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[NEW SRHIES.] 15.$]$

## A BOOKBINDER'S SEWING MACHINE.

The Singer Manufacturing Company have recently adap ted the principle of their sewing machine to the stitching of books and pamphlets; and we publish herewith an engraving of the book-sewing machine, in which all the parts are represented with such clearness that little explanation in necessary. The sheets of printed paper are first folded and then passed into the machine in succession. The attachment for effecting this is shown in our illustration; and it stitches the sheets, feeds them forward, cuts the thread and conducts the sheets along downwardly inclined guides, so that they fall between two rolls, which fold and smooth them. The machine is capable of stitching sheets of any size or thickness; and how ever thickly the sheets may be folded, the rollers will give them the proper press ure, being united by an elastic connection which allows all thicknesses to pass through under their pressure. The machine stitches the sheets with great rapidity; and as each sheet is stitched separately, the binder can get the sheets ready for binding as fast as they come from the printer, the sheets being aftersheets being afterwards collated for insertion in the covers. Much time is saved by this method, as every one familiar with bookbinding will ıcknowledge; and the separate threads to the sheets insure elasticity to the back which allows the which allows the book to open easi ly, and so contri butes in an important degree to the durability of the binding.
New Pavement A new kind of pavement bas re. cently been laid in Newgate street, London; it has not been used for any roadway previously. About 300 su perficial yards perncial yards have been laid down at the west end of Newgate
street. The followstreet. The follow-
ing is the engiing is the engi-
neer's report on the material: "That the asphalt is stated to be composed of 85 per cent of fine ground granite and 15 per cent bitumen that it is a material free from slipperiness and not affected by the atmosphere. It is laid in a heated, semi-fluid condi tion, two inches thick, upon a foundation of Portland ce ment concrete nine inches thick."

## Construction of Petroleum Tanks.

Storage tanks, whether built by private enterprise or constructed in the interests of the pipe lines, are necessarily of iron. They must needs be of some such material in or der toresist the pressure of enormous quantities of tluid in ended to be stored within them. Their contents vary all the way from 8,000 or 9,000 to 25,000 barrels of 42 gallons the way from 8,000 or 9,000 to 25,000 barrels of 42 gallons
each. These tanks are constructed of heavy iron, riveted
together and made fluid tight in the usual boiler fashion. The first step, after the bed has been made by carefully compacting and leveling the ground on which the tank will rest, is to lay out the sheets which are to constitute the bot tom on wooden horses properly arranged in the bed. These the required diameter is produced : the diameter in the case of a 20,000 barrel tank, for instance, being about 80 feet It is calculated in a rough way that the bottom of the tank with the first ring of siding attached, is chargeable with half the cost of the whole tank. This first ring is attached half the cost of the whole tank. This first ring is attached
to the bottom by means of a number of L-shaped pieces, to
vagrant grass seeds taking root, thi, roof presenting somewhat he appearance of turf. These are $t_{\text {m }}$ earth tops
Every roof has a manhole, generally non the principle an ordinary house scuttle. It affords accom to the inte ior of the tank for cleansing and other purposes. There a supply pipe which runs up the side of the tank ank ers at the top, near the manhole. About an inch or so above the bottom, one or more drawing-off pipes are insert d. Access to the roof is secured by a wooden ladder or steps; these are generally permanent attachments. Across he roof, be it of wood or iron, a slatted or cleated woode walk is provided, so that the roof may not be injured by being trodden up on. Sometimes, if tanks are near to gether, their roof are connected by wooden bridges or plank ways, that easy access may be had to all. Some times the base of tank is earthed up for three or fou eet with sloping banks of gravel Sometimes rench two feet in denth is dug obout he base, with a pening toward he downward lope of land When the tank is completed, it is subjected to an hy draulic test; wate o its full capacit s pumped in; and f the tank bears this strain with out either burstin or leaking it will f course with tend the pressure f an equal quan tity of oil. Occa sionally the wate pressure proves too strong, parti cularly if the iron has not been of a good quality. The tank, now comple ted, receives its contents through the supply pipe the oil coming through, it may be, miles of piping ither direct from he wells or from other tanks o from barges laden with the oil in bulk. In this way the oil-producin country is thread ed with countles miles of piping sometimes above ground,sometimes on or beneath its surface, and some times in the beds of rivers.

## THE SINGER BOOK-SEWING MACHINE

which these parts are respectively riveted. The remainin rings are attached or built up in the usual boiler fashion At the proper time the wooden bases are withdrawn; and by means of jack screws or some similar device, the tank is let down upon its earthen bed. The roof is either of iron or of wood. Iron roofs are sometimes constructed of something akin to ordinary roofing metal, properly supported by frame within, if the tank be small; but if it be large, th roof is generally constructed of heavier sheets, riveted to gether. The vast majority of tanks have wooden roofs Out of 85 examined recently, only 18 had iron tops. Wooden roofs are generally tarred and graveled. Sometimes, in tead of being flush with the top of the tank, they are set some inches below it, forming a water top intended to hold ted from each other by only fifty to seventy-five feet.-W water. Sometimes they are covered with earth, in which $\mid$ S. Necoall.

Some tanks are
n the tops, others on the sides or in the herts of moun tains, others at their base. Sometimes they cluster together in particular localities by the dozen. Frequently we find knots of tanks, only from five to ten feet apart : hence all morally certain of destruction by the fire that seizes upon any one of them: On the other hand, where wiser foresight has prevailed-as on the Anchor Farm, Chestnut Hill,opposite Parker's-it is made obligatory upon tank owners to build at least 200 feet apart. There are twelve tanks upon the summit of this hill. At Mount Nebo, just south of Parker, there are ten tanks separated distances varying from 100 to 150 feet, while at Montrose by distances varying from 100 to 150 feet; while at Montrose

## professor huxley's lrctures in america.

During Professor Huxley's recent brief sojourn in America he delivered three lectures (the only scientific discourses given by him in this country) on "The Theory of Evolution." They were spoken at Chickering Hall in this city, on the evenings of September 18, 20, and 22, before large and appreciative audiences.
There was a shade of disappointment visible on the faces of not a few of Professor Huxley's hearers as they left the hall at the close of his first lecture. It had not been at all what they had come to hear. The absurd reports which certain of the daily newspapers had circulated with regard to Professor Huxley's attitude toward religion had led many to anticipat something startling. As the "arch enemy of Christianity," he could not do otherwise than run a-muck with Genesis, and say things very offensive to the orthodox. So, when the speaker finished his calm, straightforward, logical, and perfectly reasonable review of the three conflicting theories of the origin of animal forms, a discourse in which there had been no exciting language and no effort to say smart things, they were disappointed, andinclinedto blame him for not being the sort of man they had come to see. Others, unable through lack of a knowledge of the subject in hand to appreciate the masterly manner in which Professor Huxley clove to the contested field, missed the real point of the lecture, and came away half persuaded that somehow they had been imposed upon. Anybody, they complained, could have said the same, and more than one popular speaker known to the American platform could have said it more eloquently. Still anothe class, and that, we fear, not a small one, shared the disap pointment, namely, those who had but a vague idea of the scope and purport of geological evidence, and no idea at al of the enormous mass of facts bearing directly or indirectly on the theory of evolution, who yet expected to be told, in course of an hour, precisely how everything came about Judging from remarks we overheard among the retiring au dience, more than one of this class must have come away feeling that the lecture had been altogether different from what it ought to have been.
To those, however,who understood the situation of affairs and were prepared to appreciate the beauty and success of way method which Professor Huxley chose for clearing th problems of evolution, to be set forth in succeeding lectures, the first evening's discourse was as satisfactory as an intro ductory lecture well could be. Particularly happy was the cornering of the Biblical theory of creation in " Paradis Lost." There the creation of living things is described pre cisely as all men read it in Geness before geological revela tions compelled theologians to vary their interpretation of of the Scriptures, as occasion might require. The ntter in consistency of the "Miltonic hypothesis," tested by the geo logical record, both as regards the manner and the order of the origination of plants and animals, was shown mos conclusively; but the lecturer declined to commit himself in any way by calling that view of creation the Biblical view. It was true that Milton's account of the six days of creation was considered to be in perfect accordance with Genesis, by all Biblical scholars of his day, and for nearly two centurie thereafter. It was true that that interpretation had most likely been taught as scriptural, in childhood, to everyon of his hearers. But Professor Huxley would not for a mo ment venture to say that it could properly be called the Bib ical doctrine.
In the first place, it was not his business to say what the Hebrew text contained, or what it did not, and in the second place, were he to say that this was the Biblical hypothesis, he would be met by the authority of many eminent divines, to say nothing of men of Science, who in recent times have de nied that this doctrine is to be found in Genesis at all. Each finds in the Biblical record just what he requires to make it harmonize with his particular scheme of geology : day may mean twenty-four hours, or a period as long as convenience requires; the creation of a species may be direct and im mediate, or, according to the same record, the species may asses, lasting millions of years. When the accredited propreters of Scripture could come to any agreement with re gard to what the Biblical account really meant, it would b ime enough to compare Genesis with geology : meantime a person who is not a Hebrew scholar can only stand by and admire the marvelous flexibility of a language which admits of such diverse interpretations." The applaus which followed this remark was evidence enough that the majority of the audience were in sympathy with the speak er.
The second lecture was devoted to the consideration of wo lines of geological evidence, the first including suc facts as are neutral, which neither help evolution nor ar inconsistent with it; and the second, those facts which give strong probability to the theory but d, not prove it. A third line of evidence-that which, being as complete as any we can hope to obtain on such a subject, and entirely in avor of evolution, may fairly be called demonstrative volution-was reserved for the third and last lecture
Historically important among neutral facts are those which ed Cuvier to pronounce against the theory of evolution propounded by Lamarck. The French expedition to Egyp had brought from that country the mummied remains of many animals, mammals, birds, and reptiles. Cuvier argued that, if evolution were true, the Egyptian remains, which were certainly three or four thousand years old, ought to be measurably unlike the birds, crocodiles, and so on, now inhabiting the valley of the Nile. He found on close examination that three or four thousand years had brought no im-
portant change to the animal forms of that region, and ac cepted the evidence as conclusive against the doctrine o furnished far strongers of research since Cuvier's time ha furnished far pronger cases than those which he drew from the mummified bodies of Egyptian animals. As we work our way through the geological record, we find at every age even the remotest,animal forms scarcely distinguishable from those which now exist. We also find great groups of ani mals, like the reptiles of the mesozoic period, abounding in vast numbers in strata representing periods of immense du ration, yet presenting no important modification from first to last. Facts like these are often cited as fatal to the theory of evolution; but they are not at all in conflict with an intelligent view of that theory, though they are "fatal to any form of the doctrine of evolution which supposes an intring necessity,on the part of animal forms which once come into existence to undergo modification; and they are still into distinctly distinctly opposed to any view which should lead to the be ief that modification in the different types of animal and vegetable life goes on equally and evenly." There is a mani-
fest tendency on the part of living forms to vary; but whether such variations persist and accumulate, or die ou ooner or later, depends altogether upon surrounding condi ditions. The persistence of old forms simply shows tha they are better fitted for the conditions under which they flourish than any modifications of those forms have been; and that, since their origin, the earth has not failed to furnish somewhere just such conditions. Facts of such a character and they are numerous, furnish no objection to evolution nor any support to it; they are simply neutral, though per fectly capable of being interpreted in consistency with it. Of like nature are the numerous facts showing the appar ntly sudden origin of forms, like the permian lizards with no trace of antecedent forms. Such facts would b fatal to the evolutionary theory, if the geological record as it stands were complete. But the exceeding incompleteness of the record is a necessary condition from the manner of its formation; and besides, there is abundant evidence of enormous gaps. A striking illustration was furnished by the Brontozoum tracks in the sandstones of Connecticutthe only vestiges thus far discovered, or likely to be dis covered, of the numerous and varied order of (probably) eptilian life which for a long period inhabited the shore of the ancient sea which existed there. That we have even so much as a footprint to hint of that mysterious horizon of ife depends on the purely accidental circumstance that the sand, since hardened into rock, was accumulating unde conditions which allowed the tracks to be preserved.
Much more interesting, on the whole, was the evidence in favor of evolution derived from transitional forms, or more correctly, forms standing between groups no distinci and partaking of the characteristics of each. For the most part, the evidence of this sort was drawn from recent discov ries tending to fill up one of the largest gaps in existing nimate nature, that between reptiles and birds, and hint ing how the evolution of birds from reptiles may have ta en place. The evidence embraced an array of facts, of a resh and intensely interesting character, relating to the rcheopteryx, a feathered animal, bird-like in most respects but having clawed wings and a reptilian vertebral column, prolonged into a long slender tail fringed with feathers : to Hesperornis regalis, a grebe-like bird six feet high, with a ong jaw thickly set with teeth; to ichthyornis dispar, a still more reptilian bird, with teeth in distinct sockets; and to the bird-like modifications of dinosaurian reptiles, culmi ating in the compsognathus longipes, a type, possibly,of the eptilian bipeds which made the mysterious tracks found in Connecticut and in similar strata in England.
The third and final lecture was begun by pointing out an lement of weakness in the evidence presented in the pre ceding lecture. It was true the mesozoic rocks furnished ossil forms so completely bridging over the gaps between eptiles and birds that it would be very hard to say wher he reptile ends and the bird begins. It was true that evt dence of that sort is far weightier than that upon whic men undertake to say they believe many important propositions. But it could not be considered demonstrative evi dence, for the reason that the intermediate forms were found in contemporaneous deposits, whereas the requirements of demonstration demand that the gradations between one roup of animals and another should appear in such orde as they must have followed if they had constituted a suc cession of stages, in time, of the development of the form at which they ultimately arrive. Such demonstrative evidence has been obtained in late years in considerable and contin ally increasing quantity. Indeed it is somewhat surprising how large is the quantity of that evidence and how satisfac tory is its nature, when we consider the exacting character of the condition of its preservation and discovery. As an illustration of that kind of evidence, the discoveries with regardto the pedigree of the horse were chosen as special y appropriate for the attention of a popular audience. The readers of the Scientific American are already familiar with the geological evidence on this point, as set forth in the article entitled "The Genesis of the Horse," in No. 16, volume XXX. The long and admirably sustained argument Professor Huxley will be found in a full report of the three lectures in the currentissues of the Scientific Ameri CAN SUPPLEMENT.
Having traced at great length the evolution of the horse from the four-toed horse-like creature of the eocene period, and showed that the history of the horse, as recorded in tertiary strata, is precisely that which could have been pre dicted from a knowledge of the principles of evolution, the lecturer said: "If that is not scientific proof, then there are no inductive conclusions which can be said to be scientific.

And the doctrine of evolution at the present time rests upon as secure a foundation as the Copernican theory of the motions of the heavenly bodies."
In closing, the speaker took the precaution to observe that his purpose had not been to enable those who had not made a study of these subjects to leave the room in a condition qualified to decide upon the validity or the invalidity of the hypothesis of evolution, but to put before them the principles by which all such hypotheses must be judged, and to make apparent the nature of the evidence and the sort of cogency which is to be expected and may be obtained from it: and he should consider that he had done his hearers the greatest service it was in his power to do, if he had congreatest service it was in his power to do, if he had con-
vinced them that the question under discussion was not one vinced them that the question under discussion was not one to be dealt with by rhetorical flourishes or by loose and superficial talk, but one that requires the keenest attention of
the trained intellect and the patience of the most accurate the traine
observer.

## A SERMON PREACHED BY THE MICROSCOPE

The mineral polishing powder lately brought into use under the name of electro-silicon consists, as shown by the microscope, entirely of silicious or flint shells of the diatomacere, species epiriscus, each shell being a flat disk. We recently measured their diameters and found them to aver age $\frac{10}{20 \sigma 0}$ inch, while the thickness was ${ }_{80}{ }^{1} \sigma \pi$ inch. Therefore, when piled up like coin (and in this way they appear
in the mineral), 8,000 of these are one inch thick; while a in the mineral), 8,000 of these are one inch thick; while a
square inch can contain more than 2000 x 2000 , or over square inch can contain more than $2000 \times 2000$, or over
$4,000,000$,such disks; and the number present in every cubic inch is thus more than $8000 \times 4,000,000$, or over $32,000,000,000$. When we consider that the thickness of the deposit in Nevada, where this mineral is found, is reckoned in hundreds of feet, and the length by hundreds of miles, we can only be struck by the immensity of the organic creative power with which the atoms of matter are endowed, a power which forms these atom-like objects, in regular shape and in numbers to be counted, not by millions of millions, but by countless myriads. Not this alone: but this power also ornaments most of the species in the most tasteful and intricate manner: an ornamentation which is revealed only by the most powerful microscope.

When we were once visiting the cathedral of Strasbourg, Germany, an architect in our company made the remark that the artisans who cut the ornamental stones had expended just as much care in giving the utmost finish to the highest parts at the top of the spire, where scarcely ever any one had a chance to admire their admirable workman ship, as to every part of the cathedral below, where it is daily seen by the worshippers. "But," said our friend, " those men labored not so much for their wages as they do now a days (often trying to cheat in the value of their work when they have a chance); but in those good old times, every artisan labored for the glory of God; it was a species of religious enthusiasm which induced them to finish their work there as conscientiously as anywhere else, although it could only be seen by God.
Considering the discoveries of the exquisite ornamenta finish of those little objects belonging to the hundreds of species of diatomacea, what is more natural than that the religious enthusiasm of the medirval church builders is taking hold of the microscopists of our day, who really are enabled to see what God wrought thousands of centuries before it could be seen by any human creature? And these won ders have waited through all these ages before the fact could be appreciated and acknowledged; that the creative power is infinitely great, even in the infinitely small.

