two thirds.

## ASTRONOMICAL NOTES.

Observatory of Vassar College.
For the computations of the following notes (which are approximate only) and for most of the observations, I am ndebted to students.

Ponitions of Planets for April, 1874.
Mercury.
This planet, which was so beautiful in the evening twi ght in March, rises in April before the sun, and should be ooked for in the morning. Its declination is so much far her south than in March that it cannot be so well seen.
On the 1st of April, Mercury rises about $5 \mathrm{~A} . \mathrm{M}$. , and sets at 4h. 31m. P. M. On the 30th, Mercury rises at 4 h . 19 m . A. M., and sets at 4 h .47 m . P. M.

## Venus.

On the 1st of April, Venus rises at 6 h .14 m . A. M., and sets at 7 h .6 m . P. M. On the 30th, Venus rises at 5 h .49 m . A. M., and sets at 8 h .19 m . P. M.

Venus should be seen after sunset, almost directly in the s un's path on the first half of the month; after that date it will be further north than the sun and can be seen for some time after sunset. Venus and the moon will be in conjunction on the 17th.

## Mars.

Mars will at present scarcely repay the observer who attempts to study its phenomena, even with the aid of a good telescope.
On the 1st, Mars rises at 6 h .51 m . A. M., and sets at 8 h . 35 m . P.M. On the 30 th , Mars rises at 5 h .54 m . A. M., and sets at 8 h .30 m . P. M.

## Jupiter.

On April 1, Jupiter rises at 4 h .50 m. P. M., and sets at 5 h . 14 m . A. M. On the 30 th , it rises at 2 h .43 m . P. M., and sets at 3 h .15 m . the next morning.
Jupiter is the great beauty of our evening skies all through the montk. It should be observed between 9 P. M. and midnight, when it is not far from meridian. Its motion among the stars is retrograde, or toward the west, and it is so great that from night to night its change of place can be detected.
The phenomena resulting from the motions of the sat. ellites on the 7th and 15th of the monih are very interesting, and some of them can be seen with a small telescope. On the 7th the fourth satellite will disappear by eclipse-it will pass into the shadow of Jupiter, and before it comes out the first satellite will disappear by transit-that is, it will be
projected on the fuce of Jupiter and will be lost in the light of the planet.
On the evening of the 15th, the fourth and second satellites of Jupiter make transits across the face of the planet nearly at the same time; with a powerful tclescope both will be seen projected on the diak, but they cannot be detected by a telescope of low power; they will be lost in the light of Jupiter, and the planet will seem to have but two moens.

Saturn.
Saturn is very unfavorably situated, as it is far south, rises in the early morning and sets on the 1st a little after 1 P.M. and on the 30th before noon.

## Uranus.

Uranus is well situated for observation, but requires a a pretty good telescope to render it interesting. It rises on April 1 at 0 h .42 m . P. M., and sets at 3 h . 7 m . the next morning. On the 30 th, Uranus rises at 10 h .49

Neptune.
It is useless to attempt observations on Neptune at present. It comes to the meridian nearly at the sume time with the sun, and makes nearly the same diurnal path.

Meteors.
But few meteors have been seen during February and the first half of March. The only one reported of any considerable size was seen on February 28, south of Sirins, at 8 h . 30 m. P. M. The moon was nearly full, yet it appeared brighter than Jupiter. Several meteors were seen between 8 and 9 P. M. of the 15 th of March.

## Barometer and Thermometer.

The meteorological journal from February 14 to March 14 gives the highest barometer, February 25, 30.51 ; the lowest barometer, March 10, 29.46; the highest thermometer, March 4, at 2 P. M., 53'; the lowest thermometer, February 18 , at $7 \mathrm{~A} . \mathrm{M} ., 11^{\circ}$.

## Amount of Rain.

The rain which fell during the night of February 20 amounted to 021 inckes.
The rain which fell between the afternoon of February 22 and the morning of February 23 amounted to 0.28 inches. The rain which fell during the night of March 3 and the morning of March 4 amounted to $0 \cdot 16$ inches.

## A Street Fire。

In this city, recently, a one horse truck laden with twentyseven cases of naphtha was being driven up Third avenue by an employee of the Gas Meter's Saving Company. When near 14th street,thedriver struck a match and threw the end of it among the cans. In an instant the whole contents were
in a bleze. The driver sprang out and left the vehicle to its fate. The horse, a fine young animal, reared and plunged with fright, but the traces and harness confined him to the burning pile. Superintendent Hartield, of Mr. Bergh's socity, riding up on a car, sprang off at the spot, and, under a scorching fire, unhitched the animal and saved it from a horrible death. In ten minutes the wagon was a small heap of charred fragments. The flames reacled the top story of
the house at the corner of 13 th street and Third avenue. An alarm of fire was sounded by telegraph, and the hook and ladder apparatus was quickly on the spot and assisted to put out the flames.

## The Basking Shark.

An interesting ichthyological discovery has lately been made by Professor Steenstrup, of Copenhagen. He finds that certain comblite bodies, which have been supposed to be appendages of the skin of certain sharks, are really shifting organs appended to the interior of the gill apertures of the basking shark; and he infers that this fish, the largest shark of the northern regions, which attains a length of thirty five feet or more, lives, like the still more gigantic whales, upon the bodies of small marine animals strained from the water by these peculiar fringes. The very fine rays composing the fringes are five or six inches long, and were some years ago shown by Professor Hanover to consist of dentine, so that each of them may be regarded as, to a certain extent, the analogue of a tooth. It is remarkable that Bishop Gunnerus, who originally described the basking shark (selachus maxi$m u s$ ) and regarded it as the fieh that swallowed the prophet Jonah, noticed the existence of these branchial sieves more than a century ago.-Science Gossip.
Prize for an Alcoholometicr.-M.Léon Say has proposed to one of the commissions of the French Assembly that a prize of 200 francs should be offered for the discovery of a process by which it may be possible to determine inmediately and practically the amount of alcohol in any mixture, no matter of the proposal, and M. Dampierre was charged to draw up a report on the subject.

A Reddish Brown Paint for Wood.-The wood is first washed with a solution of 1 lb . cupric sulphate in 1 gallon of water, and then with $\frac{1}{2} \mathrm{lb}$. potasssum ferrocyanide dissolved in 1 gallon of water. The resulting brown cupric ferrocyanide withstands the weather, and is not attacked by insects. It may be covered, if desired, with a coat of linseed oil varnish.

Mr. W. R. Norris, the inventor of the diagonal planer il ustrated on page 198 of our last issue, desires us to sta-e that the capacity for work of his machine is fifty doors, each 2 feet 6 inches by 6 feet 6 inches, per hour, and not per day, as stated in the description.

## IMPORTANCE OF ADVERTISING.

The value of advertisting is so well understood by old established busin ess arms that a hint to them Is unnecessary; but to persons establishinga new business, or having for sale a new article, or wishing to sell a patent, or find
a manofacturer to work it: upon such a class, we would impress the impor tance of advertising. The next thing to be considered is the medi m through which to do 1 t .
In this matter, discretion is to be used at first ; but experience will soon determine that papers or magazines having the largest circulation, amons
the class of persons most likely to be interested in the be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no ether source from which the adver tiser can get as speedy
soikntifio Amebiony.
We do not make these suggeations merely to increase our advertising patronage, but to direct persons how to increase their own business. The Scientific Ambioan has a circulation of more than 42,000 coples the other papers of its kind published in tne woria.

Inventions Patented in England by Americans
[Compiled from the Commissioners of Patents' Journal.]
From February 24 to March 2, 1874, inclusive.
From Febrary 2 to March 2, 1874, inclu
Cartbider Machinery.-C. H. Webb, Brooklyn, N. Y.
Corrdating Machine.-H. w. Lafferty et al., Gloucester, n. J. Emiry Grindirg.-C. Heaton (of New York city), Londoa, England. feid Watir Heatre, etc.-I. P. Magoon, St. Johnbbury, Vt.
Floor Covering.-J.L. Kendall, Foxboro' Mass. Floor Covering.-J. L. Kendall. Foxboro', Mabs Journal Box.-J. N. Smith, Jersey city, N. J.
Loom Harariss, ETO.-J. Mlada, Boston, Mass
Sewing Machise.-I. M. Singer of New Y
Twisting Friseg.-W. Brooks, Remington, Vt.