## WHY IS THE SEA SALT ?

According to Professor Chapman, of University College, Toronto, the object of the salting of sea water is to regulate evaporation (see page 98, current volume). This suggestion does not answer the question: why, or by what cause, the sea became so salt; but it assumes to tell us wherefore or
for what object the sea is salt. The cause of the saltness for what object the sea is salt. The cause of the saltness
should be answered first; and if, after we have ascertained should be answered first; and if, after we have ascertained
this, it is proved that the salting accomplishes a secondary this, it is proved that the salting accomplishes a secondary
ultimate purpose, the other question arises. But we believe ultimate purpose, the other question arises. But we believe
that a careful consideration of the Professor's hypothesis that a careful consideration of
will quickly expose its fallacy.
In the first place, then, the sea is salt as a simple and necessary consequence of the fact that it must contain all
the soluble matter which the rains have washed out of the most exposed portions of the earth's crust, and which the rivers have carried, and are still carrying, to the ocean. And as the rivers do not carry water as pure as that which evaporates from the sea, because they all, without any excepraised from the ocean sy in solution, which can never the raised from the ocean by evaporation, the sea has, in the
course of ages, become more and more salt; and the process is still going on. Such a nice regulation of the amount of evaporation as the Professor suggests is quite unnecessary,
as it is well known that the regions under the influence of as it is well known that the regions under the influence of
the evaporation of our large fresh water lakes are not much the evaporation of our large fresh water lakes are not much
different in agricultural value or sanitary conditions from those under the influence of salt water evaporation, the sole conditions for agricultural success being, next to the nature of the soil, a liberal supply of moisture and solar heat; while in a sanitary point of view, a moderate supply of both is more desirable.
We must, however, give credit to Professor Chapman for his experiments; he proved that the amount of evaporation of fresh water, compared with that of salt water under the same circumstances, may differ largely; so that the evaporaof salt increases. But we would give this fact an interpre
tation different from that of the Professor. In the condition of things preceding the carboniferous era, when the rivers had not yet dissolved so much saline matter out of the exposed earth's surface, nor the rivers carried it to the seas, the ocean necessarily contained much less salt than at pres. ent; therefore the amount of evaporation must have been much larger. This condition of things was not favorable to animal existence but it was to vegetable life; and this may partly explain the excessively luxuriant vegetable growth which was the parent of our coal deposits. When in the course of ages the ocean became more salt, the evaporation became less; the air was not so continually overcharged with moisture, and was more favorable to animal life. If the saltness has since increased continually, and the dryness of the air has augmented in proportion, we must not be sur prised that regions of the earth, once fertile and inhabitable, have become dry deserts. We know this to be the case with have become dry deserts. We know this to be the case with
the lands on which Babylon, and Palmyra, and other cities, were situated, which, as well as the whole of Upper Egypt, Palestine, etc., were formerly more fertile than they now are, considering the dryness of their atmosphere. In order
to become convinced of the influence of moisture on vegetato become convinced of the influence of moisture on vegeta-
tion, one needs only to visit the dry highlands of New Mex ico and Colorado, and compare the vegetation there with the moist southern part of Louisiana. If we take the former in summer, and the latter in winter, so as to have the same temperature in both, the difference will be obvious and remarkable.

## the spontaneous combustion of coal at sea.

An intimation of the fearful aggregate of suffering en tailed by frequent losses of ships by fire at sea is given in the fate of the crew of the San Rafael, intelligence of which has just been received. The San Rafael, of Liverpool, with a cargo of coals, was bound for Valparaiso: off Cape Horn she took fire; her crew escaped in three boats, two of which, with eleven persons, were picked up by a passing vessel af ter a period of dreadful suffering. The third disappeared, to be heard of no more until a party of seal-hunting natives reported to a missionary cruiser the discovery of the remains of eight men and one woman on a desert island near the cape, where they had perished with starvation. The instru ments and papers found with them proved them to be the missing members of the San Rafael's crew. The details of their terrible fate have been given in the daily newspapers the occasion of it, namely, the spontaneous combustion of coal at sea, its causes, and the means that may be adopted fo preventing such disasters, are what we wish to call atten on to here.
The frequency of such casualties has given rise to many enquiries by boards of trade and others, who have quite uni formly recommended ventilation as the best means of pre vention. But experience shows that the more and better the ships were ventilated, the more frequent were the fires. On one occasion, four ships were loaded at Newcastle at the same time, with the same coal, from the same seam. Three of the ships, bound for Aden, were thoroughly ventilated the fourth, for Bombay, was not ventilated at all. They were each carrying from 1,500 to 2,000 tuns of coal. Th three ventilated ships were totally lost by spontaneous
bustion; the fourth brought her cargo safely to port
stion; the fourth brought her cargo safely to port.
faith of shippers and underwriters in the saving efficacy of ventilation. A royal commission, made up of men like Dr. Percy and Professor Abel, was thereupon appointed to enquire into the matter, and their report, recently laid be fore Parliament, amply demonstrates the impolicy of ventil ating cargoes of coal, especially for long voyages across the tropics; and points out clearly the conditions which lead to development of heast due to chemical action, arising from the oxidation of substances contained in the coal. The best known of these are the combinations of iron and sulphu called iron pyrites. Moisture in the air facilitates this oxi often intense enough to set the coals on fire. Obviously any increase of ventilation serves only to increase the vigor of the chemical action, and too often to ensure the destruction of the vessel. Another source of danger lies in the capacity of finely divided or porous carbon for absorbing and con densing within its pores large volumes of oxygen and othe gases, with an attendant development of heat; moreover, the
tendency to oxidation, which carbon and certain of its compounds possess, is favored by the condensation of oxygen within its pores, whereby the closer contact of the carbon and oxygen particles is promoted. Hence, the developmen of heat by absorption and the setting up of oxidation occu simultaneously; and as the heat increases, oxidation pro ceeds more and more energetically until the carbon is heat ed to the igniting point. The breaking up of the coal be fore and during shipment, by rough usage, favors this pro cess.
the risks of spostancous conbure largely increased by the length of the voyage and the bulk of the cargo. Fo the most part fires occur in vessels carrying over 500 tuns bound for the West Coast of South America, San Francisco,
and Asiatic ports beyond the Mediterranean and Black Seas. Of such shipments four per cent were lost in 1874; and though they amounted to only 1,181 out of a total of 31,116 coal shipments to foreign ports, more than five sevenths of the fires occurred among them. There were seventy casual ties of the sort in all, of which only ten occurred in ship ments to European ports. The excess of fires by spontan ous combustion on long voyages seems all the more strik over ten and a half million tuns of coal-with the shipmen
of less than three million tans to Asia, Africa, and America And, as already remarked, the best ventilated vessels suffered most from these disasters.
Properly the conclusions of the commission are averse to entilation in the cargoes of coal ships. They also point out that certain coals are intrinsically dangerous for ship ment on Tong voyages: also that it is dangerous to ship pyritic coals wet, and coals much broken up in mining and ransportation.
In the course of the enquiry, a curious and unexpected circamstance was revealed, showing the far-reaching effects of social changes and improvements. Arthur Helps would have been charmed with it. No two things would seem to to be more remote and independent of each other than the increase of schools among the poor and the increase of fires at sea : yet the latter seems in a measure directly due to the former. In this way: The presence of iron pyrites in coal is one cause of spontaneous combustion in coal cargoes. At the mines, boys were formerly employed to pick the " brassy lumps " out of the coal. The first effect of the Education Act was to withdraw those boys from the coal chutes and send them to school. The pyrites were no longer picked out; and straightway a remarkable increase occurred in the burning of coal ships at sea!

## THE YELLOW FEVER EPIDEMIC.

Telegraphic reports from Savannah, on the 23d September, state that over two thousand people are stricken with yellow fever in that city, and eight thousand more are appealing to the country for relief and for means of preventing the spread of the infection. The disease has broken out in Charleston, and it is feared that it will extend its ravages to other Southern cities. Several cases have already occurred in Baltimore. There is a widespread feeling of concern lest, before the autumn frosts, the malady will gain a foothold in the more thickly populated cities of the Middle States. The probabilities and known features of the disease, however, all tend to remove, in this last respect, the ground for alarm. Yellow fever is not contagious from person to person, and its occurrence serves only to mark the presence of its spe cial cause, which is generated outside the human body. The conditions for its existence must be such as are favorable to he germs which develope after being received into the sys em. The germs, however, are capable of being transported n infected vessels, clothing, and merchandise, and herein lies the chief danger. Militating against thisare the rigid quar antine regulations which will be enforced, and the fact that the first frost to which they are subjected instantly destroys the organisms. On the other hand the disease, even when imported out of its indigenous region, is greatly promoted by auxiliarỳ causes, such as overcrowding, defective drain age, filth, and similar negligence in sanitary precautions. It will be seen, therefore, that the prevention of the epidemic is even more in the hands of the people individually than in those of the authorities; and the importance of every per son assuring himself that his immediate surroundings are in clean and healthy condition is evident.
We have so frequently pointed out the way to avoid filth diseases that it is difficult to write anything other than re petition of previous advice. We have before us the latest and best work on the subject, "Filth Diseases and their Prevention," by Dr. John Simon, F.R.C.S., and beyond al else the author states that impure water is the "chief way
by which filth infections get entry into the human body." Shallow wells in thickly populated regions, he mentions a especially dangerous; and wells adjacent to privies and other filth deposits are the chief means by which enteric fever spreads in such neighborhoods. Old moldy dust heaps, wet house refuse awaiting removal, the filth of ill kept streets leaky drains, and traps not gas tight and not freely ventilat d, are other prolific causes of disease. The best disposi tion of house refuse, swill included, is to burn it; and car bolic acid, chloride of lime, copperas, and other cheap disin ectants should be freely employed in privies, cellars tables, and outhouses. Filtering bad water is of littl vail; where there is none other to be had, boiling with a ump of charcoal in the vesser is a good precaution.
The suffering in Savannah is augmented through lack of money to provide for the care of the sick, and there is an argent demand for promptassistance. Subscriptions are being raised by many organized bodies in this and other Northern cities. We trust that the call will meet a most generous response. Money may be transmitted to Hon. W. H. Wickham, Mayor of New York city, who will forward it to the to do something for the sufferers, and to do it at once.

Wood Preservatives.
According to observations made on a railroad in Germany, the proportion of renewals was, with oak sleepers (not treated) after 12 years of service, $74 \cdot 48$ per cent; with oak sleepers, treated with chloride of zinc, after 7 years, 3.29 per cent; with oak sleepers, impregnated with creosote oil, after 6 years, 0.09 per cent; with pine sleepers, impregnated with chloride of zinc, after 7 years of service, 4.46 per cent. The practice of this railroad, since the year 1870, has been o employ only oak for sleepers, which are impregnated either with chloride of zinc or with creosote oil.
Mr. C. K. Wood wishes us to state that he intended to write that Professor Airy's clock gained 24 seconds, not 274 econds, in his letter on the weight of a body inside a hol low sphere, published on page 196 of our current volume.
A GOOD acid-proof cement is made by mixing a concentrated solution of silicate of soda with powdered glass, to form a paste. This is useful for luting joints in vessels exposed to

CAR TRUCK FRAME DRILLING MACHINE
We illustrate herewith a special tool manufactured by Messrs. W. B. Bement \& Son, of Philadelphia, Pa., for drilling at one operation the different holes required in car truck frames. The frame to be drilled is laid upon the table shown, and held there in position, the table, with the frame plate upon it, being then fed up to the drills. This table can be raised either automatically or by hand through the gearing shown. The drills are mounted on an upper rame, at the standard distance apart, and are driven by gearing from the coned pul. leys. The drill spindles slide in the vertical holders, which re tubular and they can be re tubur, in any desired position locked in any desired position y the set scr. The drill f the holders. The drill spindles can be adjusted on the cross frame to different distances apart so as to suit different patterns of car frames. The tool is well designed; and where a number of frames have to be drilled to one pattern, it is a very useful one, and capable of turning out a great deal of work - Engineering.

## $\rightarrow \rightarrow$

he moon and the weather. A writer in Blackwood's Magazine derides the popular error that the moon produces any effect upon the weather, as follows
The notion that the moon exerts an influence on the weather is so deeply rooted that, notwithstanding all the attacks which have been made against it, it continues to retain its hold upon us. And yet there never was a popular superstition more without a basis than this one. If the moon really did possess any power oally did possess any power would be excrcised in one of would be exercised li one of these ways: by reflection of the sun's rays, by attraction, or by emanation. No other form of action is conceivable.
Now, as the brightest light of a full moon is never equal in intensity or quality to that which is reflected towards us by a white cloud on a summer day, it can scarcely be pretended that the weather is affected by such a cause. That the moon does exert attraction on us is manifest-we can see it working in the tides; but though it can move water it is most unlikely that it can do the same to air, for the specific gravity of the atmosphere is so small that there is nothing to be attracted. Laplace calculated that the joint attraction of the sun and moon together could not stir the atmosphere at a quicker rate than five miles a day. As for lunar emanations, not a sign of them has ever been discovered. The idea. of an influence being produced by the moon is, therefore, based on no recognizable cause whatever. Furthermore, it is now distinctly shown that no variations in weather at all really occur at the moment of the changes of quarter, any more than at ordinary times. Since the establishment of meteorological stations all over the earth, it has been proved by millions of observations that there is no simultaneousness whatever between the supposed cause and the supposed effect. The whole story is fancy and superstition, which has been handed to us uncontradicted, and which we have accepted as true because our forefathers believed it. The moon exercises no more influence than herrings do on the government of Switzerland.

## The Largest Machine Belt

The New York Belting and Packing Company have re cently made a rubber belt, 331 feet long and 4 feet wide, weighing 2 tuns, for use in the New York Central and Hudson River Railroad Company's elevator at foot of 60th street, North river, in this city. The driving power to be carried by this belt is estimated at 500 horses. It is believed to b the largest belt ever made.
wooden Spoons.
In a work describing the present condition of the domestic industries of Russia, M. Weschniakoff states that not less than thirty millions of wooden spoons are annually made in that country, the industry having its great center in the district of Semenow. Poplar, aspen, maple, and box are the woods used for this purpose, and the cost

Swimming a Horse.-On reaching deep water, the rider should relieve the horse of his weight, by sliding into the water beside the horse, grasping the mane near the wither with one hand, thus requiring the horse simply to tow the rider, the latter assisting him in this, by using his legs and free arm in the same way as in swimming. In crossing rivers with rapid currents, the rider should take the down stream side of the horse

## Manganese

The important studies made of late years in chemical sci ence have given manganese great importance in many arts and industries, and 50,000 tuns per annum are now imported into Great Britain, although a considerable quantity is raised from her own soil. It is used largely in the manufacture of bleaching salts (chloride of lime), in glass making, in the preparation of Condy's fluid (permanganate of potash), a disinfectant which, when mixed with water, sets free ozone in perceptible quantities; and in the manufacture of steel, it
reader may solve for himself the neat mechanical problem which the device affords.
The construction is as follows: A is the standard; B is a grooved pulley rotated in the direction of the arrows by the crank, the end of the handle of which is shown below and to the right. C is a large balance wheel, loose on the shaft of B. D is a grooved stationary pulley formed on or attached to the standard; and E (dotted lines) is a small pulley outside the balance wheel, but attached to the end of an auxiliary shaft which supports the star-shaped piece, which may be a saw or other imple ment which it is desired to re volve rapidly. The order of mechanism on the line of the central shaft is, first, the crank handle; second, the standard; third,stationary pulley; fourth, driving pulley ; fifth, loose balance wheel; sixth, and on aux iliary shaft, small pulley; seventh, standard; eighth, driven pulley
On the balance wheel and near the rim are secured three small pulleys as shown. There is also a tightening pulley at tached to said wheel by an arm near the center. The belt or chain is then rove as follows Beginning on the driving pul ley, B, then over the firstsmal pulley of the three on the ba lance wheel, then down and over the small central pulley, E , then up and over the third pulley on the balance wheel, down and around the stationa ry pulley, back up to the mid dle pulley on the balance wheel down around the driving pul ley to the place of beginning the belt being endless. The proportion between the drive and driven pulley is as 1 to 12 that is, the former in one revo lution would produce twelve turns of the latter if simply belted or geared thereto; bu by this device one revolution of the crank handle determines eighty-four revolutions of the driver pulley, so that the gear ing augments the speed jus sevenfold, without requiring

## CAR TRUCK FRAME DRILLING MACHINE.

rapidly becoming an ingredient of the highest importance. where it icipal supply comes from span deeper than 90 feer. It generally occurs in pockets, and is of very uncertain occurrence, the miners proceeding generally by a kind of instinct rather than by any scientific rule. The ore is picked out from the pieces of rock with which it is mingled washed, and sorted as to quality ; then it is carried, generally in baskets on mules' backs, to the nearest railway or sea port. The miners, sorters, and washers are but poorly paid, even for Spain; and the discovery of manganese deposits in California; Virginia, and New Zealand is likely to limit the demand for this very useful metal in Spain and Portugal. Experiments are, however, being made in Belgium for the purpose of bringing it into use for making illuminating gas, for which it is likely to be extremely valuable.

## A NEW GEARING.

There is now on exhibition at the Centennial Exposition,

in Machinery Hall, an exceedingly ingenious and novel mode of gearing, which will doubtless find many utilizations in cases where a high speed in revolutions is required, but where any extended system of cog wheels or other multi plying gear is neither desirable nor economical. The inven tion is illustrated herewith, and we purposely omit the call culations relating to the speed transmitted in order that the
any more room than would be occupied by the simplest mechanism. Theoretically, and friction neglected, there is ap parently no limit to the number of revolutions which might be produced by properly proportioning the different pulleys. Of course the device can be used with gearing in lieu of belting. How the combination produces the sevenfold aug mentation, and what must be the proportions of pulleys leading thereto, we leave our readers to puzzle over. The specimen at the Centennial is located at C 8 , pillars 62 and 63. The inventor is Mr. Jonas Hinkley, of Norwalk, Ohio.

## SUCCESS OF THE HELL GATE EXPLOSION.

The great mine at Hell Gate has been exploded. Soundings over the reef are not yet finished as we go to press, so that the present depth of water cannot definitely be stated but judging from the extent of the visible result of the blas and from the fact that a large Sound steamer has already passed fifty feet nearer the shore than ever before, it is pro bablefthat the work is a grand success. Despite the assurances of General Newton, the effects of the concussion of the 52,000 lbs. of explosives were greatly feared, and for miles around windows and doors were thrown open, while people abandoned the houses near the mine. At precisely 2.51 P . M.,the finger of General Newton's little daughter pressed the key, and the current exploded a torpedo which in turn broke the sustain ing cord of a heavy pin-studded plate. As this fell, battery connection with the mine was established. Then a hundred vast fountains leaped into the air at once. A bove these pur white columns, perhaps sixty feet in hight, shot a mass of dense black smoke mingled with flying mud and timbers The explosion lasted three seconds. The concussion was ver slight, but was perceptible at Springfield, Mass. Throughou New York city a dull rumble and muffled boom were noticed but no shaking of the earth was remarked.
We can add our hearty congratulations to those which General Newton is receiving from all quarters. The credit of the plan, however, belongs to A. W. Von Schmidt, who destroyed Blossom Rock, San Francisco. After the U.S.engineers had exhausted their resources in devising means to remov this formidable obstruction, Mr. Von Schmidt proposed sub stantially the same system of coffer damand tunnels employed at Hell Gate; and he staked his fortune on success, for he asked no pay until the dangerous reef had given place to 24 feet of water. On the 23d of April, 1870, the $43,000 \mathrm{lbs}$ of gunpowder packed in the submerged tunnels and head ings was fired, and Blossom Rock ceased to exist. The counry is indebted to Mr. Von Schmidt's genius for the mag nificent results obtained both at San Francisco and Hel Gate: to General Newton, for the engineering skill with whic seven years of continuous and most arduous labor have been brought to a grand and befitting end.