## DECISIONS OF THE COURTS.

Supreme Court--District of Columbia. oonilin and btafford.-patent stradding cultivator.
Opinton of the court delivered by Mac Arthur, Judge

 b








April 4, 1874.1
§rieutific ${ }^{\text {An mexicau. }}$

Improved Spring Bottom Cot.
Francis E. Lord and Herman K. Blanchard, Cambridgeport, Mass.-The rame consists of two side bars connected at their ends by two cross strips and near thetr ends by two cross bars. The legs are plvoted to the side
bars, and the lower parts of each pair are connected by a cross strip. In bars, and the lower parts of each pair are connected by a cross strip. In
the ends of the cross strips are formed slots, the inner parts of which are
made suffclently large to receive the heads of the braces, and their outer madts are made narrow to fit upon the necks of said braces. The latter are
pare pivoted to the side bars in such a position that their heads, when the legs
are extended, may pass through the larger parts of the slots in the cross are extended, may pass through the larger parts of the slots in the cross
strips. The braces are then slipped close up to the legs, which brings their strips. The braces are then slipped close up to the legs, which brings their
necks into the narrow parts of the slots in the cross strips, and secarely fastens the sald legs in place. This construction enables the legs and braces
to be turned up along the fnner sides of the side bars, so as to be entirely to be turned up along the nnner sides of the side bars, so as to be entirely
out of the way, and adapt the cot for use as a bed bottom, orenable it to be out of the way, and adapt the cot for use as a bed bo
compastly packed for transportation or storage.

Improved Sawing Machine.
Harvey Morey and Samuel H. Bellah, Cameron, Tex.-A frame, mounted backwardin, the saw projecting at one side of the frame. The frame is It is desired to saw felled trees into blocks. This saw frame has a forked
pitman rod attached to each end, one of which is connected directly to the crank of a driving shaft, and the other is connected to a rock lever, which is connected to another crank on said shaft, the two cranks betng
srranged at opposite sides of the axis. The saw frame has a feed screw, srranged at opposite sides of the axis. The saw frame has a feed screw,
po arraiged that it can feed the frame forward aud back, while sald frame ro arraiged that it can feed t.
rectprocates to work the saw.

Improved Device for Emptying Carboys.
F. Koechltag, New York city.-This is an tmproved Hugh R. F. Koechling, New York city.-This is an lmproved device for removing acids and other liqnids from carboye and other vessels by atmos.
pheric preseare, and withont agitating said ilquids or disturbing any sediment that may be in sald vessels. By suitable construction, when the piston of an air pump is drawn upward, an upper valve is closed by the pres-
sure of the air within the bottle, preventing the escape of the air from the ing sald outer alr to enter the barrel of the air pump. As the piston is forced downward, the pressure of the air forced out of the barrel close the lower volve. and, opening the upper valve, passes tnto the bottle, where its pressure will force the liquid contained in said bottle out through a siphon-shaped tube into the receive.
Improved Cultivator and Plow.
James B. Lucas,"Pellsville, ill. -The axle is bent four middie bow. The tongue to seculd to torm a the latter to the axle, near its outer bends. Braces are attached to the the ends of two bars, which are plvoted to couplings, by which they are connected with the axle. Another brace bar is pivoted to a coupling, by
which it ts connected to the axie, and ta placed upon the mold board side of the beam, its eear end being bent to lie along the side of ine said beam, and to pass through the loop of the coupling attached to the plow beam. This constrnction allows the plow to have enough lateral movement to pass around stones and other abstructions, and to enable it to be ralsed and
swung beneath the framework of the machine. By operating a lever, the forward end of the plow beam may be ralsed from the ground, allowing the forward end of the plow beam ma
plow to run apon tis foot or heel.
Improved Packing Box.
William D. Woodruff, Loutsville, Ky .-The bottom has cleats fastened
upon the upper side along the edges, and projecting at the ends. The upon the upper side along the edges, and projecting at the ends. The top of the box has stmilar cleats on the under alde. The side pleces ex-
tend beyond the end of the top and botiom boards as far as cleasts do, and they also have a cleat extending across the inside at eash end. The To set up the box, the oottom is latd at the ends on the cleats of the end pleces, which are set upright; the side pleces are then lald at thetr lower edges on the bottom, between the edges of the end pleces and cleats. Then, after fllling the box, the top is laid on between the upper projecting
end of the end boards, with its cleats outs!de of and confining the upper end of the end boards, with its cleats outs!de of and condining the upper
edges of the side boards: then binding cleats are put on between the edges of the side boards: then binding cleats are put on between the
upper ends of the end pleces and the upper side of the top, and fastened by screws screwed obliqnely into the end pleces. To take it apart after unpacking it, the screws are taken out, after which all the parts can be
readlly separated and packed away in a small pile. readlly separated and packed away in a small plle.
Improved Flour and Middlings Purifier.
George W. Brown, Metropolis, and.-The general idea of this invention is to enable the attendant to force any amonnt of alr that may be required
into the chest or tnside the reel, or both, and withdraw it, as may be reInto the chest or inside the reel, or both, and withdraw it, as may be re-
quired for the different kinds, qualities, and concitions of grain, suitable valves belng employed to regulate and control the carrents. By long Valves being employed to regulate and control the carrents. By long
trunks along the top of the chest commanicating with two air chambers, air may be blown into the reel space with the pressare fan, or sucked out
to draw out impuritles with the other. By trunks along the sides of the to draw out impuritles with the other. By trunks along the sldes of the
reel above the fall boards, air Is to be forced in below the reel to clean the
fall boards and facllitate the descent of the flosr to the conveyer below, fall boards and facilltate the descent of the flour to the conveyer below. facliltates the separation of the material bolted by the jets of air it lets in from the pressure chamber. Coarse wire wings on the perforated tube separate the material falling on them. A smooth ring, fitted in the enlarged portion of the reel at the mouth of the fannel, carrles the remain-
ing unbolted material quickly ander or beyond the mouth of the funnel ing unbolted material quickly ander or beyond the mouth of the funnel
to the coarse tall screen beyond, or to be passed out at the tall end to a recelver below. The funnel is for drawing the impuritles out of that
portion of the reel through which the fine matters are bolted, while pre portin of the reel through which the inne matters are boited, while pre-
venting the escape of the coarser particles from the tall portion. The maventing the escape of the coarser particles from the tail portion. The ma.
tertal collecting in the suction chamber is removed from time to time through
ing it.

## Improved Cane Harvester

Felix L. Cervantes, Cardenas, Cuba. - This invention consists of a harvester cutter adapted for cutting a single row of cane, with an endless supporting case. The cane is held vertically, and carried against a series of horizontal saws on a vertical shaft, which cut the cane into short sectlons for convenlence in handilng. The tops are also cut off and dellvered
into a receptacle for fodder, while the cane is passed into a wagon to be Into a receptacle for fodder,
conveged to the sugar mill.

Improved Knit Legging.
Samuel Baron, New Yoric city.-This invention consists of knit leggings for ladies and children, having an extension above the knee with an elas.
tic in the top, and also having a contracted portion immediately below not be used. not be used. The object is to provide leggings which will
and a portion of the leg above, and retain their position
Ezra C. W. Hull, Hoosick Falls, N. Y.-This invention consists in an oil stone holder msde to revolve on plvots, and having three faces, with ad-
fustable clamps and screws for securing the ofl stones. By making the cyllinder to hold two or more stones, which may be of different degrees

Improved Steel for Sharpening Knives.
Taft, Brooklyn, N. Y. This invention relates to a Owen W. Taft, Brooklyn, N. Y.-This invention relates to a knife-sharp it much more efflelent and for a longer period than other steels. It consists in a sarles of blades set radially around a rod or stock, which is at-
tacied to a haudie of sultable form. These blades are employed for the benefit of the angles of thetr outer edges for knife-sharpening purposes which are more efflelent than can be formed on a steel rod by the con-
cave futes or grooves, or the file surfaces with which steels are armed
their form is better adapted for action on the knife edge; and it is such that the edges do not become dulled by wear, bat are adapted to be self-
harpening, or if necessary they can be fled or ground sharp. A patent or this device has also been applied for in England.

## Improved Frnit Masher and Sifter.

Charles S. Buckiln, Red Bank, N. J.-This invention is an improved ma Chine for rubbing tomatoes and straining out the seeds in making catsup. drical wire cloth screen, through which they are rubbed by a cam on a lonsitudinal shaft. They then pass to a lower screen which may be sultabl
inclined, which is sufficlently fine to prevent the passage of the seeds.

## Improved Press.

John W. Fields, Sherman, Texas.-The press case is arranged horizon ally, and contains a follower which has gulde pulleys on its rod. Ropes nd-fro motion is imparted to the follower.

Improved Electrode Handle for Medical Use. Jerome Kidder, New York cetty.-This invention provides, for electro
medical purposes, an improved double electrode for faciltating to ment of the amount of surface required, and the conventence of manipulating the current. It consists of a double electrode, so constructed that ated from each other, so that the hand that holds the electrode, while the other pole may be applled to other parts of the body, thus using the same with one hand, leaving the
other free for other purposes.

Improved Cnltivator,
d.-An arched bar is secured
Isaac Cory, Dalton. Ind.-An arched bar is secured to the driver's seat,so welght may be moved forward or back, to adjust the geat so that the driver's feet are secured to the rear ends of side bars by the clamps that secure the ends of the arched bar, and may be ralsed or lo wered. as the rength of the driver's legs may require. The middle parts of the side bars are connected by an arched bar, the ends of which are secured to sald
bars, and Its middle part depressed to bring it into proper position the rear end of the tongue to be attached to th, the side bonds atying spacefor the plow Landles when the plows are ratsed from the ground The forward ends of the side bars are connected by anotherbar, the end
parts of which are horizontal, and the middle part arched to allow the pows to be pivoted in front, the handles to rise up, and the implement o be moved laterally or vertically.

## Improved Axle Nut Fastening.

Rolla R. Jones, Pillar Point. N. Y.-This invention consists of a circum ferential groove. extending about half around the axle near the end, When the nut is fitted on the axle, and a silde bolt in the nut, adapted to slide over the pawl by the action of a spring, after it has fallen into the
groove, and lock it fast, obviating screw threads. The nut is fastened groove, and lock it fast, obviating screwt threads. The nut is fastened

## Improved Razor.

George A. Whitmarsh, Colton, N. Y., assignor to himself and F. E. Miner New York city.-This invention has for its object to improve the construc-
tion of razors, so that they may be more conventently and safely held in postion to be used. It consists in a razor blade made wita

## Improved Fonntain Pen.

Dardd. Latourette, New York city.-The penholder consists of a tubular bsse, which screws to the end of a tubular handle, which is the ink
fountain. The ink is shut off from the base by adisk and packing,or ground metallic Jo'nt, near the upper end of the latter. A feeding tabe extend the ink upon It . A capillary feeder of thread is arranged in the oritice of
then he feeding tube, and in connection with the back of the pen, to canse a
oven flow. An adjustable cap is screwed on the lower end of the feeding tube to regulate the flow of ink, and a spring of peculiar construction is
combined with the base plece for holding pens of different sizes and forms. Tn's inveation was Mustrated and described on page 178 of our curren olume.
Thomas W. Moore, New York ctty, assignor to Fannte N. Moore, Plain fald, $N$. J.-A series of springs are arranged parallel to each other, and crimped or corrugated to allow for a proper degree of contraction and ex pansion, and also are bent at intervals to form spaces for the reception of
ast transverse pleces. The latter are interlaced wit fiat transverse pleces. The latter are interlaced with the springs at regular intervals, are parallel to each other, and secured by fastenings. ir de-
arred. The flat pleces give a smooth face to the seat or back of a chair绪

Stop Mechanism for Spinning and Doubling Machines. aeorge Kraink, Paterson, N. J., as8ignor to himself and John Francon lecting below the bolster rail, and having the loose pullev of the spindle on it, so that the spindle will be freed from the friction of the pulley when the
belt is running on it, and thus will always stop when the belt is thrown belt is running on it, and thus will always stop when the belt is thrown off.
The second part consists of mechanism such that, when a thread breaks and one of the faller wires falls, it will swing a tongue forward into the path of a profection on a reciprocating bar. The tongue will thus be moved power-
fully by the la iter, so as to release the trid rod to stop the machine. The third part of the inventinn consists of a plece of cloth or other substanc and a side with wedge-like prongs, combined with the bobbin on whic the thread winds from the spindle, the friction roller which turns the bob
bin, and the falling rod by which the spindle belts are thrown oft when a thread breaks, so that, when the rod falls, the cloth and the wedges will be moved forward between the bobbin and the friction roller. The cloth
then stops the bobbin, so that it will not continue to draw the thread from the spindles after they are stopped. The wedges go ander the journals or plvots of the bobbin to 1 ift it , so that it will not press the cloth on the fric-
tion roller during the stoppage, and thus protect it as much as possible from

## Improved Spaol Box.

Benjamin F. Carpenter. Roselle, N. J.-A stand is rigidy a trached to the
bottom of a rotary spool box. The thread from the spools, of which there are a number disposed on plvots on the bottom of the box. Is carried up
throngh a disk plate level with the top of the cover. The holes in this are numbered on the top to indicate the number of the thread. There is a spiral wire for holding the thread when it is being cut. The thread, as it is carrled ap from the plate, is passed between two of the convolutions of the seraicircular in form, and ts attached to the top of the wheel disk, at it ends, and is covered by a spiral. The thread is carrled over the latter and orced down between two of the convolutions on the edge of the cutter,
and ts thus readily severed. In thus catting the thread, the fingers of the
dy the spiral.
Improved Check Valve.
Marshall T. Davidson, Brooklyn, N. S.-This invention consists in the combination of a globe-shaped elbow having a horizontal valve seat, with
screw cup arranged vertically ahove the seat, with a ring-shaped extenston for gulding the valve in a vertical direction. The globe-shaped elbow formsan annular chamber around the cup-shaped seat, through which the steam or water is easily conducted to the exit plpe, their return being
checked in an effectivemanner by their vertical downward pressure exerted on the vaive, securing it more tightly in its seat. The valve works thas
easily in both directions, and forms, by its position at the elbow folnt of the plpes, a conventent and efflecent connection.
 protector of spiral wire, bent in such shape as is found most conventent
for attachment and protection, and attached elther directly to the trall of the dress or to a plece of aloth to be applited to the dress.

Improved Ice-Snow Scraper.
Henry Little, Middletown, $\mathrm{N} . \mathrm{Y}$. This is a machine for rom the surface of ice, preparatory to sawing and harvestiping the anow side boards of the machine are of such dimenslons as will enable them to
contain enough snow for a load. Their rear ends meet at an angle. To the lower part of one of the side boards is attached a bar, the rear end of whic projects, and has an eye formed in it to recelve the pintle formed upon the rear end of a lever, which is plooted to the other of the side boards. To the
inner alde of the rear ends of the side boards are attached two vertica inner side of the rear ends of the side boards are attached two vertlca bars, the unper ends of which project above the upper edges of said side
boards, and are hinged to each other, so that the lower parts of the sald ends may spread apart to dischares collected snow. The forward ends of od, and the boards are kept from spreading too far apart by stop bar There is a platform for the driver to staud upon. the ends of which pas hrough keepers attached to the upper edges of the sid 3 boards, so that the sald platiorm will not interfere with the proper operation of the sald side
boards. In using the scraper, It is drawn to the place whence the snow to to be scraped; the side boards are then brought lato a vertical position he lever and bar are connected together; and the scraper is drawn to the lace where the snow is to bedeposited. The lever is then operated to dis onnect it from the bar and discharge the collected snow, and the scrape

Improved Binders' Attachment for Harvesters.
Wesley C. Dentler. Palmyra, Neb.-This invention is an improved bundlecarrying attachment for harvesters for recelving the bundles when bound,
nd enabling them to be dropped together when a sumflent number has ween collected. To curved braces are plvoted the carriers, the inner ends of which are bent upward to rest agalnst the edges of the tables, and the rom silpping off. The carriers are connected with cranks formed npon the ads of a shaft. To the latter is attached an arm, the end of which is ben at right angles to be caught by a spring catch, to hold the csrriers in place
when raised into position to recelve the bundles. The spring catch is so formed that one of the binders, with his foot, can readily detach it, an allow the carriers to be lowered by the weight of the bundles, which bunthe carriers into pos'tion to receive the bundles, when the arm is caugh and held by the spring catch, lockiog the carriers in position. By this con struction the bundles can be dropped in rows, so that they can be readily
shocked, and so that the shocks can be more conventent'y and rulckly oaded upon a wagon. Tuts construction also prevents the waste of grat from scattering, and from tts belng shelled out by throwing the bundles
pon the ground as they are bound.

Hosea Willard. Vergennes, Vt.-There is a pivoted Cithe
lating of two atanchinna is movable in a slot, so as to admit the head of the animal, and is make the frame fast. At other times the frame is allowed to revolve in elther direction, according to the position of the animal.