## MEDIEVAL IRONWORK.

The accompanying engraving shows a beautiful specimen of the renowned wrought ironwork of the middle ages. It is a lattice or grille for a window, and is a graceful and elaborate piece of work, wrought out entirely with the hand hammer. It is of German workmanship. and is to be seen at Botzen, a city of the Tyrol, one of those ancient cities to whose workmen we moderns are indebted for countless examples of what skill and taste can doin making our homes, churches, and streets beautiful, and the influence of whose works is now to be found in all parts of the earth

Improved Hospital Construction. We are indebted to Mr. John R. Niernsée, a well known architect of Baltimore, Md., for copies of sketches of various descriptions of wards suggested by him for the John Hopkins Hospital in the above named city; also for a copy of his own review of the various complete plans submitted for the construction of that institution. In the sketches, the adjuncts of the wards are isolated from the latter by placing a connecting closed corridor between them in the basement only The isolating vestibule connecting the buildings on the main floor has ventilation of its own, thus preventing any contaminating intermixture of air currents. By this system the architect propose o obtain virtually all the advantages of the de ached pavilion system of the lagely compe reat hospital in the city of Berlin Prussia The drawings exhibit five differently sharsia. The rards, with divere juncts or service buildings, but all based on the principle of effectual isolation of the common ward.

The New Thames Tunne
The new subway between North and South Woolwich, which was lately commenced in London, is estimated to cost $\$ 375,000$, and will consist of an iron tube in segments 9 feet high, with a breadth sufficient for four adults to walk abreast. It will be lined with white glazed pan iles and be lighted with gas, and will possess an efficient system of ventilation. The entrance a the south side of the Thames will adjoin the North Woolwich station of the Great Eastern Railway and on the north side will adjoin the Woolwich pier. The charge to casual passengers will be wo cents each way, but to workmen going to and fro books of tickets will be issued at a con siderably reduced rate. The new tunnel is being constructed chiefly for the accommodation of the workmen engaged at the St. Katherine's Dock Extension Works, where 3,000 men will be employed for three or four years to come, the Beckon Gas Works, where 2,000 stokers are at work Henley's telegraph works, Silver's india rubber works, Foster's wine stores, etc., numbering altogether some 8,000 men, who at present have little or no hous: or food accommodation within easy access of their work, North Woolwich being a dismal swamp unsuited for residential purposes. The new docks, which will materially increase the dock accommodation of the Port of London, will reclaim twenty acres of marsh land, and convert North Woolwich into a comparatively healthy island.

## Liquid for High Temperatures.

It is often necessary to surround the pipes of heating or evaporation apparatus, and hot air apparatus, ovens, stoves, etc., with a boiling liquid at a temperature above $212^{\circ}$ Fah.; it is also necessary to make use of water baths producing high temperatures. The liquid employed for this purpose is simply water in which sea salt has been dissolved. Oil baths, etc., are also used. Messrs. Grimm and Corvin propose, instead of these various agents, to make a solution of chloride of lime in glycerin, a solution which does not boil below 572 or $626^{\circ} \mathrm{Fah}$., and has the further advantages of never attacking metals nor congealing.

## Manufacture of clouds

The stage of Wagner's theater, at Bayreuth, required 3,247 gas jets. The rising mists and gathering clouds needed for scenic effects were produced by two large engines placed at a short distance from the theater, whose steam was carried by pipes to reservoir, from which it could be distributed by a network of tubes over the whole stage. In the corner towers of the theater are two cisterns, each hold ing about 1,200 gallons, from which water can be obtained at a very high pressure in case of need. The gas and water works of the theater have cost $\$ 30,000$.

## Ozone an Active Poison.

The eminent French chemist P. Thénard writes as follows in regard to the effect of ozone, or active oxygen, on the animal system. "I believe," says he, " that it is high time that the attention of the public, and even of the learned, was directed to the widely spread errors in regard to the action of directed to the widely spread errors in regard to the action of ozone on the system. Far from being a remedy, it is rather one of the most energetic poisons that has been prepared in our laboratories, and the serious accidents which have occurred in my own leave no doubt of it. I will not enlarge on its physiological action, since A. Thenard will soon publish an article on that subject; but will only give prominence to the fact that, under the influence of ozone, even when greatly diluted, the blood corpuscles rapidly contract
and change their form, the pulse become slower, so much so that a guinea pig with a normal pulse of 148 , after being kept 15 minutes in a weak ozone atmosphere, had the pulse reduced to one thirtieth. At the present time, when an ac curate method of measuring temperature is of great assistance in medicine, ozone may possibly prove a means of pre venting too great a rise of temperature; but inconsiderately to disseminate ozone in inhabited places, in the delusive


## A MEDIEVAL WINDOW GRILLE

 ope destroying a miasma, would be very dangerous. If ou strongest poisons furnish in certain cases our best remedies, we must first learn how to use them, so as not to make a mistake in the time of giving or in the dose. Then, is it cer tain that ozone does exist in the atmosphere? Its presence there is proven by means of colored paper, the color of which changes more less in contact with the air. But who knows that there is not some other substance present in atmospheric air, which can modify this paper in the same manner as ozone? Wittmann passed a stream of air through the flame of a glassblower's lamp, and obtained a kind of air which acted upon the so-called ozonometric paper (starch and iodide of potassium) just as ozone does; but while this air disinfected badly smelling water without making it acid, ozone does not disinfect and does make it acid. Moreover that ozone cannot exist at a temperare $392^{\circ} \mathrm{Fah} .\left(200^{\circ} \mathrm{C}\right.$.), while this modified air of Wittmann' as exposed to a temperature at which glass softens."It will be seen that there is still much to be desired in the discussion of this question, although it would be consi dered over-hasty to deny the possible presence of ozone in the air, or to assert that it is never used with profit in med icine.

## AN ORNITHOLOGICAL ORNAMENT

There is one distinction which the student of the super

exhibits of China and Japan, at the Centennial Exposition, finds himself called upon to make on comparing the respec tive displays. And that is that: while the Japanese impress
us by their remarkable progress, by the wonderful celerity with which they are adapting themselves to Western ideas habits, and customs, and with the admirable neatness an artistic beauty of their handiwork: still one may look in vain for the evidences of that tireless patience which, re inforced by skill transmitted from father to son for ages, re sults in the production of the marvelous work in ivory, in wood, and in porceain, which abounds in the chinese de partment. The Japanese bronzes exhibit the per fection of delicate labor; the Chinese carved wood rnaments show the same characteris, but priods of time The essential feature of long hing ofe in ingenity and skill; of every hing Chinese, in and hing Chinese, patience, and nowhere though out the Chinese exhit is this last characteristic more prominently displayed than in the case of ivory goods in which the curious ornament repre sented in the annexed engraving is found.
In this case are the famous Chinese balls-hol ow sphere after sphere being carved one within the other out of a solid lump of ivory, and ye each sphere is exquisitely carved and ornament ed. Here also are superb sets of ivory chessmen, alued at over four hundred dollars per set; mo els of Chinese junks with every portion a mar el of delicate filagree work; fans reminding on of petrified lace and grotesque statuettes in ivory n forms such as only originate in the Celestia mind. The ornament we illustrate is a larg bird's head, the bill being made out of ivory, rich y carved in groups of men, houses, and trees o ts upper side. At this point also the bill is stained or rather clouded a deep red. The head proper is covered with feathers attached in som ncomprehensible way, but so naturally that on would suppose, did so gorgeous a bird-not to mention a creature with an ivory beak-ever ex ist, that they grew there. The feathers abov are of a deep peacock green; as the eye is ap proached, an exquisite shade of light blue is con trasted with a golden yellow, and a few ligh crimson feathers stand prominently forth from those of softer hue. Beneath the bill the feath ers are of a rich brown flecked with black. Th combination is one of surpassing beauty. Th head rests on a base of ebony carved in intricat designs, and this in turn on an ornamental pe destal.

## Flax Manufacture in Ameriea

The commencement of a new manufacturin ndustry in this country is exemplified in the suc cessful establishment of a small linen factory a Manchester, N. H. Some enterprising partie secured some land, sowed it to flax, gathered th rop and prepared it for spinning hired a Scotch flax finisher, procured spinning machinery and loom, and worked the lowly, until by easy steps the business was thoroughly un derstood and mastered. The amount of money risked wa mall, and in case of failure the loss would have been tri ling. But it is precisely such ventures as this, and so con ducted, that succeed, and this experiment has become a suc ess. A linen manufactory is about to be put into operatio with a certainty of its being practicable and profitable. It was in this way that the cotton manufacture began in th Southern States, where it is now a grand success. Woole manufacture began similarly in the West, where it is now firmly established, and we are well convinced that it need only to be begun in this careful manner for flax manufac re to become also an established business in the West. Bulletin of the American Iron and Steel Industry.

## Jacquard, the Inventor of the Figure Loom

The Italian proverb, chi dura, vinc, is so true that the world has often had to lament the interruption of useful la ors by the too early death of those who have begun them the projector fails, and his half-executed projects fal back into formlessness. Jacquard, tried by fortune with everity exceptional in the history of inventors, did at leas ast long enough to perfect his invention and know its suc ess. The story of his life and an historical account of his world-famous loom are contained in a handsome quarto from the pen of Dr. Kohl, lately published.
Born at Lyons in 1752, the son of a journeyman silk weaver, young Jacquard grew up without more formal edu cation than the reading he snatched as an apprentice in bookbinder's shop. His energetic spirit was but disciplined by his difficulties; yet to have been able to have a share in advantages, now at hand's reach of every mechanic, would have been of priceless benefit to him, and, probably enough, of advantage to ourselves, the heirs of his successes. Hi mother died while he was yet young; when he was twent his father died, bequeathing him a little house and a hand loom. Jacquard quitted his bookbinding for the loom, see ing the time come to carry out his improvements in it, which he had long been revolving. He married a woman who en he had long been revolving. He married a woman who en
dured many years of privatiou with him: their first born dured many years of privation with him: their first born
was not many months old before poverty came upon him was not many months old before poverty came upon him
he sold his little patrimony; and destitute, with wife and he sold his little patrimony; and destitute, with wife and
child, faced about to fortune, fighting necessity with a quick child, faced about to fortune, fighting necessity with a quick
brain. Inventing, contriving, improving, he fought hi brain. Inventing, contriving, improvisg, he then the rev ution broke out.
He now became a soldier in the non-figurative sense of
the word, and remained in the army till 1795, when his son, a lad of sixteen, was shot down at his side. In 1796 he came back to Lyons: the shade deeper in his large, melancholy eyes, his face graven by thought and sorrow into the sad patience shown so well in his portrait. He now devoted him self to the making practicable his figure loom, hoping thereby to reduce the tediousness of the work of the children employed in the wea ving shops. He received sufficient support to enable him to realize his plans, and in 1801 exhibited at Paris his inventions, which won for him a bronze medal, and were immediately taken up by the Lyons master weavers. In this, as in later inventions, Jacquard retained no right of profit.
The next sight we have of him is at Paris, where he had brought a model of a machine to compete for a prize offered for a mechanical method of making fish nets. Introduced to General Bonaparte and his adjutant Carnot, the latter roughly asked him " if he were the man who professed to do what God himself could not do?" The general came to the aid of Jacquard, and, with characteristic insight, approved both invention and inventor, dismissing the latter with encouragement to experiment further.
In 1804 the Society for the Encouragement of Industry be came Jacquard's patron, and gave him a post in the Conser vatoire des Arts and Métiers. This was perhaps the fairest part of the inventor's life, and invention after invention surprised the world with his fertility. It was in the few months that he kept his post here that he recreated Vaucanson's spinning loom. Unluckily for himself, he received and accepted an invitation from Lyons to superintend a factory there, and left Paris before he had been in it a twelve month. In 1806 the Prefect of Lyons received an imperial order to pay Jacquard a pension of $\$ 600$ a year, on condition that the latter conceded to the city of Lyons all the right and profit in the use of $h$ is inventions, binding the inventor to watch over the same and give his whole time to them. The far-sighted and very capable Emperor acted exactly as many a rascally overseer in a factory does by a clever subor dinate, who, at the cost of a little inexpensive distinction, is flattered out of the fruits of his brain. From this, the highest moment of his fortunes, began their decline. Public opinion in Lyons turned against him, his models were used without compensation, he engaged himself in contracts in which only his own side was kept to, his machine was slandered as a plagiarism of Vaucanson's. The weavers were accused of purposely spoiling their goods to bring the Jac quard loom into discredit; and their hatred to their benefacor, expressed in often repeated threats of murder, culminated in their breaking up and burning, in the Place Terraux, models and machinery together-scenes, the horrors of which flashed up again only too vividly when Jacquard was an old man and came to die. Only inventors and benefactors know the innermost bitterness of moments such as these.
Little by little the Jacquard loom came into universal use, and at length, in 1840, the Lyonnese, aided by foreign subscriptions, set up in honor of their great citizen a bronze statue, with the inscription

> A. Jacquard

La Ville de Lyons Reco
The inscription must have been written by a foreign satirist. Jacquard died on August 7, 1834, in the 83d year of his age. The sketch which Dr. Kohl gives of the life of the inventor is followed by the fullest details of his inventions in the order of their development. An atlas of mechanical plates, beautifully executed, complete the very perfect monograph, to which a last interest is given by its German authorship.

## Cimtrefyoudeute.

## Rat.Talled Larver. To the Editor of the Scientific American:

I wish to call your attention to something I found recent ly at a neighbor's. The curiosity consists of larvæ, about $\frac{8}{4}$ inch in length and $\frac{1}{6}$ inch in diameter, of cylindrical form, having usually six feet on each side, and covered by a transparent skin through which the internal viscera can be distinctly seen; but most remarkable of all, the posterior end of the body terminates in a caudal appendage of about the same length as the body, and presenting to the eye the same appearance as the tail of a mouse or rat.
One thing that attracted the attention, of the gentleman at whose place I found these specimens, was the fact that the water in which they were found had contained the carcasses of four or five drowned rats; and when they were thrown out of the barrel in which the water was contained, the bodies of two of the rats were filled with these rat-like worms! Upon the water, which was quite stagnant and foul, were several hundreds of these larvæ, some alive and squirming and crawling up the sides of the vessel, but a majority dead ; but all had the tails.
I am not much of an entomologist, but have given the science some attention; and in all my reading, and in such search as I have been able to give the matter, I can find no authority for maggots with tails like rats, which these undoubtedly are. They are new to me, although they may be familiar to you. Will you please let me know where they belong?
R. M.

## Emporia, Kan.

[The curious "rat-tailed" maggots, so graphically described in the above letter, are the larvæ of a large twowinged fly belonging to the genus eristatis.
They may be found not only in stagnant pools, but also in water-soaked rotten wood, and are quite common in salt
ats. Our correspondent may rest assured that, singular as was the resemblance which struck him so forcibly, be tween these larvæ and the rats that were found drowned in the same vessel with them, it was a mere coincidence and not in any sense a case of mimicry or inheritance. The lar væ of eristatis being aquatic or amphibious, the tail-like ap pendage is in reality a respiratory tube, provided at the tip with two stigmata which may be protruded above the sur ace of the water for the purpose of inhaling air while th arva remains concealed beneath. These larvæ are furthe characterized by the seven pairs of well developed proleg or leg-like tubercles : the young of no other species of dipter possessing so complete a set of locomotive organs. When ready to transform, they leave the water and burrow into he ground, changing to coarctate pupm, of which the tail still forms a conspicuous part. The flies are frequently保 een hovering about flowers in the spring or buzzing loudly gainst our windows in autumn. One species has large,
bright coppercolored eyes, and a stout body of metalli bright copper-colored eyes, and a stout body of metallic
green color, the thorax ornamented with five gray stripes. green color, the thorax ornamented with five gray stripes.
Some are gaily banded with black and yellow, and, except by a careful observer, might be mistaken for wasps. Others again have hairy bodies and legs, and more nearly resemble bees.-Eds.]

## Expansion of Locomotive Bollers.

To the Editor of the Scientific American:
I notice that some builders of locomotives still persist in fixing the side bars or framing of their engines rigidly to the boiler, notwithstanding their knowledge of the expan sive qualities of metals. Under ordinary changes of the weather, all iron structures of much extent, if designed for durability, must have provision for easy play of this resist less and ceaseless action caused by change of temperature. How much more important is it that careful provision should be made for the free expansion and contraction of a loco motive boiler, subject as it is to vastly greater changes of emperature!
It has been found by experiment that the quality and condition of a metal determines the percentage of its expansion. For instance, tempered steel expands more than untempered, and soft forged iron more than common commercial bars. The expansion varies slightly also with different qualities of the same metal, so that there can be no fixed formula by which to predetermine the exact amount of this change by temperature.
It may be stated generally that zinc will expand 0.0025 lead , 0.0028 , tin, 0.0028 , copper, 0.0019 , silver, 0.0019 , brass, 0.0019 , gold, 0.0015 , wrought iron, 0.0012 , steel and cas iron, 0.0011 , of its length by the addition of about $175^{\circ}$ to its normal temperature. In other words, a rod of zinc 25 feet long will lengthen $\frac{7}{8}$ of an inch, lead and tin $1 \frac{3}{6}$ inch copper, silver, and brass $\frac{8}{8}$ inch, gold and wrought iron $\mathrm{T}^{7}$ inch, steel and cast iron $\frac{8}{8}$ inch
It will be noticed that copper and brass vary much more than wrought iron : hence the unfitness of these metals for any part of an iron boiler, either for tube sheets or tubes The expansion of steel being somewhat less than that of wrought iron, it would doubtless be good practice to use stee both for fire boxes and tubes in iron shells, on account of the more direct and intense heat in contact with these parts, which would compensate for the less expansive quality of steel.
One of the present long locomotive boilers, under the high pressure at which they are worked, will expand from five to seven sixteenths of an inch probably, depending somewhat upon the age of a boiler, and the quality and condition of the iron. Who can estimate the great strain thus imposed, and its effect upon the boiler and machinery when the side bars are rigidly fixed to the boiler? We only know that the boiler soon becomes leaky, and that the machinery does not retain that perfect linage in which it was first placed by the painstaking machinist, and which is so essential to the durability and economy of an engine.
It is true that most locomotive makers provide partially for the expansion of the boiler by elongating the screw holes in the feet of the brackets and braces that rest upon the side bars, and more recently by loops which embrace the side bars along the sides of the fire box; but there are some builders who still persist in fixing a central girder rigidly both to the boiler and side bars. I refer to the girder which sustains the rear end of the crosshead guides. I am partial to the looping principle, and this central girder and the feet of all braces attaching the side bars to boilers should simply embrace the side bars in the form of a loop nicely fitting the side bar; and the rear ends of the crosshead guides should slip into the centrai girder so as to allow of a slight lengthwise play.
But the saddle casting, to which the cylinders are attached should of course be most rigidly and thoroughly fixed both to the boiler and side bars. Then the office of all the other fastenings which hold the side bars to the boiler would be simply to keep the guides and machinery in perfect line without obstructing in the least the free length wise play of the boiler. It is excellent practice to cast'half of the saddle with each cylinder, and then bore and fit the cylinders together, so that they lay perfectly parallel with each other, of course both vertioally and laterally; and then fit them to the boiler as a single casting. In getting up a pattern of this kind, the pattern maker should be familiar with some of the intricacies of molding; if he be not, he should consult an intelligent molder.
Worcester, Mass.
F. G. Woodward

Mr. Merrick Bemis' address is New London, Conn., no New Haven, Conn., as stated on page 177, current volume.