## lmproved Saw Jointer.

Edwin Gowdy, Pettisville, Ohio.-This invention is an improved machine for dressing and truing the teeth of clrcular and other ea ws. It conststs of
a base plece, with a longitudinal screw for carrying a file holder with fles Armly secured by a key and washer. After the teeth of the saw have been irmly secured by a key and washer. Aster the teeth of the saw have den
swaged, and the shorter teeth raised sufflently to strike the frst flle, the ale holder is adjusted on the saw so that the same runs steadlly between en crews. By turning, then, the saw backward, the first fle acts as a gaze and mes on the circumferential edge of the teeth, dressing them smoothly and
evenly. The key is then loosened and taken out with rhe front fle and washer. Thefle holder is then screwed forward and the side fles adjasted rough side edge of the teeth is taken off, and a smooth anit square edge is et, but little adjustment, which is, however, earily obtained by detach!ng the sllding fle holder and adjasting the bottom set screws.
Improved Three Cylinder Engine.
Philip T. Brownell, Elmira, N. F.-This invention is an improved bnshing for the crank pin of a three-cylinder engine, and an Improved olling device
for the same. The sectional bush for the wrist or crank pin of the engine is the same. The sectional bush for the wrist or crank nin of the engine pin within the eyes of radial sild tig rods, and are secured to sald eyes, one nner surfaces of the eyes are so formed as to permit a free movement over dhe parts of the bush that are fastened to the other eyes. The shaft has a plane eccentric, bns inrer end, and the wrist pin projecte therefrom in describes a circle, whose center is the axis of the shaft. The ofl for lubricating the bushings is held in and supplied from a cup which is attached
fixedly to the pin, but is arranged eccentrically thereto, and concentrically with the shaft. When the engine is at reat, the oll remains in the lower portion of the cup. When in motion, the ofl is distributed in the cup and carried around by centrifugal force, fiuding its way to the bearings.

Improved Mud Fender for Equestrians.
Speed, Loutsville, Ky.-This is a device for pro
Austin . Speed, Loalsine, mid. It constists in a steel frame, to which is attached a boot of such size s to recelve the foot of the rider, and within which the stirrup hanga free o it, except ansists of a sole hsving an upwang projechg edge of its closed side is attached to the covered frame.

## Improved Ear Cleaner.

Moritz Letner, New York city. - This invention is an instrument for
leaning the ear, and it consists in a twisted stem of metal, having swa or bulb of some soft elastic substanee at one end, attached by an eye in one ond of the stem, and a spoon or scraper at the other end of the ste

## Improved Soed Planter.

Thompson Pressly, sweet home, Tea., assiguor of one half his right to D. E. Hicks. -The roller, which rans upon the ground and presses the earth
on the seed, is supported by curved side bars and strabs, which are adjastabis on the beam and standard, so as to throw the roller up or down. The riction of the roller on the ground rotates the asitator in the seed boz
Theplow is attached to the end of the standard. so that it can be raised o lowered, and thereby regulate the depth of furrow.
Reginald R. Parker, Indianapolis, Ind. - The object of this invention is to furnished an improved neck the or bow, the ends of which are stiffened in such a manner that they are prevented from becoming limp, or wrinkled
or curled to the outside, protecting, also, the raw edge. and Imparting to the whole bow a neater and better shape. The invention consists In a neck stiffenting facings, of paper or other suitable material.

Improved Sweep for Cnltivators and Plows.
Ellas Halmari, Columbus, Ga.-The middle part of the sweep has a ridge formed along its central line and extending from the bolt hole in the stem
to, or nearly to, the point, while the side edges of the stem are bent to form o, or neariy to, the poong whin
danges extenotug along the apper edges of the wings. These two corrugaanges extendug along the apper edges of the wings. These two corruga-
tions, belng thus relatively placed, prevent the sheet from helng bent in etther a vertical or horizontal direction, and allow of the employment of

## Improved Safety Pin for Thill Couplings.

Joseph G. Dance, Long Green, Md. -This invention relates to a peculiar
construction of safety pin by which a thill may be coupled tos vehtcle with construction of safety pln by which a thill may be coupled to a vehicle with
great facility, and yet so securely that no jolting or ordinary casualty wil displace it.
A. John Bell, Ashland, $\begin{array}{r}\text { Improved Ship. } \\ \text { Sbis invention }\end{array}$ A. John Bell, Ashland, Ky.- Chis invention consists in a ship or vessel
having it it iower deck made in three parts. the middle one resting upon
bulkbeads bracing the aldes of hull, and easily, removable.

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G. McK. does not state the materials cipe fordressing skins in the Indian manner on p. 266 ,
ol. $26 .-\mathrm{C} . \mathrm{H}$. B. 18 informed that iron gas plpe is not 5 per cent of the total fron manufacture.-B. B. S. will
find full directions for solder of all kinds on p. 251, vol. - Co. . N. Will find the deting a telescope, trustworthy and correct.J.D. H. will find instructions for skeletonizing leaves
on p. 315, vol. 29. Suggestions for preventing echoes in bulldings are given on p. 956 , vol. 29.-J. N. F. Will find
ome valuable information on the restoration of burnt ron on p. 51, vol. 30.-E. H.B. The attraction of gravita-
ton ts the attraction of all portions of matter for each tion is the attraction of ail portions of matter for each
other.-A. . W. The prismatc colors are often visible
in a halo, or in a fog of any kind. There is no generally In a halo, or in a fog of any kind. There is no generally
accepted theory of the aurora borealis. Meteors are sup.
posed to be small portions of matter floating through space ; they are attracted to our center of gravtity, and
becomencandescent by friction with our atmosphere.A.F.B.will find that a marine glue, made of best glue and caoutchouc, will remain flexible if enough caoutchouc
be used.-J. W. B., of Nashrlle, Tenn., does not send
his name.-L. M. should apply to the master mechantc his name.-L. M. should apply to the master mechanic
of some rallroad for a situation as fireman.-W. C. T.
will find directions for bullding cement walls on this page.-M. H. W. can fasten leather to fron by following
the directions on p. 42, vol. 26. Cementing emery to he directions on p . 42, vol. 26. Cementing emery to
cloth, leather, and wood, is described on p. 266 , vol. 26 . -W. A. R. can cast rubber by the process detailed on
p. 283 , vol. 29.-L. B.'s questions are incomprehensible. F. L. S. can find the proportions of actds for silvering lass by experiment. We have never heard of any suc-
cessfuimode of silvering glass by electro-deposition. -A. B. D. will find directions for mounting and varflling, see p. 90, vol. 29.-C. W. H. Jr. can attach cloth o cast iron by the process deecribed on p. 42, vol. 26 .
-H. E. cannot do harm by having an investigation of his engine.-D. W. G. Will find a bar or chisel handy for
knockirg clinkers from the sides of a stove.-J. A. Will
 vol. 30. Chinese white or the mineral off an enameled
card will do to whiten the surface of the block.-W. K. should read Wilson's " Treatise on the Steam Boller."-
G. F. D. can clean his old flles by the process described G. F. D. can clean his old flles by the process described
on p. 263, vol. 28.-G. McI. can utilize his old rubber by ollowing the directions on p. 349, vol. 26.-B.J.L. should read the instructions on p. 379, vol. 26, for polishing
walnut wood. - W. F. Wwill find directions for mending
rubber boots on p. 203, vol. 30 A. A. says: In the SCIENTIFIC AMERICAN
of August i6, 1873 (editorial on lightning rods), it is stated that the gas and water plpes ought to be connec-
ted with the rod; because if not, there is danger that
persons may recetve shocks from such pipes by the tnpersons may recelve shocks from such pipes by the in-
duced electricty developed in them. Now, as the rod and the plpes all extend into the ground, are they not
all substantially connected? If the water and gas pipes of a dwelling communicate with the ground, and through it with the rod, is any further connection neces
sary in order to prevent injury by induced electrictly? A. The connection with the ground is good, but at the wrong end. The upper end must be connected or the
resistance of the plpes etc., themselves will cause the resistance of the plpes etc., themselves will cause the
trouble mentioned; and also as regards the induction, cloud is charged and not the other end in the ground These are a few points, but one must study the mean.
B. B. E. asks: What shape or degree of
convexty musta plano-convex lens have to ensure the east spherical aberration? A. The smalles
possible, in other words, a long focus lens.
C. R. asks: How much power is saved by
he use of sperm ofl for lubricating purposes as com. pared with lard, tallow, or mixed olls? A. There will
be from 1 to 5 per cent of difference in the friction with different lubricants, according to Morin's experiments.
T. M. Jr. asks: 1. Do you know of any make of engines with the ordinary eccentric valve cut-
ting off at both ends of the stroke allike? What would be the advantage of such an arrangement? A. It is sometimes done by making the lead different at each
end of the stroke. 2. What could $I$ do to prevent danger o surrounding buildings from spariss coming out of the
tack of a cupola while casting? A. We cannot recomA. P. G. asks: Has any steam frigate,
ny sea.gong vessel of any class, ever attained a spe ny sea-golng vessel of any class, ever attained a speed
of 25 miles an hour, under ordinary conditions? A. We have seen it stated that one of the English blockade
unners, during the war, made a speed of 22 miles an unners, during the war, made a speed
hour this is not well authenticated.
S. says: Is smoking cigarettes very injuri-
ous, on account of the paper in which the tobacco is wrapped? A. The paper is in
than the vile weed tt encloses.
F. G. W. asks: Howheary a weight with a on ordinary work, for an hour? A. A welght of 3,000
H. R. G. says : I would like to mold some
abber blocks. How shall I dissolve my rubber? Would laster of Paris do for molds? A. Dissolve in bisul-
hide of carbon. Plaster of Paris will answer for G. W. F. Says, in reply to M ,
Who asks
What
causes his pump valves to thump
I set up an engine runsing at 150 revolutions with a pump which thumped. I put a bolt with a large head up through
the airchamber and screwed it down over the valve, not letting the valve lift so high. Then I put a jam nut on top to keep it from turning, putting rubber between bolt, coming close to the valve, keeps it from lifting too high. It has worked all right ever since. (We Our
much obliged to our correspoudent for this letter. Our much ors would do good service if they would send us
reader
notes of this kind on matters of general interest.-EDs. W. B. asks: What effect will frost or rain How should these ingredients be mixed? How should water, lime, sand, and small limestone be mixed to
makea wall? How would water, lime, sand, and soft make a wall? How would water, lime, sand, and soft
coal cinders do fur a wall? A. To bulld concrete walls It is not safe to use anything but the best cement,
roken stone, gravel, and clean sharp sand. One barrel of the best Portland cement will be sufflctent for 13
barrels of the barrels of the other ingredients, flling the interstices
between the particles of stone and gravel and adding between the particles of stone and gravel and adding
nothing to their bulk. The cement should be well it-
corporated with the other ingredients, and supplite corporated with the other ingredients, and supplied
with sufficient water to set well.
F. H. B. asks: What is the advantage of
constructing shot guns of laminated steel ortwist fron barrels? Two old hunters here clalm that a shot gun
barrel made of pewter on any other material would If they were subjected to the same charges of powder
, and say that the material of which theyaremade makes no difference in the shooting. A. Provided the shape
of the barrel is not changed by the discharge, we think of the barrel is not changed by the discharge, we think
the old hunters are right. It Is not diffcult to see, howwith the same strenfti., by making the barrels of toagt
E. F. C. asks: 1. In constracting an induc there be in the primary coll, and why should it be com
posed of coarser wire than the secondary? A. From one layer upward, although there is but a slight gain be der to afford less resistance made of coarser wire in or How is the secondary coll to be wound? Should it be done by commencing at one end or the wire, and wind-
ing it upon the primary coll, as thread ts wound upon a Ing it upon the primary coll, as thread is wound upon a
spool? A. It is best to wind it on flat layers like the colls of a rope, and insulate each layer from the next by a ring of oiled silk or other insulator. 3. How many
cups of Dantells battery, 8 inches high by 6 inches di ameter, would be required to run the coll described on
p. 316, vol. 29, so as to produce perceptible shocks? A. Six cups of Dantell's battery, with a properly cosstruct ed coll, should give sparks seversl inches in length.
$\underset{\text { about } 75}{\text { J. Dorse power, an ordinary horizontal with com }}$ mon sllde valve. I wish to reverse the motion or speed
how can Ibest do tt, as I cannot very well get access to Place? An engineer gives me the following rule the stroke, and mark the valve stem with flle or chise close up to the gland of stuffing box; now place the
crank on the opposite center, loosen the eccentric and crank on the opposite center. loosen the eccentric and
turn it round upon the shaft until the mark on the en the eccentric." Is thts a correct rule, and will it
give the same lead as before? It does not seem to me that it would. A. It would not give the same lead ; and If you do not know the amount, you may have to equal
izeit by trial at the cyllinder cocks. 2. On p. 381 of your vol.29, in answer to $F$. H. D.'s query as to the proper dimenstons of steam and exhaust plpes, you give a table
taken from W . S. Auchincloss' work on valve and lint taknom What I Alish to know is how on valve and link
motione the table; $I$ cannot exactly see into it. Will you please make it a
ittle clearer for me and several others? A. The piston speed in feet per minute is twice the number of revolutions per minute multiplied by the length of the crank in feet. For example, an engine having a diameter of
16 inches and a stroke of 2 feet, making 100 revolutions 16 inches anda stroke of 2 feet, making 100 revolutions
per minute, has a plston speed of $2 \times 100 \times 2=400$ feet per minute. The ares of the plston is 201 square inches and from the table it appears that the area of steam pipe should diameter of a little more than $8 \frac{8}{8}$ inches.
O. C. W. says: I have a pipe 3 inches inclosed valve at the bottom. It is filled with water.
What is the pressure on the valve? A. The weight of pipe. 2. How can I increase the pressure without ma
king the plpe longer or forcing the water in at the to king the pipe longer or forcing the water in at the top
of the pipe? A. By dissolving something in the water
L. W. asks: Will a rotary engine of 3 horse
power propel a small side wheel boat gofeet long by $7 \%$ feet beam? It draws 12 inches of water. The boat has a medium flat bottom and is sharp forward. Her engine
ruus at 300 revolutions per minute, and is geared to ruus at 300 revolutions per minute, and is geared to
wheel shaft in proportion of 4 to 1 . What speed ought
to be obtained, the diameter of wheel belng 5 feet 6 nches, with $8 \times 10$ buckets? A. With such an engine, the
H. G. C. says: Has the twist or rotary mo-
tion, given to a rifle ball by the pitch of the ifling, anything to do with its velocity or the distance to which it may be thrown by a given charge of powder? A. The
C. Y. says: Please state what is the size of
the quantity galvanic battery necessary to neat an Iron wire the 1-25th of an inch in diameter to rea or white eat ? The liquids are to be nitric and sulphuric actds.
A. About twenty cells. N. D. S. asks: Is there a law that will hinrunning it (bysteam) to any place? I am not a licensed
engineer. Can any inspector force me to have my boller tested against my will, if I only carry my own property?
A. We do not think that your case will fall under the re-
M. W. R. asks: How can I restore the color turning it to a light brown? A. Further injury may be
prevented by rubbing the spot first with dilute acetic prevented and then with water, but the coloring matter has
aeen destroyed and can be restored only by dyelng again.
A. S. G. says: A stream of water moves at
the rate of 10 miles an hour, with a fall of 1 foot per mile; what is the momentum of the water per square
foot? A. The horse power of the water per square
foot of cross sectlon is equal to the velocity of the water in feet per second multiplited by $62 \cdot 4$ times the hight
dne to this velocity, and divided by 550 . To illustrate:
Velocity in feet per second $=14 \cdot 6$. Hight due to this veloVelocity in feet per second=14.6. Hight due to this velo-
city $(14 \cdot 6)^{2}+64 \cdot 4=3 \cdot 3$ feet. Horse power of water per
S. C. Z. asks: 1. At what part in a machine is the position of the crank when the piston is at efther hat will dissolve. 2. Can youtell me of any chemica posed by sulphurtc or hydrochlortc acid. The silica can chen be dissol.
caustic alkali.
P. says: A neighbor bought a cast steel
plow and put it into gravelly soil. After using it half a day, he found the mold board badly creased and fur
rowed. He then exchanged the steel plow for a cast rowe. He
ironone. It is wellknown that a steel slelgh for a cast
wors worse on bare ground than a cast iron shoe. Is steel
softerthan iron? If not, how do youaccount for these
focts? that the steel was of poor quallity and badly tempere so that it was not homogeneous in texture, and did not G. O. A. asks: Will a solid ball of iron
welghing 25 ibs. fall a distance of 1,000 feet quicker than welghing thesame description weighing 1 lib.? A. No. Will a cylinder of tron 1 inch in diameter and 12 inch
s long fall 1,000 feet quicker than a cylinder 1 tuch in
S. says: We have a tubular boiler running
ght and day, using water pumped from the river,with. out any filtering. We find, after running three or four
days, that the water foams in the boiler to such an extent that we are compelled to let the steam go down
and draw oft part of the water, and refll with fresh. Can you give me ofrough the column sof of your paperany
nethod to prevent foaming? Is the use of tallow or any other olly substance injurious to a boller? We have In use an uprightbofler feeder, and until recently have
used the exhaust from the pump to assist in heating waterfor the boller, the pump plston belng lubricated tallow. The question bas arisen whether the tallow have a tendency to cause foam by entering into a com-
bination with matter contained in the water. A. The oaming seems to be caused oy impuritles in the water, the water at intervals may remedy the trouble, but it
would be better to use a feed water heater that would xtract the impuritles. Oll and
anless they contain impurities.
J. E. C. asks: I. Will it increase the draft small plpe with the boiler and let it extend into the smoke stack? A. Yes. 2. If so, what sized pipe should
I use for a 12 horse power engine, and how far up in the nokertack should exten? $A$. About a $q$ quit
L. E. I. asks: 1. What are the proper diing 250 revolutions at 60 lbs . pressure? A. Make the portarea one half that of the plston. 2. What would
oe the power of such an engine? $A$. Horse power equals pressure on piston in poundsmuitiplied
speed in feet per minute, divided by 38,000 .
speed in feet per minute, divided by 93,000 .
J. G. G. G. R. says: 1. I sit opposite a large
stained glase window in church. I am shortsighted and cannot, with my eyes wide open, see the saape of the
figures, but if I close them a little, every little line, etc.. tands out very clearly. Why is this? A. Shortsightedof light coming to a focus before reaching the retina. have the effect of flattening the humors of the eye
have ufflclently for distinct vision, and of siso cutting off sed in the telescope. 2 . I have not a heavy votce, but When Iget up in the morning it is a deep bass. This
continues for about an hour, and then it resumes its natural tone. How is this? A. It looks as if your
volce were not inclined to rise until an hour after its wner. You had better consult a physiclan, as this may
e owing to some slight bronchial or throat complaint 3. Would a device for preventing an engine from get-
ing on a center pay? A. Such a device might in some ircumstances be an improvement. 5, Is there any method by whicha person could copy mustc faster than With a pen, something in the way of types, etc.? A
An instrument has been invented by which, it is said, in the act of playing the plauo, the composer's musical
thoughts are at once printed by types on a plect of pathoughts are at once printed by types on a plect of pa-
per. The keys actuate machinery which 18 put in moper. The keys actuate machinery which is put in mo-
tion by electrictty. 5. Is there any method by which a shortsighted person could restore his sight to worigishortsightedness is to wear spectaeles of the proper
curvature.