## PRACTICAL MECEANISM. <br> by joshua rose. <br> Second $\overline{\text { SERIEs-Number XI. }}$

In Figs. 76 and 77, we have another example of flask molding, but for a pattern of different shape to our previous

Fig. 76.

ne. The pattern is, in this case, not made in halves, its flanges on one side being left loose. In Fig. 76, one half of the pattern is shown on the molding board, and the nowel

pattern is shown molded and ready to have the cope taken off, A representing one of the crossbars fitted into the cope and following the outline of the pattern.

CORES
are projecting bodies of sand, either left in the mold by the pattern itself or else made in a separate device called a core box. They are placed, after being dried, in position in the mold. The purpose of a core of the latter description is to leave a hole or recess of such a peculiar shape or in such a position that it is impracticable to make the mold of the necessary conformation by the use of the pattern alone. The use of these cores also permits us to modify the shape of a pattern that would otherwise be difficult to mold. For example, Fig. 78 represents a plate of such length that it is necessary to mold it in thedirection indicated by the arrow as the pendants, which are long and narrow, with their

Fing. 78.

projections at the extremities, would lock the pattern in the mold. Three methods present themselves whereby to overcome the difficulty. First, we may make the projection loose, the vertical line, A, being the joint; and it is held in position by vertical dovetafls or by horizontal wires, as shown in Fig. 78. In the latter case, the molder, when ramming the sand, withdraws the wires; and when the pattern is withdrawn from the mold, the two different projecting pieces are left in the mold, and are subsequently retracted horizontally, and then lifted out. It is obvious that this can only be done when there is sufficient space to accommodate only be done when there is sufficient space to accommodate
the projecting piece as it is withdrawn from its recess in the the projecting piece as it is withdrawn from its recess in the
sand, and to admit of its being raised to the surface. To sand, and to admit of its being raised to the surface. To
this method there is the objection that the recess left by the projecting piece in the mold cannot be, in many cases, either inspected or dressed if any reparation is required. A se cond plan would be to make the projecting piece join the pattern at the horizontal line, B, in Fig. 78, but separable from it; but in this case a three-part nask would have to be used, entailing double work for the molder. The third method is to affix the core prints, C C, to the sides of the pattern, leaving those sides smooth and even; and the pattern will then draw easily out of the mold. If we then core away all we have added to the pattern, as shown by the dot ted lines in Fig. 78, the casting will retain the correct shape of the pattern. To effect this coring away, we make dry sand cores of the shape of the core prints, C C, and place them in the mold. Ordinarydry sand cores are composed of a mixture of sand and flour moistened with water, and they are molded to the requisite shape in the core boxes already mentioned. They are then baked, becoming sufficiently strong to handle; but previous to the baking they are so weak that they cannot be handled without being in some way supported. It is, therefore, as great a consideration to the pattern maker how the core is to be taken from the box as it is how a pattern shall be drawn from the mold. We may divide cores molded in a core box intothree classes: First, those that lie as they are made; second, those that re quire turning over; and third, those that not only require
turning over, but require also a bed of sand made for them to lie upon during the process of baking. Figs. 72, 73, and Fig. 73.


Fig. 72.


Fig. 74


74 are examples of the first, in which the cores are represented by C. The core boxes, being made in halves and loose at two of the opposite corners, can be drawn away from the cores, C , leaving them standing, just as they were made, on an iron plate ready for removal to the oven. In a core box made as in Fig. 74, it is necessary to bore in the ends a couple of small holes for the insertion of wires to effect ventilation. In cases where sufficient draft or taper can be allowed on the core, the core box need not be made in halves, but may be made solid, as shown in section in Fig. 75.

Fig. 75.


While it is the aim of the pattern maker to form his core boxes to work in the simple manner illustrated in our examples, there are very large classes of cores with which such easy methods are impracticable. This, for instance, is the case with all round cores that are of such length that they are not able to support themselves on end, and with those having branches, as shown in Fig. 79, which represents a core fo

a straight faucet. If it were attempted to make this core in a vertical position, its overhanging branches would fall away immediately after separating the two halves of the box; hence it is made horizontally, and generally in separate
halves, which, after being baked, are pasted together and halves, which, after being baked, are pasted together and again dried, thus forming the full round core. In cases, however, where great numbers of such cores are required, as in steam fitters' work, they are usually lifted from the box whole; but it is a delicate operation, involving much practice. We need not, however, go into this, the subject only being mentioned to show how a pattern maker decides whether he shall make a full core box or only half a one for if the halves of the core are to be made separate, and one part is exactly similar to the other, then a half core box is all that is necessary. Suppose, for instance, the core of a faucet, shown in Fig. 79, to be alike at the branches, C and D ; then, it being made in two halves meeting in a point represented by the line, A B, the core box may be made to mold the half, E ; and two of such halves, pasted together as described, will form the whole core. In this particular example, however, there is yet another way of making the core, providing the branches, Cand D, are parallel in diamter, and that is to punch holes in the main part of the core, through holes provided in the core box., using a piece of wood for the purpose.

Fig. 80 is an illustration of a square core for a baluster its four sides being curved, it is necessary to make it in separate halves, dividing it diagonally across the corners, as denoted by the lines, A B.


We have now to give an example of the third class of core, which will not stand on end and does not present a flat surface on any of its four sides, neither can it be readily divided, as in the former case. Fig. 81 is an illustration of

probably the simplest kind of this class, which will requir a core box that must part in all directions in order to enable us to extract the core, which will require, in addition to this, what is called a turnover box. Fig. 82 is an end sectiona view of this core box, having four jointed sides and a bottom, with holes cut in them where the projections are to be formed on the core. The top, in this case is simply two bars that cross the box where the projections occur; and projections occur; and holes are cut in thes bars to form the projec tiens. The box is re-
tained together and kept in position by the taper pegs shown at the junction of the sides
 The ends of the box
are recessed to receive the sides, but all is removable. In using this box, after ramming up the top, the crossbars are removed and in their place is mounted the turnover box

Fig. 83.

shown in section in Fig. 83, at A, which is a simple square rame, made taper. It rests on the outer edge of the core ox, so as to give a bed of sand somewhat larger than the t in position. The frame is then carefully filled with ordi nary molding sand, so as not to disturb the projecting parts f the core, and the sand on the outside is then struck of level. An iron plate is then placed on the top of all, and he whole is turned upside down. The bottom of the cor ox, which has now become the top, is first removed, an hen the sides and ends. Thus the turnover box affords a bedding of sand, on which the core may rest without suf ering injury from its own weight.
It would be a costly matter to make core boxes for long ylindrical cores, such as are used for pipe and similar cast ings; hence, for such purposes, a core is made as shown in

Fig. 84, in which C represents a core for a pipe, having socket at one end. It is prepared as follows: Upon the two tressels, A $A$, is mounted the long tube, $D \mathrm{D}$, which is per forated throughout its entire length with numerous smal holes, and which is provided at one end with a crank han dle, by means of which it may be revolved as it rests in the two rude $V$ bearings, provided in the top of the tressels, as shown. Upon this tube a layer of rudely twisted straw rope, sufficient to make its diameter assume, from end to end, nearly the required diameter of the core, is coiled. Out side the straw rope, there is then applied a coating composed of a mixture of loam and other material, sufficient to in crease the diameter from end to end, somewhat above th finished size. To round up the core even and make it of the necessary size, the core or loam board, B B, is employed It is simply a board ranging in thickness from seven eighths inch upwards, according to its length. One of the edges is inch upwards, according to its length. One of the edges is
cut to the conformation of the required core; and all but cut to the conformation of the required core; and all but
about three sixteenths of an inch of the thickness of this about three sixteenths of an inch of the thickness of this
edge is beveled off at an angle of about $30^{\circ}$. This board is laid upon the tressels with the beveled edge uppermost, and is held in position by weights placed upon it over the tres sels. The core is then revolved by the handle in the direc

tion of the arrow, as shown in Fig. 85, in which A represents the tube, $B$ the straw rope, $C$ the loam coating, and D the board. It follows that, as the loam is added, the board will level it off, leaving the surface round and true, and to whatever shape the edge of the board may be made. It is whatever shape the edge of the board may be made. It
customary to mix, with the coating of loam, horse dung or a customary to mix, with the coating of loam, horse dung or a
substitute therefor, the object of which is as follows: It substitute therefor, the object of which is as follows: It
will be readily perceived that it is a difficult matter in a long will be readily perceived that it is a difficult matter in a long
casting to give vent to and permit the escape of the air and the gases formed in the mold by the molten metal; but by mixing in with the loam a combustible material, the latter becomes consumed during the baking of the core, leaving the latter porous, so that the air and gases can pass from the mold through the loam coating and thence through the straw rope, and find exit through the hollow tube upon which the latter is wound. We are now, however, verging upon the work of the loam molder, a subject of great im portance to the pattern maker, and which will therefore de mand some extended observations after the simpler exam ples of pattern work have been explained

Naval Items.
The United States steamer Vandalia was subjected on Sep tember 8, on the eve of her departure for the European sta tion, to a speed trial over a carefully measured course of three nautical miles in the Hudson river, under the superintendence of a special board of naval officers. She made four runs, two up and two down, over this course. She was fully armed and equipped for a cruise, laden down to her deepest draft. The following are the results of the trial which was pronounced highly satisfactory, as well in regard to the working of the machinery as to the developed power and speed:
Draft of vessel during trial: Forward, 16 feet 10 inches; midships, 17 feet 3 inches; aft, 17 feet 8 inches. Area of midship section at that draft, 516.6 squarefeet; displacement of vessel at that draft 2,130 tuns; average steam pressure during trial, 76.3 lbs.; indicated horsepower developed, 1,176; average speed of four runs, 12.06 knots per hour ; force of wind, 1 ; water, smooth; tide, last of flood, slack water, and first of ebb.
The Vandalia is a new sloop of war built at the Boston navy yard, and has a pair of compound engines designed at the Bureau of Steam Engineering of the Navy Department. She was completed and put in commission in the early part She was completed and put in commission in the early part,
of the spring of this year, and has since done service at dif. of the spring of this year, and has since done service at dif-
ferent parts of our coast. The following are the principal dimensions of the vessel and of her machinery :
Length of vessel on load line, 219 feet; extreme breadth, 39 feet; diameter of cylinders, 42 and 64 inches respectively; stroke of pistons, 42 inches; area of grate surface, 240 feet. She has a four-bladed screw, of 15 feet 6 inches diameter and of 21 feet pitch.
The above trial differed in some essential particulars from the "measured mile trial" of English naval vessels. Their dash over the short course of a single mile is made under exceptionally favorable circumstances,namely with a special force of carefully trained firemen, the best picked coal, and not unfrequently a forced draft: the object of the trial being a test whether the different parts of the machinery are properly proportioned to one another and to the hull. It is evident that the trial of the Vandalia, made under the conditions of ordinary service and over a three times longer course, affords a much closer estimate of the actual capa bilities of her machinery.

## A NEW MECHANICAL MOVEMENT.

The annexed engraving illustrates a new mechanical move ment for transmitting rotary motion, in substitution of bevel gears, the invention of Mr. Melville Clemens, now of Philadelphia, Pa. The apparatus is so constructed that absolutely the same angular velocity of the driving shaft is trans mitted to the driven shaft, with positive exactness and avoid ance of back lash; and the joint makes a self-adjusting, flexible coupler, enabling the pla ing of the connected shafts at all desired angles of deflection, from a straight line up to and beyond a right angle.
Compared with bevel gears, especially for heavy work the present device offers the advantages of being noiseless and of possessing greater strength, durability, and safety, besides its complete range of shaft divergence.
The engraving shows sections of two shafts, A and $B$, connected at right angles by the coupler ; on said shafts are fixed, concentrically with their axes, the like cylindrical heads, C and D , each of which are slotted transversely, forming like jaws, on which journal caps are attached by bolts. Journal bearings are formed through the jaws, at right angles to and concentric with the axis lines of their respective shafts, in which journals are fitted like journal pins, E. The four equal coupler arms are carried in pairs in the jaws, by their hinge-jointed hubs, on the pivot pins, E. The outer ends of the arms are coupled together by two like ball-and-socket joints, each joint leeing formed by a ball turned up on one arm and fitting a take-up socket box,formed on itsconnecting arm and Babbitted. The weights, F, on the arm hubs, preserve the balance and uniform momentum of the two pairs of rotating and vibrating arms. The pivot pins are cored out for oil reservoirs, from which oil is supplied, through holes plugged with leather, both to the journal bearings and to the ball joints, making the apparatus self-lubricating. Motive power being applied to rotate either shaft, the inner ends of the arms will revolve with their respective shafts, while the onter ends of the arms will revolve in their diagonal circle of rotation, which compound rotary movements cause the arms to vibrate, both on their pivot pins and at their ball joints, with equal pivot movements : the arcs of vibration at each pivot being, in each revolution of the shafts, equal to the angle of deflection of the coupled shafts. The angular velocities of the two shafts are evidently the same at all points of a revolution of them, when we consider the arms of each opposite pair as equal levers in all their positions during a revolution.
Mr. Clemens has secured patents in this country on his invention, bearing dates November 2, 1869, and April 23, 1872, and has also received patents in several foreign countries. One of his shaft couplers for one hundred horse power can be seen at section C 9, Machinery Hall, Centennial Exhibition, in connection with the exhibit of Mr. George V Cresson, of the Philadelphia Shafting Works.
Parties desirous of ordering the shaft couplings for the Middle States and Ohio, address George V. Cresson. For orders and territorial rights for the Western and Southern States, address the inventor, Melville Clemens, care George V. Cresson, 18th and Hamilton streets, Philadelphia, Pa.

IMPROVED LINK BLOCK FOR LOCOMOTIVES.
We illustrate herewith an improved adjustable link block,
Fig. 1

claimed to fit tightly in the link and to wear it equally. It has other advantages, which will be found fully described below.

The block is not constructed in one solid piece, as is ordi narily the case, but is composed of two longitudinal parts. $A$ and $B$, the adjoining sides of which are made with suita ble inclination to receive the wedge piece shown at C, Fig. 1, and separately in Fig. 3. Screw bolts, D, connect both parts, the heads being countersunk in the recesses of on part while their threaded ends with screw nuts are adjusted by a wrench introduced into the slotted recesses of the other part. The wedge piece is suitably slotted to slide along the connecting bolts. Fig. 2 is a top view of the device, in whic E E are the face plates which guide the blocks.
All who are familiar with the link, and its operation with


CLEMENS' MECHANICAL MOVEMENT.
the present style of solid block, know that it is the concus sion of the block in the link that causes the link to wear so
unevenly ; that there is no effectual way of taking up the lost unevenly ; that there is no effectual way of taking up the lost motion; that as soon as it occurs it accumulates very rapid parts, and the cosine to run at a great disadvantage. To remedy matters a large amount of work is required.

With the presentimproved link block, the in ventor claims that one block, properly fitted, will wear the link perfectly true and outlast the engine, providing only the lost motion is taken up as soon as it is perceptible, and not left to ac cumulate as in the case of the solid block. That the valves can be set and kept square without losing lead. That when the lost motion is obviated, no appreciable wear can take place on the side plates, while much of the wear on rods, pins, etc., will be saved. That the lost motion can be taken up in a few moments without taking down or disturbing any other part of the machinery. That the necessity of using the piece link is avoided, and the solid case, hardened link, which is allowed to be far preferable, can be used to the greatest advantage, and that the device is not costly. The block can also be used as the ordinary old style block to advantage. When, after being used, the links need grinding out and new blocks fitted, all that is needed is to lap out the pin hole, insert a liner between the key and block, or fit in a thicker key, and a block equal to new is gained at a very trifling cost.
Patented through the Scientific American Patent Agency June 23, 1874. For further information address the inven tor, Mr. W. A. Alexander, P. O. box 130, Mobile, Ala

## Carbon Bisulphide as an Antiseptic.

Herr P.Zöller publishes the statement that, in an atmos phere containing a small quantity of the vapor of carbon bi sulphide, animal and vegetable matters are effectually pre served against decomposition or putrefaction.
The author affirms that a few drops of this substance is sufficient for the purpose; and since it volatilizes at ordinary temperature, the employment of heat is rendered unnecessary. In this manner, he adds, bread, vegetables,fruit of every kind (and fruit juices), and meat may be preserved for a considerable time in closed vessels. Upon opening the vessels, the unpleasant odor of the bisulphide is very apparent; but upon airing the substances treated for a few minutes, it disappears entirely by volatilization. In the case of meats, the flesh, after having been submitted to the above treatment for several weeks, is in no wise unpleasantly affected.-Deutsche Industrie Zeitung.

## American Meat in Europe.

The exportation of fresh meat in Europe seems destined to attain more importance than its promoters originally expected. It is but a little time since the steamship Abyssinia took the first shipment of fresh beef from New York-the dressed carcasses of 120 head of New York and Western cattle-contained in an iron refrigerator having an air ex-
hausting apparatus. Now fresh meats form an important feature of all outgoing cargoes.

The invention herewith illustrated is an ingenious and novel appliance designed as a substitute for the valves principally employed in water and gas mains. The common valves are usually mere diaphragms moved by a screw either inside or outside of the valve chamber. Outside screw valves are at present mostemployed; but owing to the length of the screw and its consequent long travel in order to open the valve, the latter is placed on its side. This avoids the deep excavation otherwise required, but still necessitates a ong narrow vault, which must be bricked and otherwise inished, and the construction of which in rocky ground such as is constantly found in many New York streets, we are informed, may cost, for a large valve together with the gearing necessary to work the valve, as high as a thousand dollars, The outside screw, moreover, is liable to rust, and therefore needs constant oiling and attention to keep it in working order. The inside screw, while not subject to the last mentioned difficulties, is easily bent and rendered inoperative; and in case of its fracture, the valve falls across the pipe, and is extricated only with considerable trouble and expense.
The present inventor, who has had a long practical experience in the laying of both water and gas pipes in this city, has devised the valve illustrated herewith on an entirely different principle, and he claims that it will altogether obviate all the disadvantages above noted. It consists of a cylinder, A, having an opening cut through it and placed in a valve chamber. By turning the cylinder on its vertical axis. either the aperture or the solid portion is carried in face of the pipe connections, and thus the water is allowed free passage through, or is shut off by, the valve. The cylinder rests below on rubber balls, B , so that its motion is always free on its seat, while its weight is thus firmly supported. Above, it is flanged so that no water can pass up over it into the bonnet. It has a central stem, C , to which the tool for turning it may be directly applied. In valves f large size, on the upper portion of the cylin of large size, on the upper portion of the cylnor an auiliary shaft D; so that by tirning the an in whe atter the cylinder can, when desired, be rota ted with iess power than when operated direct y by the central stem.
This valve, being practically but little larger in diameter than the pipe itself, requires no vault, and can be inserted anywhere. In places where pipes mingle, rise above, or cross each other, where it is generally impossible to work the ordinary screw valve, the apparatus shown in our engraving is inserted without difficulty. All its parts are covered so that they are not liable to stick; there is no screw to strip; the cylinder cannot fall, nor is there any portion to become out f order. We understand that the invention is already in uccessful use in many localities in this city It is applica ble to all purposes.
Patented through the Scientific American Patent Agency,


August 29, 1876. For further particulars address the in August 29, 1876. For further particulars address the in.
ventor, Mr. J. D. Keegan, 240 West 31st street, New York city.