April 4, 1874.$]$
$\xrightarrow{M}$
 by beng heated and then ouddenly cooled d n water or
oil.
The temper can te and allowing it to cooo slowivy









 and to raise himself hc must pull enough more than 100 and to raise himsercome the friction and leave a slight excess
of wetght on his hands. Of course with a single rope of weight on his hands. Of course with a single rope
he would pull the whole 200 lbs., and, equally of course, by the pulley and loop, etc.,would gain, as stated, nearly phy that power is indestructible, and can netther be created nor destroyed by man. This belng so, there can be
no gain of power by the man, whatever arrangement he no gain of power by the man, whatever arrangement he
uses to elevate htm self, the work done betng the wetght raised multiplied by the distance through which it was
lifted. In the case of the loose pulley, if the man raises himself with half the force required where a single rope is used, he exerts the force through twice the distance
that would be necessary in the case of the single that would be necessary in the case of the slig re
rope. Moreover, there 18
quired one and account of the friction of the pulley and the quired, on account of the friction of the pulley and the
rigtidity of the cordage. Notwithstanding this, it may be a conventence to use the loose pulley, for the same reason that
employed.
J. F. F. asks: What is the difference beInches of water under 8 feet head, set in a flume, and
one of 4 feet diameter with 8 buckets, with scroll on top of wheel, using same amount of water? Will the
one in the fume ruin any faster than the other, if both wheleare of the same size ? A. This
cail best be determined by experiment.
G. B. asks: 1. How many barrels of cement and 25 feet high, the walls to be as thick as they ought
to be in your judgment? A. The thickness of the walls to be in your judgment? A. The thickness of the walls
should be adjusted to suit the length of the wall as well Which they will have to support. If you have a cross wall at the center of your bullding, and the concrete be
properly made, the walls may be 12 inches thick, for an wall, 16 inches would be little enough for thetr thick ness. The concrete should be composed of one barrel
of Portland cement to 13 barrels of broken stone, gravel, and clean sharp sand; the proportion of cemen
therefore, is equal to one thirteenth of the entre for it is lost in the intersulces of the stoneand gravel If 25 . feet of hight includes the foundation (which
should extend at least 4 feet deep into the ground 1 you have no cellar, ,then your wall, if 12 Inches thick, will
contain 4,050 cubbe feet, but 1116 inches thek will con contain 4,050 cublc feet, but 1 t 16 inches thick will con tain 5,400 cubic feet; one thirteenth of these amounts is
$3117_{3}^{7}$ and $415 \frac{1}{2}$ respectively. A barrel of cement when slacked will make about 4 cubic feet; the 12 inch wall, therefore, will take 78 barrels, and the 16 inch wall 10
barrels. 2. Is common mortar as good as cement for
building concrete houses? building concrete houses? A. N
nomical to use the best cement.
F. O. C. H. asks: How can a patch be put lead, fron, and hemp with white lead, but nelther would
do. A. It should have a lip turned allaround it, so that a good quantity of cement may be introduced. The
cement should be made of red and white lead and iron
P.D. F.-1. A siphon can only operate when ply. 2. The lantern for showing paper pletures instead
of glass transparecteces, is coustructed like any magic lantern, but the picture is placed where the light usual ly stands, and the light is placed at one side, so as to 11
luminate the picture. To work well a very strong is required. The mineral spectmen looks like a fossil
plum. The width of the Gulf Stream is abcut 50 miles.
D. G. says: 1. Can the insulators ordinarily
used on wires be coated, with lead, tin, or some other material that will protect the insulating material from decay? A. They can be coated with gutta percha.
What is "static inducion"? A. The influence of a electriffed body upon a body which is not in contact
with it. 3. If copper is a better conductor than fron, is it neceessary that a telegraph wire made of copper
should be as large as one made of iron? A. No. What size is the smallest copperwire which is sufflecent ly large for ordinary telegraphing, tension not consid-
ered? A. It will depend upon the current. It is only necessary that it should be large enough not to become
unduly heated. 5. In your paper of January 31, p. il unduly heated. 5. In your paper of January 31, p. 7 ,
the writer on sumac speaks of an acre producing nu
less than three tuns; does he mean green sumac or dry A. Dry. o. How can I obtain the Commissioner's repor spoken of there? A. Write
Agriculture, Washington, D. C
M. J. C. asks: I. How is brass wire tem-
pered for making springs? A. By hammering or rolling 2. Is there any way of hardening brass so that it canno be fled? A. We do not know of any method
 so that it cannot be flled? A. By chilling it in the mold.
C. W. K. asks : 1. What are the improve-
ments needed in rotary engines? A. Some means of
preventing wear. 2 Is the unequal balance in the revol ving cylinder a sertous objection? A. This is obviated in
some forms. 3 . As there can be no shock in this style of engine, would you consider a variable cut-oft of any
use? A. It will be usefulin cases where the losd
$\underset{\text { with cast iron borings? }}{\text { W. Wan }}$. What is the best to do with cast iron borings? Can $\begin{aligned} & \text { melt them in a cupola? } \\ & \text { will not the fan or blast blow then out? How would }\end{aligned}$. it do to put a small portion in each ladle of hot iron?
Do you think they would melt suffctently to make a Do you think they would melt sufflecently to make a
good sound casting? A. Your best plan will be to melt
G. P. H. asks : Is there any invention used
or the purpose or detecting mineral substances in the W. F. W. says: When we speak of the the power applied, the resistance, and the fulcrum
Some people belleve that a large water wheel is more powerupl than a mamall one for the same reason that a
ong lever is better than a Bort one. In two overshot or breast wheels, one 10 and the other 20 feet in diame
 wheel, with pinilon at tached on a level with wheel sbaft

 water, the machinery will start. Will any less welght o
 efer, as we understand you, to the supposed gain o
power by the use of a long lever. This, of course, 18 a
and delusion. What the long lever accomplishes is to make
ittle force avallable; and in this way it is sometimes
S. G. C. says: Your answer to W. F. W. W. vershot water wheel may be correct if only applied to he turning of the wheel; but when the power of the
wheel is applied to the driving of machinery, I assert thet there is no lever princtple applicable. One whee Iarger wheel will continue the power twice as long a the emaller whel, for the reason that the water would
remain twice a long on the larger wheel. Iclaim that drtving machnine ery, je jagt the welght of the water ever purchase. Am Irtght? A. You have the correc dea on the subject. No well Informed person 1 magine at there can be any galn of power by the use ot a lever
other mechantcal devtce. The object of the mechan.
F. L. L. asks: How can I draw the curves
 nderstand it. His rule ti: As drattemen are generally satisied With representing the epleycloldal curves by
arce of circles, which almost cotncide with them and nearly fulill the same conditions, such arcs must be tan.
gentlal to the radal sides of the teeth at therr polnts of intersection with the pitch ctrcle. They are determined