## Railroads in the United States.

Railroad building in this country is progressing with much ore rapidity than in 1875. The Railroad Gazette for Sep tember 8 states that 1,388 miles of new railroad had been completed in 1876 up to that date, against 678 miles reported for the same period in 1875, 984 miles in $1874,2,408$ mile in 1873, and 4,264 miles in 1872 . The Los Angelos Divisio of the Southern Pacific Railroad has been completed, and the Cincinnati Southern is now the only other long line in the country now under way. It will be completed in 1877

## VINES FOR WINTER DECORATION.

It may at present seem to be early to be preparing floral ornaments for indoor decorations; but six months beforehand is hardly too soon to commence setting out vines and cuttings for this purpose.
It is a matter of course, says the American Garden, from which we select the engraving published herewith, that pots should be used, and then the plants need not be disturbed in the fall. The best of soil, fine dark leaf mold from the woods, should be used; if it be mixed with sand, your plants are sure to thrive with ordinary care. If leaf mold cannot be obtained, use garden loam mixed with sand ; but in this case water the plants freely with liquid manure. If started early, your vines will have made a good growth by autumn, and be ready with the best of their foliage and flowers when brought into the house. Be sure that they are not exposed brought into the house. Be sure that they are not exposed
to frost, for the slightest touch will check their growth, and make them miserable and sickly all winter.
In choosing plants suited for this purpose, select only those species which will succeed with ordinary accommoda tions and treatment. It is useless to spend time and strength on delicate plants that can only be brought to perfection with greenhouse heat and moisture.
Ipomea coccinea, which we illustrate, is a very rapid climber, of the same family as the morning glory, though much more delicate in flowers and foliage. It is excellently suited for window ornamentation, as it is a very rapid grower: it will usually begin to bloom in four to six weeks after planting the seed. The flowers are small and star-shaped, of a brilliant scarlet color, and produced in great pro fusion. Many who fail with almost everything else succeed in growing this plant.

## Saw Flies.

Mr. F. Smith, in a recent paper before the Lon don Entomological Society, says: "This nematus gallicola is one of the commonest species of saw fly found in Europe ; it is the maker of the well known red galls, so plentiful on leaves of different species of willow. The galls are, as Mr. Cameron observes in his communication to the Scottish Nat uralist, somewhat local, but they are extremely abundant in many situations. I have on many oc casions collected large quantities of leaves, more o less covered with galls, and have bred many hun dreds of the flies-all proving on examination to be females. Mr. Cameron observes, in the pape alluded to: 'The male is quite unknown to me, and this appears to have been also the case with Har-
tig.' Last spring I collected, in the London district, a quantity of the galls, placing them in a large flower pot half filled with garden mold. The larvæ soon quitted the galls and buried themselves in the mold for the purpose of undergoing their transformations. About a month after this the flies began to issue forth, probably to the number of from five to six hundred; among this number I had the satisfaction of finding two males. This sex closely resembles the female, but has a narrower body, longer antennæ, and the tip of the abdomen is pale; the abdomen is also narrower, and not, as in the female, widened toward the apex. This sea son I have repeated my experiment, and have ob tained a single male out of several hundreds of flies.

Mr. Cameron further observes: ' In all proba bility they, like cynips (lignicola) Kollari and other cynipida, propagate without the aid of the male sex.' This observation was undoubtedly made in ignorance of the discovery made by Mr. "Nalsh in 1868. In the American Naturalist for that year the author records the fact of having himself bred both sexes of cynips spongifica from the galls of the black oak of North America. These galls resemble those of cynips Kollari, being globular, rather larger than the European galls, but of the same hard woody consistence exter nally, and of the same spongy sulsstance inside. Mr. Walsh
adds: ' By the fore part or middle of June, both male and feadds: ' By the fore part or middle of June, both male and fe-
male gall flies eat their way out of a certain number, say male gall flies eat their way out of a certain number, say
abanat one fourth part; the remainder are not developed until about two months iater.' In a private communication from Mr . Walsh, I learnt that he had, like myself, bred hundreds of the gall flies from galls collected late in the autumn, al these proving to be females, and that it was not until he made collections of galls in summer, when a partial devel ment of flies takes place, that he obtained the male, this sex being as one to many hundreds of females. At length he bred three males, one of which he kindly forwarded to me and which I exhibited at a meeting of this Society. Following up Mr. Walsh's method of collecting the galls of cynips Kollari early in the season, that is, just at the time when they are becoming hardened, and before any flies have es caped from the fresh galls, I have tried, but hitherto with out success, to obtain males of cynips; but I advise all who are interested in the matter to pursue the same plan, always remembering that these mysteries of nature are only un folded at intervals, and then only to favored votaries.
"With respect to the obtaining of males of nematus gal licola, I believe that any one may collect, even early in the season, thousands of the galls of that insect without obtaining a male; but in all probability, by persevering season af ter season, his efforts will, as in my own case, be crowned with success; but I feel assured that unless the galls are gathered before any of the flies have escaped, he will have little or probably no chance of success

Foundations for Woodworking Machines.
The following practical information is extracted from Mr. The following practical information is extracted from Mr.
J. Richards' new work on " Wood Conversion by MachinJ. Richards' new work on " Wood Conversion by Machin-
ery." The subject divides itself into two branches; one pertains to machines with reciprocating motion, and the other to machines with rotary motion only.
In respect to reciprocating machines, such as frame saws, jig saws, mortising machines, and so on, earth foundations resist vibration mainly by the inertia of their weight ; that is an iron machine frame, when firmly bolted to a mass of masonry, becomes part of a whole, consisting of the foundations and the superstructure. A machine frame of one tun weight, bolted to five tuns of mason work, is in effect much the same as though the same machine frame contained six tuns instead of one tun of iron. It is, therefore, not the earth attachments which give solidity and firmness to machinery set on stone foundations so much as it is the weight which is attached to machine frames, and such a proposition at once suggests certain conditions, in constructing founda tions, which are often neglected. Presuming a foundation to be an integral part of a machine, the value of such a foundation will be as its solidity, and depend upon how firmly it is bound together, and how near the whole mass, including a machine frame, approaches a solid.
To excavate a hole in the earth, and fill it with loose
ting machine can be changed at discretion from a vertical al to a horizontal plane, and vice versa, the counterweight ing of such machines should, in all cases, have reference to, and be arranged for, the kind of foundations or attach ments employed in erecting the machines.
In experiments conducted some years ago by the writer, to determine the most effectual means of resisting vibration in a peculiar kind of sawing machines, driven at from 1,000 to 1,500 revolutions per minute, it was found that a heavy crank wheel gave good results. This in effect was employ ing the inertia of a heavy mass to resist rapid reciprocating motion. the effect of vibration not being permitted to pass through the crank shaft bearings and be communicated to the machine frame. The experiments were such as to in duce a belief that if, in designing deal and log saw frames, portion of the metal putinto the framing were transferred the cranks or fly wheels, a higher speed could be attained The introduction of an elastic medium, such as a spring or bock of wood, between the bearings of a crank shaft and machine frame, although seldom done, is one of the most effectual means of avoiding jar and vibration in reciproca ting machines.
To sum up the means of avoiding vibration in reciproca ing machines we have: (1) Solid foundations, the machin framing rigidly attached so that the whole becomes in effec one mass, to resist vibratory strains. (2) Counter weight arranged with reference to the plane in which vibration can best be resisted. (3) An elas tic medium placed between the bearings of crank hafts, and machine frames. (4) Heavy crank o fy wheels, with the crank pins inserted at or near he center of percussion
With a proper attention to these several condi tions, and by reducing the weight of reciprocating parts to a minimum, it is safe to claim that at leas one third can be added to the speed of ordinary re ciprocating machines, such as are employed in wood manufacture.
The main argument in favor of strong founda tions for rotary machines is found in the manne bjech their frames are usually how many sepa rate legs can be provided, and how long a founda tion base can be secured. It adds to the apparent tability of a machine frame to have a long base, and ta doubt it has such effect if a foundation is consid ed in it it red in imbe, bul is ene the with tions not in wood machines have to be set upon, any settling or change of the foundation is communicated to th machine frame, which is thereby warped and strained out of truth in proportion to the weight o the foundation and the power of resistance which the frame offers; in this way a machine frame, instead of being supported by, may be said to support, a oundation. It is not unusual to see machines with four, six, or more legs, fastened down at as man points to upper floors, or other foundations which yield from unequal loads and from settling; tenon ing machines are especially affected by being fast ned in this manner, and their carriage ways ge out of truth, and the frames warped.
A remedy for this difficulty is to mount machines on three bearing points, instead of four or more, a matter which every one understands, and a plan of construction well adapted to many, if not most od-cuti dopted. A machine with three legs may requir more rigidity in its framing than if four or mor legs were employed, that is, if we are to conside the theoretical conditions under which strain, jar and so on are resisted; but in so far as keeping machine in truth, and without settling strains, its performance will, in most cases, be improved by re

IPOMEA COCCINEA
stones, will not make a foundation; and to attach holding down bolts to pieces of timber buried beneath masonry is to provide elasticity where rigidity is required. Anchor pieces for holding down bolts should be made of iron, and in al cases be placed beneath masonry, so that the whole nass
will be bound together. Such anchors require considerable surface, and should never be narrow pieces of wrought iron, but broad castings of sufficient strength to ensure against their breaking with the utmost strain which can fall on them. Such suggestions by no means relate alone to the difference between good and bad foundations. First class foundations are often prepared with holding down bolts to embrace but a part of the masonry, and no attention is given to linding the stone work together.
In cases where such rigidity leads to the destruction of bolts, bearings, and so on, and when some degree of elastic ity is essential, it is obviously wrong to place the elastic medium. whatever it may be, between a machine frame and its foundation, or to provide for the elasticity in a founda tion; the proper place for introducing a yielding or elasti connection in such cases is between the crank shaft bearing
and the machine frame. In this way the desired result is attained in a more effectual manner, and the evil results of arring and vibration avoided.
When any reciprocating machine, such as a frame saw or mortising machine, has its reciprocating parts balancedthat is, when a weight equal to the reciprocating parts is at tached to the opposite side of the crank-the vibration wil be changed from a vertical to a horizontal plane: if the re ciprocating partsare not balanced, vibration will fall mainly in a vertical plane.
From this it follows that, if the vibration of a reciproca

## ucing the number of legs or supports.

Rough cutting is the result of imperfect balancing, loose earings or spindles, or cutters so weak as to spring and bend, and is rarely caused by a movement of machine frames or their foundations.
So important, indeed, are balancing, stiff spindles, strong cutters, and true bearings for wood-cutting machines, tha in those countries where the highest efficiency has been at lained, in constructing and operating such machines, we find hat massive frames and foundations are regarded as matter of secondary importance in the attainment of good work, and that the most perfect English woodworking machinery is constructed with frames of moderate weight.
There is no purpose here for arguing against strong fou dations, nor even against heavy frames for machines, when there can be anything gained by either; the object is to explain that many machines which are thought to require masonry foundations can as well be operated on upper floors, as on earth foundations, and great convenience be thus attained in many cases, besides avoiding useless ex pense in preparing special foundations.
It is, moreover, believed that, in arranging wood factories and machine foundations, there is a want of a proper under standing as to the difference between reciprocating and ro tary machines, all being looked upon as the same, and as requiring similar foundations and supports. "Have a good foundation for the planing machines; mortising machines and sweep saws can go on the upper floors," is not an uncom mon remark to hear in arranging a wood factory, and a very correct one, considering the general course in a factory but it is bad to place rotary-acting machines on earth floors, and reciprocating machines on upper floors.

## centennial notes.

the belgian mining apparattes.
A system of apparatus, devised by M. Chandron and designed for sinking the shafts in coal mines, is exhibited in Machinery Hall. 'The machines are of colossal size and form, the most prominent feature of the vicinity. There is a trepan weighing 15 tuns, which is made of forged iron, and fitted with cutters secured by taper keys, so as to make a cut six feet long. The trepan is raised by steam power to a hight of three feet, and dropped. It is turned at each elevation so that a circle, six feet in diameter, is cut. The ad vance in soft sandstone is said to be three feet per day. The trepan being withdrawn, a massive iron bucket is fitted into the hole to remove the débris. After the first tool has pene trated about 30 feet, a second trepan, much heavier than the first and having a central guide working in the opening made by the first, is used, and, in the stone above mentioned it progresses at the rate of about a foot per day. A grapple for recovering broken rods, and a sweep to catch the sections of lifting bars, are also exhibited. There is, besides, a grapple for stones, etc., which is an ingeniously constructed pair of double lazy tongs arranged so that the arms extend to the sides of the hole as the device is being lowered, and scour the bottom as it is being lifted.
When the cutting is finished, circular plates are let into the opening, the bottom plates or cylinder sliding inside of a second ring, and being surrounded with a moss gasket compressed bet ween the flanges. This keeps the water out of the bottom. The second ring is convex beneath and floats on the accumulated water. Then, as ring after ring is
added, the water is allowed to escape, the rings sinking added, the water is allowed to escape, the rings sinking
gradually. Guides prevent the casing from tilting until it gradually. (xuides prevent the casing from tilting until it
is secured to hard impervious strata, when the shaft is pumped out and is then ready for use. This machinery and tubing has, already, we learn, been applied to 48 deep mining shafts in Europe.

## RUSSIAN RHODONITE.

We have already noted the magnificent display of malachite and lapis lazuli from Russia. With the malachite objects are two card receivers of a very peculiar red stone, the nature of which puzzles most people. It is rhodonite the name being derived from the Greek work for "rose," in allusion to its color. Chemically it is a silicate of man ganese, and it is found in iron mines in Sweden and in var1ous parts of Russia. Professor Dana, in his "Mineralogy," states that it has been met with in various parts of New England, and mentions a large bed as existing in Maine. Diamond dust is needed to cut it, a fact which at once ac counts for the price of the articles exhibited, $\$ 2,000$ each, which will probably deter enterprising New Englanders which will probably deter enterprising New Englande
from seeking the precious mineral in their own vicinity.

## russian furs.

Not the least interesting portion of the Russian display in the Main Building is the superb exhibit of furs, which, individually as well as collectively, are well worth studying. For example, there are some black fox skins which are so ex more expensive, with the single exception of the pelt of the more expensive, with the single exception of the pelt of the
sea otter. The color is a glossy black, usually with a silsea otter. The color is a glossy black, usually with a sil-
very grizzle on the forehead and flanks. When this grizzle very grizzle on the forehead and flanks. When this grizzle
occurs the price falls, the pure black skins only costing such high figures. Some of the skins of Russian sable ex hibited are valued as high as $\$ 125$ each. This renders them, when size is considered (each skin would little more than cover a good sized rat), nearly as costly as the black fox fur. The darker the skins, the greater the value. But few such fine skins as are exhibited at the Exposition reach foreign markets, as they are monopolized by Russian royalty and nobility. It is stated that only about 25,000 sable pelts are yearly captured.
Besides these famous furs, superb skins of the ermine, squirrel, mink, fitch, seal, etc., are displayed, both in crude state and made up into robes, muffs, and garments. One robe of sable is valued at $\$ 2,000$. A cloak lined with Thibet goat skin, a fine silky wool, pure white and glossy, is offered for $\$ 328$. Fur rugs and carpets, almost unknown here but largely used in Russia, are also exhibited. We noticed one exquisite rug, made, we were told, of 2,400 small pieces of fur, of every kind and color arranged in tasteful designs. For the labor manifested in its execution the price asked ( $\$ 250$ ) seems small. The peculiarity of all the Russian furs is the skill shown in their dressing. Every particle of substance that can possibly be removed is scraped off the inner side of the hide, leaving the thin skin which holds the hair as soft and as fine as a kid glove. The method of preparation is also such as to render the furs moth proof, and even prolonged soaking in water has no effect on their pliability.

## the spanish fibers.

Spain and her colonies contribute a collection of vegetable fibers, which are applied to a multiplicity of aseful purposes. The well known manilla is shown, crude in ten feet lengths, and manufactured into ropes, twines, carpets, and artificial "switches" for ladies heads. The pina fiber is a beautiful production, as soft and as fine as raw silk. The
filaments are not taken from the stalk or leaf, as in the flax filaments are not taken from the stalk or leaf, as in the flax and similar plants, but are thrown out from the center of the
flower. A large case of fabrics from this material is exhibited in the Main Building. The cloth resembles silk, and is superbly embroidered. There is a curiosity in the millinery line, near the same case, in the shape of a rather gaudy lady's hat, interesting, however, because made from the
" peel of the common daisy." Several other plants, notably the banot, taloto, corteza de colias, de nabo, palma de buri,
and others, yield fibers of varying degrees of fineness, which likewise are $\epsilon$ xhibited, either suspended so as to show their greatest length or wound into skeins.
two austrian curiosities.
An opal, said to be the largest in the world and valued at $\$ 25,000$, is exhibited in the Austrian section. It is an ir regularly shaped flat stone, perhaps two inches in its greatest diameter, and comes from the mines in Hungary, whence some of the finest opals produced are obtained. Another some of the finest opals produced are obtained. Another
curiosity in the Austrian section is a large chandelier made of hundreds of pieces of the finest amber. It is valued at of hund
$\$ 8,000$.
the smallest steam enaine in the world
On the platform of the Corliss engine is, perhaps, the smallest piece of steam machinery ever constructed. It is an engine made of gold, steel, and platinum, so minute that it has for its foundation a twenty-five cent gold piece, while many of its parts are so tiny that they cannot be seen with out a magnifying glass. It has a regular steam gage; and though complete in every particular, the entire apparatus
weighs only seven grains, the engine alone weighing but weighs only seven grains, the engine alone weighing but
three grains. The flywheel is three fourths of an inch in three grains. The flywheel is three fourths of an inch in diameter, the stroke is one twenty fourth of an inch, and which can all be taty-fourth of an inch. in films of silk The constructor is Mr. Levi Taylor, of Indianola, Iowa.

## egetable rallow and cinchona.

The leaves, fruit, and wood of the tingkaroang tree, also the pulp, from Borneo, are exhibited in the Netherlands sec tion. The produce of this tree is known as vegetable tallow, and is obtained from the fruit.
The tallow, carefully prepared, is used by the natives for cooking purposes. A common article, prepared with less ore, is used for lamp oil, for lubricating machinery, and other purposes where fats are required. The roots of the
tree are successfully applied in healing wounds, and the tree are successfully applied
wood is a very good timber.
In a large case on the west side of the pavilion is exhibted an herbarium, illustrating cinchona cultivation in Java The danger that the cinchona tree would be extirpated in South America led to an attempt at its cultivation in Java, which has been entirely successful. In 1852 , cinchona plants and seeds were sent to Java, and their cultivation was commenced on a large scale. At the end of March, 1875, the government cinchona plantations contained $2,020,810$ the government cinchona plantations contained $2,020,810$
plan $1,819,710$ were planted in the open air and 201,100 were kept in nurseries.
There are seven plantations, having together an area of about 1,500 acres. The trees from which the bark is to be taken are cut off about eight inches from the ground and stripped of their bark, which is dried in the sun. From the base of the stems which have been cut, a number of shoots
spring up, of which one or two are left, which will grow in spring up, of which one or two are left, which will grow in seven or eight years to a tree that may be again cut off.
The herbarium contains samples of the bark and wood, both rough and polished, showing the section both lengthwis and across the grain, the seeds and leaves of the plant and specimens of quinine, cinchonidine, quinidine, cinchonine, and a namorphous alkaloid, made from the Javanese cincho na tree.

THE DUTCH AGRICULTURAL EXHIBIT.
In Agricultural Hall, the Dutch contributions comprise a remarkably large variety of animal and vegetable products. Among the grains we notice a prepared flour so treated as always to keep fresh in the hottest climate. It is put up in hermetically sealed cases, and has we learn, been successfully subjected to the severest tests. Yeast cakes, made from corn meal and oil pressed from corn, are likewise a novelty. There is an interesting display of beet root sugar, produced by the centrifugal process. Beekeeping is repre sented by a few straw hives of the ancient pattern, and a dress for apiculturists consisting of a bonnet and cape of
wire cloth. A large exhibit is made of canned goods, some which, the descriptive card states, were put up in 1852 and have made several voyages to India and back, remaining in excellent condition. Cod liver, rapeseed, linseed, and other well known oils are represented by samples of much clearness and purity. Dutch flax, hand-scutched and millfour feet long. An, the fiber being frow Zaland is almost as white and as glossy as silk fiber. Especial attention is directed to the white blossom linseed, which is exported from America to be manufactured into oil. The fiber of this flax is coarser than that of the blue blossom; but it is said to be superior in value. A very marvelous piece of work, partly the handiwork of nature and partly of art. is shown in a lat tice or screen, the meshes of which are about six inches square, and formed of interlaced twigs which have grown
into each other at the intersections. The lattice is about 8 feet high and 5 feet broad, and the rods are $1 \frac{1}{2}$ inches thick. TROPICAL WOODS.
Over 1,500 specimens of woods from the Philippine Is ands are shown in the Spanish Government building. The specimens are about eight inches square, one side of each being polished and the other plain, and one end is shaved
down in a bevel to show the grain. The bark is also left on the block. Amomg the more valuable of these woods is the narra, a reddish brown timber resembling walnut, and sometimes showing a bright red color, which variety is more highly esteemed. It is in demand for cabinet work. A large plank of this wood, which is $7 \$$ feet wide
and $11 \frac{1}{2}$ feet long, is on exhibition. Very many varieties are marked as valuabje ship timbers. These are tough, close-
grained woods, and oak and teak, the latter resembling live oak or black walnut.
In this collection of woods is shown a mahogany log from Cuba, about 25 feet long and 18 inches square. The value of this timber for veneers may be appreciated from the fact hat the Commission has been offered $\$ 2,000$ for this stick. Other woods from Porto Rico and Cuba are also exhibited with that from the Philippine Islands. The prices at which hese woods are contracted for, cut, at the province Tayabas, as a principle producing center, are for the narra timber, 1 oot square and 30 feet long, $\$ 5$ in gold, and the same for the molave timber.
In the same building is a piece of rattan 550 feet long and only $1 \frac{1}{2}$ inches in diameter at the butt. It is coiled up like a cable.

## RAMBLING NOTES <br> Number I.

## Water wheels and their marers.

"I saw Root last week for the first time in three months. He has a first rate mill site out on the Pappillion, and has ust finished his mill. He expects to start up next week. In speaking of the wheels he had purchased, he brought forcibly to my mind a business principle well worth consid ering
"He had his own prejudices regarding wheels, as every mill man has, but before ordering he sought and received my advice on the subject. I may state here that I have my prejudices on the water wheel question as well as he, and I will further state that he ordered three wheels, neither
his own pets nor the ones I had recommended. When he his own pets nor the ones I had recommended. When he
first spoke to me about the matter, I recommended a certain wheel and at the same time gave him the addresses of al he wheel builders in the country. Last week, at the meet ing mentioned, he told me his story. He had written similar letters to all the builders, stating the case and soliciting terms, financial and dyramical. He received many courte ous replies and gorgeous catalogues. The respondents ex-
plicitly stated that in the last seven years they had sold plicitly stated that in the last seven years they had sold
such a number of wheels-had replaced such a number of So-and-So's wheels-have 200 wheels running in the State f New York alone-' a wheel of our make was placed in he mill of Mr. Sample in New Jersey, under circumstances dentical with those named in your letter, and performed perfectly satisfactorily-have several wheels in your county and enclose you addresses of users who will speak for them-
send you herewith names of 1,000 users of our wheels, hic you herewith names of 1,000 users of our wheels, our new speaks for itself of their merit-think three of our prices-call wheels will suit you-call foct that all the wheels in use in our own county are of our make-enclose you Mr. Emerson's report of test of our wheels-advantage of turbines over overshot wheels no longer a question,' and numberless more such items. But one concern wrote as follows: "Three of our forty-two inch wheels, placed as you lows: "Three of our forty-two inch wheels, placed as you
state, will do the work specified in your letter. Would be state, will do the work specified in your letter. Would be
pleased to receive your order with that understanding." Now here is a party not afraid to say 'will,' and the banks say Y. 18. Of course the wheels were ordered from these last parties, who seemed to know something about wha their wheels will do, as well as what they have done. Roo says he cannot lose, even if the wheels fail. The concern furnishing them is responsible, and under the circum stances the price does not become a matter worth considera
'There may be a moral to Root's story worthy the attention of manufacturers of the solid order. I mean, of course, solid capital behind solid merit in the product.'
the waste of coal by smoke.
From my office window I can see a paper mill chimney of imposing hight. Night and day for two years, that chimney has not ceased to belch out its solid volumes of smoke, solid enough apparently to hold up the chimney if the positions were reversed. That smoke must cost the mill owners a great deal of money; and a great deal of it finds its way into my office in the form of palpable soot. The fact is that this whole smoke business is an abatable nuisance and a sign of waste. Furnaces constructed especially for the economical consumption of fuel are required, on for the economical consumption of fuel are required, on
general principles, to burn the smoke. It is not found difgeneral principles, to burn the smoke. It is not found dif-
ficult to so construct a furnace as to attain this end. Smoke ficult to so construct a furnace as to attain this end. Smoke
is composed of carbon which is visible, and hydrogen which is composed of carbon which is visible, and hydrogen which
is invisible. Had these products, when first set free in the furnace, been supplied with exactly the proper amount of oxygen, they would have turned into carbonic acid and have been consumed. The proper adjustment of the combination of these gases forms the basis of design for smokeconsuming furnaces.
"But plenty of furnaces are now in use in places where it is desirable to burn the smoke, without entirely recon structing the furnace or going to any such expense. Many ingenious contrivances have been invented, intended to be a simple attachment to the ordinary furnace and to answer the purpose of originally designed smoke consumers. They consist generally of peculiar dampers or peculiar doors, of air holes behind the bridge wall, or of somearrangement of steam jets in the furnace. The behavior of some of these
affairs is remarkable. Some fail entirely, some succeed perfectly, while some burn the smoke, but at great expense.
'Any ordinary coal-burning boiler furnace may be made to consume nineteen twentieths of its smoke, and to effect
some slight saving in fuel, without any alteration, and without a penny expense, by proceeding as follows: First,
if you have been in the habit of using a poker, trade it off for a hoe. Next fire as usual, and, if it is not raining too hard, go out and take a look at the top of the chimney It is bound to be smoking. Now with the hoe push all the burning coal a little back, so as to leave a foot of the front end of the grate bars uncovered. Now throw in fresh coal on this clear part, quite a lot of it. It will now burn from its inner edge, which becomes coked, the escaping gases passing over the glowing coal further in the furnace. The process of firing consists in pushing these coked portions heap nearest to you. You will notice that by this plan of firing you never put any coal into the fire at all, but into firing you never put any coal into the fire at all, but into what may becalled a coking oven, and you burn only coke. All coals, clinker, etc., are moved inward, and as a conse-
quence the clinker will all have to be taken out at the back quence the clinker will all have to be taken out at the back
end of the grates. For this purpose a door in the side wall, end of the grates. For this purpose a door in the side wall,
level with and at the back end of the grate, will be found more convenient than engineering the clinkers around to the front door again. This method of firing is almost universal in England, where municipal law fines a smoking.chimney. One objection to the process is that the charges of fuel, being light, must be pushed forward frequently, keeping the furnace door open a great deal. Notwithstanding this fact the plan will be found very satisfactory.
shafting, hangers, and pulleys.
Dixon has recently been replacing one of his line shafts. He has been telling me for the last two years that the thing was annoying him. He has made a clean sweep this time, and I hope he is now at peace. He bought that shaft, with its hangers, couplings, and pulleys, in Boston when he first started his shop. It was his main line then. It was only one and fifteen sixteenths in diameter, and the pulleys had
wretchedly gotten-up set screws in them. He says he bought the stuff with his eyes shut, and I believe him. About a year ago the receiving pulley on this shaft slipped a little and gouged a couple of rings in the shaft. Last thing that ever happened to it, for it made Dixon mad and thing that ever happened to it, for it made Dixon mad and
he superannuated the whole thing. Even the pulleys he laid aside for other purposes. The hangers, when lying on the floor, look as though they had a world of drop, but in reality it was only ten inches, and they had been put up with nine inch wooden blocks to lower them. They had a fearful lot of metal in them, for they dropped about two feet and then turned up again. That's what made them look so imposing when on the floor. They were fancy-looking affairs, all the orders of architecture having been called into play in their design. Dixon threw them in his scrap pile. The shafting was not at all nice, being very irregular, and the pulleys were poor fits. The couplings were of the modern taper sleeve variety, and looked first class in every
way, but were always troublesome. They were all right way, but were always troublesome. They were all right
when the shaft was in perfect line, and they were all right when the shaft was very much out of line, as was the case once when a new Daniels planer was put in the pattern shop above. But when the shaft was just a little out of
line, as most shafts are, those couplings would squeak and " chaw" the shaft, and work off. Nothing could be done for them but lining up the shaft, which seemed to be the only thing which ought to be done; but the floor above was not substantial, and it would disarrange the shaft in a very short time. In putting up his new shaft, Dixon has stiffened this floor as much as possible, and put up hangers with twenty inches drop, with solid cast iron boxes and glass oilers. The old boxes were self oilers, but gave trouble. He has enlarged a portion of this shaft, as ough to have been done at first, and put on all the pulleys in
halves. He says it cost him fifteen dollars every time he halves. He says it cost him fifteen dollars every time he
put a new pulley on the old shaft, or changed the order of put a new pulley on the old shaft, or changed the order of
hose already on. He has put on the ancient style of flange coupling, which looks very much like retrogression; but my own experience has been about like Dixon's, and I expect I should have done about the same thing. His couplings are provided with an outer sleeve a foot long, which covers the bolts. Without these sleeves I believe these flange couplings to be the most murderous pieces of metal about a shop. His pulleys are the neatest I have ever seen. Most of these two-part pulleys look very clumsy.

SELF-OILING BOXES.
'Speaking of self-oiling boxes, I was told of a Cincinna ti firm who sold a complete mill outfit, with all boxes on the self-oiling plan. The customer reported trouble with the boxes, and further inquiry elicited the fact that no oil whatever had been supplied to them at the trial start. The self oiling feature had been depended on for supply as wel as regulation."

Leftwick.

## the fair of the american institute.

Despite the existence of the Centennial Exposition, the present Fair of the American Institute is likely to be as interesting, in point of novelties displayed, as any of its late predecessors. The same, we think, will be found true of
other local exhibitions. Both from the size of the Centennial other local exhibitions. Both from the size of the Centennial
and from the limited time which most visitors thereto have and from the limited time which most visitors thereto have
at their disposal, to the foreign exhibits is given the greatest share of attention; and many home contributions, which in smaller collections would be narrowly scrutinized, are there overlooked, or at least but cursorily examined. Local fairs, therefore, viewed as domestic advertising mediums, really offer superior advantages to the great international display; and the recognition of this fact, by manufacturers and others, doubtless accounts for the non-diminution of the usual number of entries in the American Institute building. On the part of the Fair managers, it is evident
that exertions have been made to render the show more at ${ }^{-}$ tractive, both to exhibitors and to the public. New decorations, quite tasteful in their way, a new and handsome fountain, an attractive-looking, though poorly stocked Japanese bazaar, and various other improvements have been added. The general arrangement of the hall, however, is the same as during former years; and we can dispose a once of a large share of the miscellaneous exhibits by stating that they offer a like similitude. As at every recurring fair there is some one prominent contribution of especial interest, so there is to this one, in the shape of

## the pottery display.

Visitors who are familiar with the exquisite ware of France and England will see, doubtless, little to admire in the two neatly arranged exhibits of the Union Porcelain Works of Broaklyn and of a New York manufacturer ; but on the other hand, those who have watched the progress of the pottery industry in this country will see, in the ambitious attempts at majolica ornaments, Parian statues, and like objects hitherto only imported into the United States from Europe, an advance both rapid and full of promise for the future. We have before us a French journal in which try to examine the Centennial Exposition and who has re turned, warns his trade publicly that the competition of the United States in the manufacture of fine pottery is greatly to be feared. Probably the best we can that shown at the American Institute Fair. The tast displayed in ornamenting is sometimes questionable; but
the work is there, and there is plenty of artistic ability in the country to supply the needs when once its attention i directed to the subject. In the Brooklyn factory's display, quite a handsome vase is exhibited, commemorative of the Centennial year. Scenes from the national history are exe cuted in bas relief in panels around the base; on the sides are medallions of distinguished men, and the handles are bisons' heads. The painting is appropriate and tasteful, and as a piece of pottery it is of excellent fineness. There is also in the same exhibit a commemorative cup, sho

## THE MACHINERY DEPARTMEN

a chaos, but we are promised a host of new things. Whriving engines are three in number; an 80 horse powe admirable workmanship and finish, and a Hampson \& White hill 40 horse power machine. There is the inevitable and omnipresent Baxter engine in its various sizes, possessed of a new interest through being attended by a lady engineer. A new yacht engine, said to be of 5 horse power, built by Har sen, of Greenpoint, is a neat, compact, and very small ma chine, which seems excellently suited for small boats. The cylinder is vertical and inverted, and there is a new and simple reversing gear, which consists of a rod moved to and
fro in an inclined slot in an eccentric, thus changing the latfro in an inclined slot in an eccentric, thus changing the lat controlling the motion. The device, which might be termed a single link, works excellently. Celluloid emery wheels, composed of a mixture of celluloid and emery, are exhibited at work. They seem to have the advantages of not glazing, they run with little noise and few sparks, can be used with water, and the wheel at the Fair has cut a clean square edged notch in an old file, a good piece of test work.
Of course the band and jig saws are out in full force, and the popularity of the Chinese puzzles and toy frames and urniture which they manufacture shows no sign of waning. We notice a new tool interesting to woodworkers, called a riction feed cut-off saw. The friction feed is obtained by passing a strap, which connects the treadle and the vibrating aw carriage, over a friction pulley which is always revolv ing when the saw is in motion. By pressing lightly on the readle, the band is tightened over the pulley, and the lat ter thus pulls the saw forward to its work. There is also a new gage and measuring attachment, placed transversely across the front of the table, consisting of a perforated plate and sliding stops thereon, which last is connected with a pin and knob by a rod. In using, the pin is placed in the hole on the plate corresponding to the length to be cut, and the top is thus moved to the exact distance from the saw indi cated in inches by the scale. This is done very quickly an so saves time. A new gear wheel is exhibited in model (why e fail to perceive, as opportunities might easily have bee fforded for showing full sized wheels at work), made afte new process, the $V$-shaped teeth being forged or pressed
by the action of a die revolving in contact with the heated by the action of a die revolving in contact with the heated
blank wheel, which likewise rotates. Advantages claimed re absence of flaws, accuracy, strength, no back lash or lost motion, etc. Veneered pulleys are novelties, and seem to be a cheap and fair substitute for ordinary wooden pulleys. The peripheries are made of three layers or veneers of ash. The pulleys run true and easily. They are not visible in actual ase, and hence no further opinion is possible. Exhibitor dle, which can easily be displayed in operation. This is be coming a too common error at the American Institute Fairs. The mechanical public, the interest of which it is hoped to enlist, is not at all inclined, under such circumstances, to accept assertions of advantages on faith

## Handasyde's Composition for Boiler

Messrs. C. H. Handasyde \& Co.. Dunleith, Scotland, have recently established an agency at 24 Broadway, in this city see advertisement on another page), for the introduction of ocomotives in this country. The composition has been tested on the railroads and in collieries and ironworks to a
great extent in England and Scotland; and we have before us a long list of the names of the most extensive manufacturers abroad who are using the article at the present time. Mr. G. C. Campbell,the agent in this country, has instructions from the manufacturers to make no charge to users of the composition unless it accomplishes all that is claimed for it; and they modestly state in their circular that they "refrain from claiming for their composition any advantage ove others of a similar nature, but ask for a fair and unprejudiced trial, so that its real worth may be ascertained."

## The Patent Business of Great Britain.

In the year 1875, the applications for patents made in reat Britain and Ireland numbered 4,561, being 69 more than in 1874 . The increase is less by 129 than that of the
previous year, and this diminished rate of growth is fairly previous year, and this diminished rate of growth is fairly ttributable to the depression of trade.
The British patent statistics enable us to form an idea of the proportions of inventions in that country that have any substantial value. For instance, in the year 1875, 1,173 patents were not carried further than the six months provisional protection, which is the preliminary period for which patent is granted; and as a rule, only 28 per cent of British patents survive their third year, and 10 per cent their seventh. Small as this business appears in our eyes, the considerable fees exacted from patentees realize altogethe a very large income, the year 1875 yielding a revenue of over $\$ 550,000$ in gold after all expenses were paid. This sum is about the average amount; and since the office wa remodeled in 1852 , over $\$ 6,150,000$ has been paid into th public exchequer. The claims of Science are now being arged upon the (iovernment; and it is to hoped that, in con sideration of the large revenue yielded ly the patent office, the proposed Science Museum may be established. A site on the Thames embankment has already been suggested for the purpose, and a plan for the institution is published in the Patent Office Report for 1875 , recently issued.