e chord, B, , which passes through the extremittes of e curve by a perpendicular, which will cut the ta BM N, which very nearly colncldes with the epleyclotd-
al curve. The same arc tis repeated for each side of all
 draw the chord, B ? ? If the potnt, $\mathbf{0}$, 18 known, wha is the ene of draw wing the chor, , B N, N, and how rar from
te polnt of contact should the point o be? A. Th the pont of contact should the polnt o be? A. The
points $B$ and $N$ are given. Connect them by a stralght Ine. Draw P O perpendicular to BNatits midale part Daw the arc, BM N, with the radius OB or ON .
 dinary charge, with out report, by olltng the barrel tube and cap. It think not. Which 18 ritht? A. It 1 .
settle eos simple a matter by direct experiment.
T.L.asks: How can I set a locomotive eccenlactng the engline at each end of the stroke, and trying placling the engine
he cyllider cocks.
J. P. asks: How can I season a wooden
crew made of green hard wood timber, so that it will oot crack kn seasonnng? A. Your best plan will be to place it tn some positlon so that It will become seasoned
nir you can prevent cracking.
 tion may be made by forclag a current of air, by means
of a blowplpe, into a fame of common thuminating of a bowppipe, into a fame or common minumnating.
gas, and directing the flame againat a plece of chalk. G. A. asks: I. In spinning copper, how is
cone
 ( 1 . A .
A. N. R. asks: Is there any instrument for
enlarglng or contracting drawings? A. Yes. See enand
gravting and directlons for use and manutacture in Sci ace Record for 1874.
 Wrth prusalate of potash, sal ammoniac, and black oxlde
of manganese, but these, we flad. only harden on the Burface. A. You should harden the steel by the ordil. equently deseribed in our columns. A few experiments Will show you the best heat.
A. H. D. asks: How many feet board measnd $3 \%$ t Inches square at the other, and il feet tin length? A. This ordinary rule of flnding the contents, in board
measure, of a plece of timber, 18 to multiply the breadth n Inches by the depth in inches, and by the leng th in
feet, and divide the product by 12 . Where the timber tapers regularly, the center breadth and depth are used Lis the given case, the piece of timber is the same as one having a bread and and depth of $(26+88)+2=32$. Hence the
contents in board measure $w 11 \mathrm{ll}$ be $(32 \times 32 \times 11)+12=938 \cdot 6+$
G. W. A. asks: How do you calculate the the
number of square inches of a astety valve, and how large should the pea be? A. The following formule Will enable you to determine any part of a safety valve,
if you know the others: : Presaure of teeam in pounda per
 Xlever arm of lever + weight of valve and stem $\times$ lever arm
of valvo
 R. A. B. says, in reply to E. B. who asked What means was accurate allgnment of the Hoosac
ninnel attalned : "I can answer this, as $I$ did 1 t myself mnnel attatned: "I can answer this, as I did it myself.
in the first place, a line was run over the mountanin and tested several times to oe that tit was exactly y tratght.
Then the working lineof the tunnel diverged northerly

alx inches in every one hundred feet from each end
This was to prevent the posibility of pasesing in the
H. M. P. Bays that G. S. D., who gives a
 of the same specfic gravity as water. 2. It assumes that the head Is of the same specifc gravity as the rest
of the body. The method can easily be teested by an
Then it the body. The method can easily be tested by an
experiment with an tida-rubber-headed doll, frrst welghng with the head illed with alr, and then with 1 then ould be to fillone end of a block of wood with lead, nd to welgh it with the ends alternately 1 Im mersed tin
ater. $\boldsymbol{1}$ he welght will be found the same, whether the Ight or the heavy hall 18 above the surface.
J. H. W. says, in reply to many readers, Take 2 1bs. of flour and 4 pints of water, mix part of the
 d,then stratn through a napktin or colender and cook comes to boll take 1 of $1 t$ sufl conty cold The stir in hailt an onnce of nitro-murlattc accid and put in ize of a chestnut, broken up and dissolved in the wa er, hasa tendency to whiten the paste. Paste require

S. K. W. says, in reply to F. H. M. who nquiryto mean without fulling or turning them yellow,
will glve a modus operaniit, whlch I have found satis will give a modus operandi, which I have found satis-
actory: Shave a little white soap tinto a pall, and pour factory: shave a little white soap into a pall, and pour
on It water nearly bolling hot to dissolve it, adding, it
 good poander or a machine, as the water needs to be of
too high a temperature for the hands. Wring the flan too hag h temperature for the hands. Wring the flan
nels, and put them Into a second water, 1 like the first ex chine. Rub the soiled spotst in the suds as hot as you
can bear; but never rub soap on the spots. Wring the
 them on a line in a brisk, drying air. The hotter they
re when wrung, and the sooner they dry, the better Thelr color may be tmproved by a inttle bluing; and it
they are well ironed betore getting quite dry, fulling it

 frog, and by ignorance in setting the shoe, by carrying the seating or bevel of the upper side of the shoe so far
back that the heel rests on the slope of the seating, otherrise on two Inclined planes; so that every step
preeses the heel together. The frog, haviag been cut, rest on shell of hoof all round, and the frog should seldon, if if
ever, be cut. Nature has made ample provision for hrowing of all superfluous frog. Contracted hoo
perates on no part of the leg above the fetlock joint. operates on no part of the leg above the fetlock jolnt
The coffni jeint 18 most affected. Your corresponden can experiment on the sensation produced in contracte hoof by puttling the feet into a pair of boots that are Wo sizes too smail and three sizes too narrow on the Sotoms, and walking 10 miles per day for 30 days, the This will give him a better ide
ameness than can be described.
J. W. P. P. says: 1. I have a quantity of bees wax that tas been used for dental purposes; it thas be dirt from the laboratory. How can I separate the pure wax from the misture? 2. Can old and brittle gutta percha be made over again, 80 os to work like new? J.J.J. abks: Is there a compound that will force the
beard to grow faster than it will of theelf?
E. F. G asks: Is there auy way of photographtng a posttive ple
ture on glase directly, oso as to answer for a magte lai
 more easilly, large or mall axled wagon? Most farmer aim that a woodenaxle in a plpe box can bedraw causelt 1s larger. G. J. asks : Can any one give the for mula for the enamel used on engineers' instruments Which ti called the bronze finta? -A.B.D. .asks: In what
ma nner should a common mouth blow plpe be applited to manner Bioula a common mouth bowppipe be appied
the flame and work to get the best effect in golderlng (hard and soft) and in se8ay yng and experimenting with
ores and metals? C. D. M. asks: Does the rapldity in hich the temperature of steel is changed have a ten dency to detemper it, providing the temperature 18 no
ralsed above 225 Fah.? For st a temperature of $10^{\circ}$ and plunge it into bolling water. Will this detemper it to an injurious extent? Does it nujure a razor at all to put it into bolling water?' What fected by a rearrangement of molecules, or 1 s it a de arbonization ?-W.E.S. asks: Can any one start an - M. J. M. askg: How are clocks finished, and wha kind of varnish is used ?-C. L. asks: How can I con see distinctly the animalcule in water? 2. Why is
sith hy is with hot frult, if a knife or spoon is placed upright in
the can?-W. E. S. asks : What is the best and most aurable whitewash known, for outdoor work ?-N. L.F. asks: If a vessel of water is revolved so that the con-
tents will be elevated at the outsite, and a series of end less chains, provided with floats, arranged over pulleys in such a manner that they will ascend at the outside and descend near the center of motion, where the water
Is considerably lower, will the unequal hight of the col-
to the chains, and if not, why is the buoyant effect o
the e thutd in this case different from what it is when a

## COMMUNICATIONS RECEIVED.

The Editor of the Scientific American cknowledges, with much pleasure, the re ceipt of original papers and contributions upon the following subjects
On a Ball dropped into the Earth, etc. By J. L. B.

On an Aerial Electric Ship. By C. W. W. On the Hanging Rope and Pulley. By M., by C. B. T., and by N. P. M.
On Large and Small Water Wheels. By On 1
G. $P$.
On a Crooked Stick. By A. A.C.
On a Gasoline Accident. By W.L. W
Also enquiries from the following:
P. A. T.-J. M.-M.P. C.-T. с. H.-G. С. H.-A. H.--
J. M. M.-G. B. \& P.-H. H.-N. R.-J.T.-H. G. J.-

Correspondents in different parts of the country ask ho sellis a plow that will scour as well in black prairie
and (Texas) as in a sandy soll? Who makes sawing chines for felling trees? Who makes magnets to or to the weather? Who makes cork cutting machinery? Who makes machines for packing coffee, etc., in paper?
Who makes furnacesfor restoring spent alkaltes? Who makes twist drills, of different kinds? Who has a pat
ent plan for bullding lime killos? Who makes tron sla ent plan for building lime kills? Who makes iron sla portable paptr boats? Makers of the above articles will probably promote their interesta by advertising in reply, in the Scirntific Ambrican.
Several correspondents request us to publish replie
their enquiries about the patentability ntions, etc. Such enquiries will only by of their in ter, and the parties should give their addresses. Correspondents who write to ask the address of certain lso those havilug goods for sale, or who want to find artners, should send with their communications a mount sufficient to cover the cost of publication unde the head of "Business and

## [OFFICIAL.] <br> Index of Inventions

Letters Patent of the United States March 3, 1874,

## and each bearing that date.



EngIne cyllnder lubricator, c. B. Trueadell
Engine, direct actlog steam, T. Hanson.... Engine piston balance valve, S. Maltoy. Engine ptop valve, etc., G. C. Howard.. Equalizel for vehicle springs,
Eyc plass, A. Serin.............
Feather renovator. C. Seamana. Fence, portable, J. M. W
Fire egcape, H. P. Bell... Fire extingulsher, w. C. Bruson.. Fish hatching apparatus, N. W. Clark....
Flour chest and bread table, J. M. Jones Fog signal, G. C. Pattison..
Fuel, burning liquid, M. Wil Furnace, J. F. Belleville............. Furnace doors, governor for, A. C. Norcroe
Furnace, reverberatory, J. O. Stewart... Furnace, gaseous fuel, W. \& G. H. Sellers.
Gas from coal, etc., making, D. Davison.. Gas from coal, etc., making, D. Davison
Gas, mak'ng coal. D. Davison........... Gas, purif ying. St. John \& Rockwell Gzs st Jve, Witteck \& Stetnmetz. Gate, farm, G. Van Riper. Gear, running, w. H. Hathaway.......... Grain meter. J. Hemlugway Guan lock, A. Spaulding. Hammer, nail, G. Peck, Jr.......
Harrester dropper, J. F. Black Hoar ringer, G. Stevenson.. Hook, hotsting, J. Tappan
Houk, siap, S. Reynolds. Horses, detaching, I. Thompeon... Horseshoe machine. C. H. Perking
Hose, hydraulic, E. A. Street....... Hydrant stop box, Williamson \& Hornung
Hydrocarbons, burning, C. J. Eames ....... India rubber articles, makine, E. R. Bart Insect gun, W. Keunish. Jewelry, pln fastening for, Lyons \& Abrat
Lamp. J.F. Marsh ................... Latch and lock combined, C. Roberts
lathe, J. Moessinger. Last blocis fastening, L. S. Wrigh
Luck for doors, etc.., D. Wolit
Loom harness, J. Sladdin ..
Loom narness, making, J. Sladdit Loom selvage guard. J. Clay
Loom stiuttle, W. M. Parker
Loom shutue, w. M. Parker
Lubricator, w. S. . Par
March care or splint, J. E. Cofilin Medical compound, P. \& L. Prass. Millstone driver, M. Holden Monug strips, sheathing curved, B. F. Gale. Motion, preventlog retrograde, w.Cloud Music leaf turner, G. Sweatt.... Mualesl intervals, indicating, S. D. Tillman.... Nall plate feeder, J.R. Finney. Nut machine. P. Eley.
Offal, treating, W. E. Johns...........
Oil tank titing. H. F. \& A. S. Snyder. Olltng apparatus, pulley, C. E. Helme
Organ stop action, T. Winans ............ Organ stop action, T. Winans ..........
O verseaming machine, etc., E. Cornel Pail, milk, E. Gates.
Pan, baking, J. D. Mason............
Paper hanging machine, R. H. Miner Paper pulp digesier, H. J. Lahousse...
Photograph mount, J. H. Fitzgibbnn. Photograph mount, J. H. Fitzgibbnn....
Photographs, burnishing, E. R. Weston Plck handle, T.. . B. Correll Pipe, molding, F. S
Pitman, R. H. Kerr
Planing machine, w. C. Horton.
Planing ghingies, w. J. God
Planter, corn. C. F. L. RIsch....
Planter, cotton sfed, J. Dana.
Plasterer's hawk, J. B. Glazier ................
Plow, cuitivator, and chopper, J. J. Watrous.. Plows, ch:lled mold board for, J. Ollter Press, cotton, E. L. Morse. Press, wine and clder, J. Clark.
Printing press, G. P. Gordon... Propeller, marine, W. D. smith..
Pump, stenm, Douds \& Harteuff. Purifier, middlings, C. S. Fuller..
Purifer, middliags, J. J. Ma yers Purifer, middlings, G. \& E. Walker..............
Rallioad curves, turning, J. v. De Noailles... Rallroad frog, Tbomas \& Miller.
Rallroad, street, T. J. O' Toole. Raliroad switch. Adams et al... Raliroad switch, C. H. Koc Register, hot air, E.D. Norcro
Regulator tor fluids, W. L. Horne.......................
Revenue guard for clgar noxes, W. Wohltmann Roof, metalic, J. S. Balfour
Saw, J.W. Branch
Saw gulde frame, D. J. Parmele
Saw hanger, gsng, B. C. Butler
Sewing last, De Co Sewing mach. hemmer, ttc.. H. C. Goodrich, 148,04 Sewing machine winder, M. \& M. G. Co
Sewing machine motor. G. W. Manson.. Sewing machine shuttle, J. Knox Sewing machine tucker, E. Boullion Shaftung, hanger and box tor
Snirt bosom, A. F. Chase.
Shirt cuff, A. F. Chase..
Shoe tip, etc.,detachable.M. H., L., \& A H.Leve Shovel, , snow, c. L. Marsh.
Snovel, wooden scoop, J. V
shatter worker, w. Adams
Slates, etc., composit
Soapstone, ornamenting, J. B. T. Baker Spark arrester, W. Puillips



## CANADIAN PATENTS

List of Patents Granted in Canada Febrdary 24 to March 3, 1874 3,169.-Wm. C. Shipherd, Cleveland, Cayuhoga county,
O., U. S. Improvements on Whymetree stubs, call O., U. S. Improvements on ${ }^{\text {nhpmetree stubs, called }}$
"Shipherd's Improved Whiffetree Stub." March 5,18 3.170.-Wm. McKean, Toronto, York countr, Ont. Im-
provements in meat cutters, called "McKean"s Meat provements in meat
Cutter." March 5, 187
171.-J. W. Meaker, Detroit, Wayne countr, Mich.,
U.S. Improvements in self.closing doors for hatch. ways, called "Meaker's Self-Closing Doors for Hatch ways." March 5, 1874.
,172.-A. Muhletsen Ottawa, Putnam county, O., U. S Improvements on hounds for vehicles, called "Muhl
eisen's Bent Hounds for Wagons, etc." March 5, 189 elsen's Bent Hounds for Wagons, etc." March 5, 1874.
3,173.-R. C. Margeson, Hallfax, Hallfax county, N. s. Medtcine for cure of the stone, gravel, and other dis. eases of the u
March 5, 1874.
Mat.-J. A. Tupper, Ottawa, Carleton county, Ont impr's Washing Machine." March 5, 1874
3,175.-D. Mack, Barnesville, Bourbon county, Kan.
U. S. Improvements on, U. S. Improvements on garden cultivating imple
ments, called "Mack's Garden Cultivating Imple ments." March 5, 1874
provementa on a machine for con county, Ont. Im"Casey's Improved Washer and Wringer." March 5 3.187.-G. J. and J. R. Wilson, Ottawa, Carleton county Common Sense Washer." March 5, 1874.
3,178.-J. A. Knight, Auburn, Androscoggin connty, Me.
U. S. Improvements on tables, called " Knight's Im proved Drawing or Writing Table." March 6, 1884.
3,179.-T.A. Norris and C. Lockman, Hamilton, Went
ders without dust. called "Norrite \& L Lockman's Im
proved Cool Clider sifter." March $6,1874$. 3,180.-S. F. Cowles, Coventry, vermont, U. s. Improve. ment on apparatus for coolng and preerring milk.
called "Cowles's Milk Preesver." March 6,1874 . 3,181.- G. Morton, Orwell, ElyII connty, Ont. Improve ments on a machtine for burnishng p photographs, ca,
"Morton's Improved Burnisher." March 6 , 184 . "Morton's Improved Burnisher." Mrarch 6, 1874.
s,182.-S. w. Emery, Portland, Cumberland county, Me. U. S. Improvements on four wheel rallway cars,
B called " Emery's Improved Four Wheel Rall way Sate ty Car." March 6, 187 .
8,188, - W. R. Jolley, North Repps Rectory, Norfolk county, Englina. Improvements
-. Jolley's 1 Life Ratt." March 6,1871
,184.-A. MacKay and G. Jones. Montreal, P. Q. Process for preventing and neutrallzing sour beer, stout,
ale,and othermaltedlliquors, called "MacKay\& Jones' Preservative and Neutrallizer of Beer, Ale, stout, and Fining s." Marca 7, 1874
3,185.-Jas. Morrison, Toronto, Ont. - Improvements on Check and Globe Valve." March 7, 1874. 3,186.-Jas. Morrison, Toronto, Ont. Improvements on water gages for steam bollers.'called "Morrison's Im.
proved Adjustable Water Gage for Steam Boilers." proved Adjust
March 7, 187 .

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