## DECISIONS OF THE COURTS.

United States Circuit Court--Northern District of Ohio. Marvestei patent.-henry f. mann $v$ s. edwin bayliss.
In Chancery.- Before Emmons, C. J. - April Term, 1876.]


## DECISIONS OF THE COMMISSIONER OF PATENTS.






## Zexent gmericau aud foreigu zautants.

## NEW MECHANICAL AND ENGINEERING INVENTIONS.

improved chimney flue cleaner.
James Grimes, Portsmouth, Ohio.-This invention consists of spring acted wing sections of the cleaner brushes, which are
ocked to the stem until the same is carried up in the chimney neans of jointed links. The wings are released by a cordrunning down along the stem.
mproved water elevator and purifier. Conrad Hartzell, St. Joscph, Mo.-This invention causes a curwater through a submerged tube, at the bottom which draws its er. The object is to afford a constant supply of pure water. improved balanced throttle valve.
Hubbard Hendrickson, Red Bank, N. J.-In opening the valve, he movement of a stem first moves small additional valves, which re easily moved and admit the steam. The later passes the main valve and equalizes the prossure so that can be moved freely.
improved paper-cutting machine. James Harding Brown, Porter's Mill's, Wis.-This consists of a
lever fixed to swing horizontally around a vertical axis in a fullever fixed to swing horizontally around a vertical axis in a ful-
crum standard over a cutting table, and carrying two roller cut ters. The latter are adjustable for cutting wider or narrower
strips. There is also a roller gage for pressing on the sheet of strips. There is also a r
paper to hold it in place.

> IMPROVED RAILROAD CAR TRUCK.

Laban B. Lyons, Chillicothe, Ohio.-This invention relates to the construction of the metal side frames of the truck, to the means for connecting and suspending the brake beams, and also to the ars, see patent.

IMPROVED TIRE UPSETTER.
Edward W. Holt, Corinna, Me.-In order to easily and quickly upset the tires of wagon wheels without changing the form of
the tires or cutting them apart, this inventor provides a pair of arc-shaped jaws, with fiuted cams, that engage with fluted lugs on the jaws to clamp the tire. One of the jaws is fixed to the bed piece, and the other is capable of being moved in ways in the bed by an eccentric pivoted to the bed and bearing against a roller in
the movable jaw. The jaws are forced together to upset the tire. improved road scraper
Addison Shanklin, London, Ohio.-This invention has reference to such improvements in road scrapers that the handles may be locked securely to the scraper bowl by bolts, which may be readily leng thened
improved steam vacuum pump.
William V. Dubois, Covington, Ind.-This relates to the construction and arrangement of the working chambers, air chamfor changing the admission of steam to the working chamber and to a vacuum chamber for relieving the jar at the foot valve in the end of the pipe in the wall.
improved railroad switch guard. Frank B. Peace, Maryville, Tenn., assignor of one third his right rails, with projecting parts or heads pivoted at both sides of the switch rails. The engineer is enabled to see readily, by the pro-
jecting guard rails, whether the switch is set jecting guard rails, whether the switch is set or not, and has time serve as stops to the train without throwing the same off the serve as
track.
imp zoved machine for striping pails. Samuel R. Henry, Stillwater, Minn.-This invention consists of a chuck for tholding the pails, striping rollers, a roller for supplying
them with paint from a paint box, carrying and guiding rollers, and a contrivance for raising and lowering the chuck to facilitate the application and removal of the pails.

## NEW HOUSEHOLD INVENTIONS.

improved folding table.
Wilber F. Bartholomew, St. Louis, Mo.-The legs of this table slip into standards, and are supported therein by spiral springs. They thus may be, by spring catches or like devices, adjusted so
that the table will remain at any desired hight. With this construction, it can readily be raised to a convenient hight for use as a cutting table, and, when in use for ironing or sewing, can be lowered and drawn over the lap.
improved nursery crib
william H. Thompson, Columbus, Ohio.-This is a crib having two sides hinged to bottom, two sides hinged to the corner posts, and two divisions hinged at the bottom. This allows of the device being folded into small compass.
improved flat iron heater.
Franklin A. Powell and Susanna L. Robinson, Pontiac, Ill. $\nabla_{\text {The }}$ body of the sadiron has an angular socket which receives the
lower portion of the handle. The part of the handle that attaches lower portion of the handle. The part of the handle that attaches
to the iron is made to fit the socket, and is cut down to allow latch to swing over it and under a hook attached to the iron.
improved washing machine.
Micajah D. Martin, Marietta, Iowa.-This is a novel lever contriect of the lever is to enable the operator to work the rubber by an easy purchase, and, at the same time, to stand sufficiently distant from the tub to avoid the steam rising up from the soapsuds. improved hanging spittoon.
John C. Winton, Muddy Creek, Tenn.-The object of this invention is to provide a spittoon, so constructed as to adapt it to be
suspended upon a wall or other vertical support. The device consists of a saliva box or receptacle of suitable form, provided with or attached to a plate extended upward, and having a flange from escaping over its edge and to guide it into the aforesaid receptacle.
improved starch boiler and strainer. William H. Whitlock, New Albany, Ind.-This device admits of the starch being strained instantly after boiling without being
poured into another vessel, dispensing thereby with straining through a cloth, and burning of hands. It consists of a vessel with interior strainer, sliding therein by a bale. When the starch is
ready for use the strainer is placed into the vessel and bushed to ready for use the strainer is placed into the vessel and bushed to
the bottom of the same, so that the liquid starch will flow through the bottom of the same, so that the liquid starch will flow through the stra

## NEW AGRICULTURAL INVENTIONS.

IMPROVED HAY LOADER.
Caleb Loader, East Pennard, England.-This relates to certann improvements in that class of hay raking and loading devices in
which the frame which carries the endless elevator is made jointed, and with an upper movable section; and it consists in the means for operating the said jointed section. Said section is adworted as required the by a handle. The section is also arranged in connection, with a suitable elevating device.
improved flood fence.
Wiley C. Barber, Rockmart, Ga.-In this device an eccentrically pivoted log, with a no the passage of drift wood, and readjusts it self automatically.

IMPROVED POULTRY COOP.
Markus Ehlbert, Greenville, Ala.-This inventor arranges the bars or grating forming the sides and top of a coop in such a way
that they may be folded compactly together. The object is to provide a coop which may be used for shipping poultry, or a crate for other articles, which may be folded in small compass for reshipment.

## Rudolph Vampill, Mull

 lates secured in a diamond-shaped frame. At the forward end of the latter a wheel is journaled. The wheel may be adjusted tocause the hoes to work at any desired depth in the ground. A suit able handle is attached to the frame.
improved ad.justment for harvester platforms. Samuel Noxon, Jr., Ingersoll, Ontario, Canada.-The novel fea ure in this device is a simple arrangement of a lever and gearing
which serves to lower the grain table, thus adjusting the cutters which serves to lower
mproved seed planter and fertilizer distributer John C. Fooshe, Greenwood, S. C.-This relates mainly to the
constraction of the hopper, the bottom of which is made in secons, which are caused by suitable mechanism to rise and fall The effect is to work the guano out of the hopper and also to crush
all lumps. The material is afterwards guided to the ground by a suitable guide plate.

IMPROVED CIDERM ILL
John Thomas Griffin, Grant, Tenn.-The essential features her re a perforated crib, resting on a platform, in which the juice is hooked under a yoke, and prevented from driving the yoke to gether by a bar.

IMPROVED PLOW.
Stephen M. Harris, Forest Grove, Oregon.-The new feature here is a clearer for preventing the clogging of the colter or stand-
ard, where it is connected with the beam, with stubble, weeds, and the like. The said clearer is a kind of shovel blade fixed on a spring upport over the beam. The support couples with a wheel fixed so as to roll
backward.

## IMPROVED PLOW.

Robert C. Traweek, Blanco, Tex.-The plows are attached to bars Wich may be turned on their pivots so that the plows will alway ine of draft. The bars may also be adjusted to any desired angle with the beam, and are held securely in place when adjusted. IMPROVED PLOW.
Judson S. Hartzell, Addison, Pa.-This plow is so constructed worn, and replaced with new ones, and when in use will be held firmly to their places. A flange is formed upon the standard and mold board, and recessed upon its inner and outer sides to receive he two parts of the landside, which are bolted to each other and to the flange.

## IMPROVED CULTIVATOR.

John C. Bannigan, Dunlerth, Ill.-This includes a variety of new mechanical devices. By means of one, the draft may be attache in such a way as to protect the plants from being injured, by an driver's seat is caused to balance the forwarddraft
improved horse hay rake.
Henry H. Hathaway, Clockville, N. Y.-This invention is a horse hay rake,so constructed that it may be used for heavy raking, an or light raking or gleaning, may be easily dumped to discharg scratch or catch upon the ground. The novelties here are all in mechanical construction. The rake is susceptible to a variety of uses including heavy as well as light raking or gleaning. The rev-
olution of the wheels acts to cause the teeth to drop collected hay. olution of the wheels acts to cause the teeth to drop collected hay
Devices are provided whereby the machine adjusts itself to uneven Devices are provided whereby the machine adjusts itself to uneven
ground, and the hay is prevented from rolling or twisting in the rake.
mproved land dizag and clod crusher.
John M. Crockett, Dallas, Texas.-This invention is an improve ment upon the clod crusher and drag for which letters patent No plement a series of flat metal bars are secured, in ranks or rows, to front and rear wooden crossbars, each of said metal bars having two curves so arranged that they alternate in position with the curves of the contiguous bar or bars, for the purpose of more quickly reducing the clods to a pulverulent condition in passing ver them. The object of the present invention is to simplify the construction, reduce the cost, and increase the efficiency of the
drag. The metal bars are divided into two parts, and each part

## NEW WOODWORKING AND HOUSE AND CARRIAGE

 BUILDING INVENTIONS.IMPROVED SPOKE SOCKET.
Henry Oldendorph, Waterloo, Ill.-This invention consists of of a felly and spoke, to fasten said spoke when broken off at th houlder of its tenon.

IMPROVED GATE.
George W. Calkins, Milton, Wis.-This gate is so constructed that it may be opened and closed by a driver without his leaving his
seat in the vehicle. A slotted lever receives a pin attached to the ower part of the gate, and passes through a space between th parts of one post and is pivoted to said post. The upper end of ne lever passes through a slot in the upper bar of the gate frame toward its ends, are attached the ends of two cords, by pulling upon one of which the gate will be opened, and by pulling unon the other the gate will be closed.

## NEW MISCELLANEOUS INVENTIONS.

COMbINED GLOVE STRETCHER AND HAND MEASURE. Moses Greensfelder, Harrisburg, Pa.-This consists in the combination of a hand measure with a glove stretcher, the measure being being drawn out for use. It is caused to regain its position in the handle by means of a suitable spring.
improved revolving siiow stand
Orange P. Gould, Lewisburg, Pa.-Threc spider framesare mounted on a spindle at suitable distances apart, for holding shelves, on
which the goods are to be placed. The said frames are made of which the goods are to be placed. The said frames are made of
cast iron, and made to revolve on shoulders of the spindle, which keep them in their respective positions. Apch bars are provided or connecting the spider frames outside the shelves, and are
ranged with loops and pins for that purp se. improved artificial marble.
Richard Guelton, New York city.-This is a process for imitating fine black marble without veins, and also for reproducing artifiblack, and after it is set the pores are filled with more cement, previously colored. Then follows the application of nitrate of iron, etc., and polishing. There is an ingenious method for imit
ting veins, and a process for rendering the marble acid-proof.

Alpheus M. Barnes and William F. Yocom, Weston, Mo.-The hides, after being limed, are bated in a mixture of soft water and
corn meal. They are then strained out and are ready for the dres liquor, which is prepared of soft water, salt, sulphuric acid, sul phate of potash, and buttermilk. After handling, the hides ar placed in a tan liquor, prepared by adding to each 100 gallons o xtract a dark iquor, suitable quantities of salt, sulphate of pot saking in gambier liquid, and lastly preparing in sumac liquor The invention also includes a process of tanning hides with the hair and fur on, by subjecting them to the action of a dress liquor, and then treating them with a composition of half-strength lye.
improved adjustable arm rest.
Moses Shoemaker, Plattsburg, assignor to himself and Charles
J. Nesbit of Platt City, Mo.-This is a device for supporting the am when writing upon the lower part of the page in large, thic ooks. It may also support the side of the book in a level position when writing upon the thinner part of the book, or upon a
page of a book so bound that its sides will drop or incline when aid book is opened.
mproved carbuieter.
Martin Schmidt, Houston, Tex.-This invention is an improve ment in that class of carbureters in which air or gas is forced aturated with hydrocarbon. By a novel arrangement, by opening stopcock, more or less gas will pass to the burners without pas ing through the carbureter. By opening it fully, none of the ga will pass through the carbureter; and by closing it fully, all the as will pass through the carbureter.

IMPROVED LARD OIL LAMP
John Roemer, Champion, Mich.-This invention consists of pipes or receiving the heat of the flame, and conducting it down into the oil chamber for warming the oil: the object being to make
ard oil lanterns capable of use in very cold weather.
improved ellitpsograpir.
Henry C. Root, San Francisco, Cal.-This is an ingenious instrument, excellently suited for the uses of architects, engineers, and thers. By turning a crank the pen will describe an ellipse, with the long axis coinciding with the face of one standard, and the
short one in similar relation to the face of a second standard. By short one in similar relation to the face of a second standard. By
adjusting the centers so as to coincide, that is, one above anothef, a true circle may be struck. The size of the figure described by the pen may be closely regulated.
improved barrel stand.
David Scott, Olney, Ill.-This device furnishes a storage place or barrels, protects them from dust, etc., and is so constructed as toallow of their being tilted easily. The barrel can be adjusted to ny desired hight for drawing off its contents.
improved adjustable pocket book fastening.
Daniel M. Read, New York city.-This consists of top and bottom plates, having each a corrugated channel, in combination with a face plate, having a catch on both sides. The shoulders of the
channel receive the catch between them, so that the catch can channel receive the catch between them, so that the catch can
have no lateral movement, and cannot slip out from between the have no
plates.
improved hitching post
Charles F. Roth, Winterset, Iowa.-This invention consists of a ell-shaped metallic case, in which a vertical bar, slotted at its spring catch bar; the latter being released from the vertical bar by means of a key so constructed as to press when turned on its upwardly inclined inner end. A spiral spring surrounds the lower end of the vertical bar, and presses it up, exposing the slot when he spring catch bar is released from it. The hitching bar has a ounded hemispherical head, which, when the device is closed, IMPROVED bacinaped case
improved machine for stringing tobacco leaves. Louis Strasser, Columbus, Ohio.-This consists essentially of a needle lying on a bed, so arranged and being so confined that a vimade to push the lcaves on the needle and along it to the string attached to the head, and also along over a rod or wire, from which the leaves are to be hung, half from one side and half from the other. The arrangement is such that the leaves can be strung as rapidly as two persons can present them from opposite sides in ront of the needle.

IMPROVED BRIDLE
Daniel T. Van Antwerp, Prophetstown, Ill.-This is an improved ttachment for bridle headstalls, to enable the horse's head to be aised or lowered, as desired, and to enable an unruly or vicious horse to be more readily controlled. The invention consists in adin overdraw straps which are drawn together at their middle parts, their lower ends being secured to the bit rings. The overdraw traps have gag runners attached to their ends to receive the check straps
rein.

Mrs. Alwilda Swallow, Shelbyville, Ill.-This consists of a bustle, made of one piece of spring wire, and bent to form two bows, of which one is larger than the other. Said bows are arranged at a suitable angle and connected by coiled springs, to which the belt
is attached. The bustle has no sharp edges to cut the clothing, is attached. The bustle has no sharp edges to cut the clothing,
and is light, cool, and strong.
improved bale tie buckle
Thaddeus Bunker,Cuero, Tex.-This consists in half-ring bars, having small half-ring hooks formed upon their ends in the opposite direction, which secure the ends of a bale band by clamping he inside end of the band edgewise, in a manner not to cut or
strain the band, but to make it an impossibility to slip or give
METIOD OF tipping and patching boots and sioes.
David T. Cooper, Jackson, Mich.-By the old method of putting on tips or patches, the tip or patch is retained by sewing through ance, while requiring a great deal of labor. By the present method a tip, patch, or foxing may be put on the shoe in a few moments, and without ripping up the heel seat. The invention consists in doubling up the edge of the tip, patch, or foxing, inserting a wire into the folded part, and fastening the wire by forcing the ends
through small awl holes of the outer sole, and by intermediate wire clips, which are drawn up tightly, twisted, and clipped off or clinched on the outside of the sole.
improved tobacco stick holder.
Thomas A. Eanes, Leesville, Va.-This is an implement for holding the stick on which the tobacco leaves are hung after cutting, saving thereby the labor of the hand required for holding the stick
while the cutting hands hang the tobacco. The invention consists of a metallic post, driven in the ground, with retaining fork or foot piece, and top bracket and clamp, to support the tobacco stick.

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metalus．E．Lyon， 470 Grand Street．New York．

## （4）（a）${ }^{4}$

 R．K．will find directions for temperingrock drills on p ． 202 ，vol．31．－W．F．will find that greasy cotton waste is very liable to spontaneous combustion．Seep． 26 ，vol． 33 ．－M．S．will find a
recipe for purple ink on p .315 vol． $33-\mathrm{J}$ ，N． w recipe for purple ink on p．315，vol．33．－J．N．W．
can nickel plate his iron castings on p． 235 ，vol． 33．－C．S．will find a recipe for preserving timber
on p．265，vol．33．－W．F．，J．R．C．，w．M．，J．C．w．．
and others who ask us to recommend books on in booksellers who advertise in our columns，all of whom are trustworthy firms，for catalogues．
（1）B．J．H．says：What will restore the
kin to its natural color after being tanned by xposure to the sun？A．Use a paste made of precipitated chalk and glycerin，and avoid ex－
posing the skin to the influence of strong sun－ posing the skis．
（2）J．B．H．asks：What will remove the tar of tar weed
zine or napbtha．
How can I make my
Can you give a simple process for making po Can you give a simple process for making po－
tato starch？A．Convert the potatoes into a pulp by means of a scraping knife or an instrument milar to a nutmeg grater；throw the pulp upon cold water to run through the mass slowly for several hours．By this means all of the minut tarch granules may be washed through the cloth；and on allowing the water to stand for
some time，these will settle to the bottom，and may be removed by decanting the water and raining．
（3）A．B．asks：How can I stain basswoo
（4）A．H．asks：Which is the most approve iln for burning charcoal？I hear that，around Lake Superior，retorts resembling those for gas
or pyroligneous acid are used，the object being or pyroly production of charcoal．Is charcoal burn in retorts equal to that burnt in kilns？ iner qualities of charcoal are made by distilling the wood in closed retorts such as you mention． By this method several other valuable products such as illuminating gas，
acid，etc．，are obtained．
（5）J．S．says：I have been using cow．ie co－ pal，which dissolves readily in alcohol．I now
wish to use Zanzibar copal，which will not dis－ wish to use Zanzibar copal，which will not dis－
solve in alcohol．Can you tell me what will dis－ lve it？A．Zanzibar copal is soluble in ether．
（6）H．B．M．asks：1．Is it not a fact that comes heavier than sea water？A．No；liquid comes heavier than sea water？A．No，nqu
carbonic acid is lighter than water．2．If a pres－ does not that degree of pressure exist in the deep－ er portions of the sea？A．Yes；but the acid
would speedily be dissolved by the water，and would speedily be dissolved by the water，and
gradually escape to the surface．3．Does press－ gradually escape to the surface．3．Does press
ure arrest decomposition or chemical change A No．4．If carbonic acid gas be generated a will render it heavier than water，can that liquid rise through the water to the surface？A．Yes ．Should chemical action in the depths of the ocean set more gas free than the undisturbed wa－
ter above can absorb，is it not possible that be－ ow a certain depth the ocean rests upon a sub cean of liqueted carbonic gas，and may not th erial brought from the bottom is strongly harged with carbonic acid＂be attributable to the imprisonment of the gas by the pressure of
the water above it？A．This is not at all proba be；when the water has been taken from grea depths，it has，in some instances，been found to
be heavily charged with carbonic acid．6．If in be heavily charged with carbonic acid．6．If in
vestigation should prove the existence of a large body of carbonic acid gas beneath the ocean， might not the fact of its known electrical affinity throw further light upon the action of the tides and other terrestrial phenomena？A．We do not the tides，etc．7．Would affirmative proof of the above justify the conjecture that the absence of
tides in the lakes might be due to the want of ufficient depth to compress the gas to a suffi cient specific gravity？A．No．
（7）H．C．asks：Please give me a recipe fo kid gloves．A．Draw the gloves over suitable wooden hands，and treat with a little putty pow－ der and benzole．
（8）H．\＆L．say：Please tell us of a cheap or lead in lining wooden tanks to hold sulphuri acid．A．We do not know of such a cement that （9）J＇I
（9）J．E．＇T．asks：How can I clean tallow？
A．Digest it for some hours with dilute sulphuric cid ；the pure tallow will separate and rise to the urface．The application of chlorine，which you is not necessary
（10）C．C．asks：If I make a pump by ta－
king 4 pieces of plank 6 inches wide， $11 / 2$ inches king 4 pieces of plank 6 inches wide， $11 / 2$ inches
thick，and nail them together，and leave the hole hick，and nail them together，and leave the hole valves at the bottom of the pipe，can I raise wa－ ter 112 feet without bursting the pipe？A．If
you fasten it well，with bolts or straps，it will an－ swer．
How is the horse power of boilers rated？A． Makers generally rate the horse power of a boiler quently by the siz
（11）H．F．L．asks：Can you tell me of a for $\mathrm{AgNO} \mathrm{O}_{3}$ in printing from a negative，which wil give as good a print as silver？A．No．
（12）P．R．says ： 1 ．What is the highest boiler $2 / 3$ full？A．With sufficient temperature in the furnace，the limit would only be reached a the melting point of the material of which the boiler was constructed，provided，of course，that steam be raised to a greater degree while in the same boiler，and what degree will steam attain by separating it from the water and superheating
it？A．The steam can be superheated in either case，to the same cam limits as buperhere．e．3．Is either
che top
or boiler beed or boiler head of a steam boiler $\%$ g full of water
any hotter with 100 lbs．pressure than with 10 lbs pressure？A．Yes，because the temperature in eases with the pressure
（13）W．H R．asks：What is the best way to mix paint for the red staff to staff millstones
with，water or oil？A．We think oil is generally with，water
preferable．
（14）N．W．J．says：1．I am using a force pump located over a well，with 24 feet of suction nd force the water ${ }^{25}$ feet up into large tubs， The suction pipe is $22 / 2$ inches in diameter，the
discharge pipe 3 inches，running on a level with he pump 70 feet，then up throurb the bottom the tub，without a check in the pipe．The pump as a 12 inch valve．When running，the valve and piston thump hearily．How can I remedy ？A．Air vessels should be employed．2．Does
pump in working form a vacuum ？A．Yes，if it ifts water．
Will ice transmit the rays of the sun，so as to作基 the thermometer？A．Yes．
（15）C．A．D says：I want to build a beat behind，with a one horse properled with a whee Sizz should the boat be ？A．Yon can use a boat
sif feet long and of $31 /$ or 4 feet beam；but the en－ 15 feet long and of $3 \%$ orl 4 feet beam ；but the en ine is rather too sman．
（16）W．R．P．asks：How can I wind up a
ne 60 inches long with a uniform tension of，say， oz，without interposing a fusee？A．You can wit by means of clockwork actuated by weight：or if you wish to use a spring，it should
be quite long，and the clockwork should have an scapement with a pendulum or balance wheel In other wards，the problem that you bave pro－ posed is precisely the same as occurs in the manu－ acture of clocks and watches．
（17）A．L．B．asks：What is the hight of he tallest mast of a sea－going vessel ？A．The hree Brothers，said to be the largest sailing ves－ igh．If there are vessels with higher masts probably some of our readers will be kind enough send parttculars．
（18）W．A．P．says：1．I have a small engine ith two oscillating cylinders $31 / 3$ inches long an it in a small side wheel steamer．Please give me the dimensions of which to make the boat ong ；wheels 2 wheels．A．Boat 18 to 20 feet ake a boiler for the above．Of what dimen ions should it be to furnish steam enough？A Make it 2 feet in diameter and $31 / 2$ or 4 feet high sine？
In＂Wrinkles and Recipes＂you give a recipe or coating iron with mercury to prevent rust My engine is all polished．Would it do to co
accordingly？A．It might answer very well．
（19）L．D．B．says：I have a well that a ords about three fourths enough water for $m$ J bile．Can I turn my escape pipe into the we un water from my reservoir into the a pell the end of the escape pipe，shooting it out in fine pray？A．The plan does not seem very promis－ ing，as it requires several times as much water，as
given volume of steam was formed from，to ondense that steam．
（20）J．O．H．Jr．says：1．I have an engine and boiler．Size of engine cylinder is $41 / 2 x$ x
inches；the boiler is a double flue， 6 feet 4 inche ong and 2 feet 4 inches in diameter．What siz ine，running the engine 5 revolutions to 1 of th wheel？A Boat 30 feet long and 6 to 7 feet beam． ．Of what size should I make the wheel？A Propeller 20 inches diameter， $31 / 2$ to 4 feet pitch． What speed would the boat make against a cur－
rent of $41 / 2$ miles per hour？A．You might real－ ze 3 miles an hour．
（21）A．T．asks：What is the best metal for ning the sides of a box in which the plunge of iile mill works，in order to wear the least？A．
Ve think you will get very good results by using Bessemer steel．
（22）L．B．asks：1．Is there any danger an explosion in making soldering fluid，that is， gets heated to $120^{\circ}$ Fab．A．There is no dange provided the gas（hydrogen）which is evolved is allowed to escape into the air without contact with flame．2．Is it very injurious to health to inhale the fumes of the acia，while boiling？ The acid vapors are poisonous．3．Can youinfor The operation should be conducted in the ope air，in a large wide－mouthed porcelain or stone ware jar．To avoid the first violent action it better to dilute the acid with thrice its volume of water．
（23）F．E．J．says：I want a cement that will resist dilute sulphuric acid and carbonic aci gas．I need something equal in strength to plas hold a light vessel in place．Can you aid me A．Try paraffin，plaster of Paris soaked in melted paraffin，or solution of caoutchouc．
（24）D．C．D．says：You give a description of a baroscope，made by placing a glass tube in a
bottle partly flled with water，and blowing a column of water up the tube，when the hight of he column of water will vary with the pressure of the atmosphere．What cement can I put
around the cork to make it airtight and hold up the column of water？A．A rubber stopper is best for this purpose；it should be well greased with a little cerate，and forced in as tightly a
osssible．Where it is not possible to obtain a uitable rubber stopper，choose a good cork one， mmerse it for a short time in melted paraffin， he neck of the bottle tightly and hold it in po－ sition until perfectly cool．
What cement will cement hard rubber and lass together and resist the action of ordinary
writing inks？A．Melt together in an iron pot equal parts of pitch and gutta percha．Thismay wipt liquid under water．
Will nickel resist the action of ordinary writing ks as well as siver？A．No
（25）H．C．N．asks：What will dissolve tin， bismuth，and lead（both severally and together）， without acting upon copper
（26）O．O．W．asks：How can I compute the mount of heat generated in an air pump at，say 00 lbs．pressure，with thermometer at $60^{\circ} \mathrm{Fah}$ ． ．By ung the formula．$T=$ absolute lute temperature of air atter comprescion；$V$ volume of air before compression ；$v=$ volume o ir after compression ； $\mathrm{P}=$ pressure of air befor compression；$p=$ pressure of air after compres ion．Then $\frac{c}{\mathrm{~T}}=\binom{-v}{v}=\binom{p}{\mathrm{P}}$ ．This equation ithms，thus $: \log .\left(\frac{t}{\mathrm{~T}}\right)=0 \cdot 408 \times \log .\left(\frac{\mathrm{V}}{v}\right)=0 \cdot 29 \times$ ${ }^{\left(t_{n}\right)}$
（27）J．H．P．says：1．I wish to prepare ations．How can I harden the mold so that it will not break or crumble under pressure？A Mix the dry plaster with a solution of alum in
in water in place of pure water．2．Beeswax in thin sheets is very frail and breaks easily when cold
What can I add to it to toughen it？A．Try fus What can I add to it to toughe
（28）W．C．T．asks：Is there any material of which soft，pliable gloves can be made，tha will stand hot water and be durable？A．Glove ith caoutchouc solutions），etc，have been use or this purpose，but were soon discarded．W do not know of anything that would be an im （29）J．E．A．asks：How c $\cdot \mathrm{n}$ I remove ker sene oil stains from a marble slab？A．A past made of soda，pumicestone，and chalk is recom is to be washed with soap and water． Can steel or chilled inon balls be
fectly spherical？A．It is better to grind them． How are what are called rephotographs pro duced？The photographs seem to be first trans erred to glass by some method，and then touche ap on the back with oil paints．Will you give me a descripti
359 ，vol． 31 ．
（30）C．W．T．says：J．C．J．can lower the close of his the handle．
（31）A．H．\＆S．G．ask．1．What is the best rail for railroad purposes，namely，for strength and safety，irrespective of cost？What should be
is length，size，and weight？A．A committee of the American Society of Civil Angineers rtee of mend a stee rail weighing from 52 to 56 lbs ．pe yard ；hight from 4 to $41 / 2$ inches：head $23 / 8$ inche wide， $1 \frac{1}{4}$ inches deep ：top of head curved to radius of 12 inches；thickness of stem $\frac{7}{16}$ to $1 / 2$
inch；width of base 4 to $41 / 2$ inches ；thickness of base at edge $\frac{3}{16}$ inch，rising at an angle of $14^{\circ}$ ． What is the effect of cold on the best rail？A because they are clastic．Other prominent engineers do not think that the railsare weaker in cold weather，and be lieve that good rails are no more liable to break in winter than at any other season．3．What ing nature of the strain upon a rain by the pass mg over pression because it acts as a beam between sup ports．It also has to resist blows or impact，and the imposed weight tends to crush it，in addition
（32）C．C．asks：In a first class condensing ngine，cutting off at one sixth，what is the pres are in cylinder at the end of stroke，supposing
that in the boiler to be 60 lbs ？A．About $\frac{1}{6}$ of that in the boiler to be 60 lbs ．
the pressure at point of cut－off．
（33）H．P．says：There is a spring，afford ing water enough to fill a 6 inch pipe， 400 rods rom and 70 feet above the village．To bring enough to throw to the tops of buildings what ize of pipe will be necessary？A．Unless use a very large main，the head will be so muc cut down that the hight of discharge will be quite small．It would probably be cheaper to pipe in the town．
（34）J．M．says：I make a fluid from galls， neutralize the sulphaulphate of indigo；when dust，there is a violet－bluish film on top of th ink ；filtering does not remedy it，as the fim soo collects agaln．What is it，and how can I get rid of it？A．Your solution after filtration is prob－
（35）L．I．asks How can I color russ ather red and white？A．Forred，use an alco解 eather white，except it be by the coloring the plication of some light－colored the supericicial ap－ nc white（oxide of zinc）and finely ground ba ytes（sulphate of baryta），rolled in with gum arabic solution．
(36) C. R C. says: In Fowne's "Chemistry"
t is stated that picric acid is also one of the ult timate products of the action of nitric acid upo indigo and numerous other substances, as silk, etc. The way to produce it from indigo is give in detail. Will the same method answer for silk? A. Yes; but the quantity of the acid obtainable
from this source is small, an-1 difficult to isolate rom the numerous other products of the decom position. Its presence among these products is therefore, only a matter of scientific interest. (37) C.Roggenkamp, of Appingedam,Holland, oxide of calcium. It is commonly prepared fro imestone or marble (calcium carbonate) by ignition in a kiln. The carbonic acid is thusdrive off, together with the moisture. 2. What is plas (38) J. C. M. asks: How can 1 make ferro hloride of iron in distilled water, and add to this a strong aqueous solution of pure soda (or carbonate of soda) in excess; heat nearly to boiling, filter, wash the precipitate thoroughly with hot water, and dry. Then add to this an equal weight of citric acid, and about 20 times its
weight of pure water, and allow to stand at a temporature of about $170^{\circ}$ Fab. for 24 hours in a covered vessel. Dilute a little if necessary, filter and evaporate the filtrate (which contains the acid
bath.
(39) E. W. W. asks: How can I take blu ing stains out of a red and white crumb cloth A. If ordinary bluing were used, boiling in a little
hot water should remove the stain. If not, let s know what kind of bluing was employed, an n what way
(40) C. H. H. asks: What is the best meth od of generating carbonic acid gas for use in soda ployed are dilute sulphuric acid and coarse marble ust. Use marble dust 10 lbs., water 30 lbs. (about 4 gallons), oil of vitriol 15 lbs .
(41) H. T. D. asks: 1. How can I coat metal rum rubber, and then heat in melted sulphur unExperience will best teach you the proper conditions. The efflorescent and adhering sulphur may be removed by hot solutions of potash or oolding work in a plating solution, to prevent de posit, and also to resist the action of soda or pot ash lye? A. Try successive coatings of solution of caout of glass, or glass and hard rubber (ebonite).
(42) J. J. W. asks: What is a good brown ye for straw hats? A. Try the following: First dry the straw thoroughly, then steep for a shor copper. On removing the material from this, dr again, and immerse for about five minutes in
weak solution of ferrocyanide of potassium.
(43) H. J. asks: I have a set of rabbit fur hey are soiled by the hair. How shall I clean ble method than that of the application cnzole (not benzinc) and some absorbat ial, such as paper pulp (dry and warm) or pipe clay.
(44) P. R. H. asks: 1. Please give me an per? A. It consists, generally, of pure copper,
but often contains both silver and mercury, sometimes as much as 7 or 8 per cent of the for mer. 2. Of what are the ridges on copper imple
ments composed? A. They are probably points that have been covered with organic or other unchangeable material, that has offered more or less protection to the metal beneath. The noncorrosion of the metal at these points may also to f silver be attrinutable to the small masses of silver which are sometimes found with the copper. 3. Can copper be cast? A. Copper may
be cast, but the castings are, for the most part, useless, owing to their non-homogeneous charac er, and the numerous blowholes which they contain. 4. Are there any castings made of pure (4.5) A. H. says: In Machinery Hall at the Centennial, I saw in the exhibit of a compressed ir railroad brake a wooden ball, dancing in strong current of air which was escaping from the apparatus. Please explain why the ball did
not leave the stream of air and fall to the ground. A. The explanation, with diagrams, ment No. 37 .
(46) J. II. I. asks: How can I get a humming or whistling noise out of a tin tube attached to a wheel of $21 / 2$ inches circumference? The
tube is 1 inch long by $1 /$ inch wide, and the whee runs at 60 turns a minute. A. It will probably distance beyond the rime tube to project som ide a little longer than the other
(47) C. C. P. and others.-The aniline col ors are not, in themselves, poisonous; the poi trace of arsenical compounds to be found ina most any of these commercially prepared dyes. It has been found necessary to employ arsenic acid in the preparation of these beautifuland, a present, indispensable colors; and the best that w can do, under the circumstances, is to avoid plaing any colored fabric suspected to owe it icle, especially of children.
(48) C. J. H. asks: 1. Is there any way to determine the presence or absence of carbolic
acid, chloride of lime, and copperas in a mixture of gas tar and brick clay? A. Yes, but we do not
think it probable that notable amounts of the in such a mixture. 2. If so, can I do it myself A. It would require the skill of a chemist. W
do not think that any instructions we could giv you here would enable you to make a satisfactor
analysis of the material.
(49) D. W. H. says: I am engaged in man facturing an article into which liquid ammonia of $16^{\circ}$ proof enters largely. I am informed that monia and lime and that the apparatus for ma king 25 to 60 gallons per day is not expensive. What do $I$ need in the way of apparatus? A. Al that is requisite is a large iron retort in which t heat the mixture of ammonia salt and lime, and suitable absorption apparatus, preferably a se ies of large woulfe's bottles, partially filled with pure cold water. The proportion of castic lime equal weights. In order to free the ammonia ga rom impurities before dissolving it in the wate it is advisable to pass it through an iron worm trong solution of potash.
(50) (. C. B. says, in reply to a correspond ent who asked as to the origin of the $\$$ mark: 13 the ancients the pillars of Hercules (Gibralter
were regarded as marking the end of the world and the two pillars are displayed on ancient coin bearing a filletbetween them with the motto $n$ plus ultra (nothing further, or nothing beyond On the discovery of America by Columbus,Spain, with pardonable vanity, stamped her dollar and other coin with the same pillars, and thre tra (further yet). The mark $\$$ thus designate (further yet). and in time the American
(51) J. W. W. says, in reply to J. A. P who asked how to make apple butter: Take an down to half its quantity. Then add fresh ripe aplies which are quartered and deprived of the cores. Continue the boiling, stirring all the time with a wooden padale o prevent burning andad hesion to the sides of the $k$ ettle. The boiling consistence, when it is put away in jars or keg or use. If the butter is made properly, it will an winterin a perfect state of preservation Minerals, etc.-Specimens have been re eived from the following correspondents, and examined, with the results stated:
R. M.-Both specimens contain gold.-W. S. V No. 48 contains a considerable quantity of iro yrites. No. 49 is orthoclase, a sincate of alum , iron, lime, and potassa.-No. 50 is not of na bly spiegeleisen, a carburet of iron containin manganese.-I. W. S.-The curious piece of woo you send us appears to have been taken from the shell immediately surrounding the pith of the log, and has subsequently been subjected to a proce its remarkable is remard like to have further particulars concern ing the material, as your letter is not quite clea -H. G. S.-It is spiegeleisen, a carburet of iro containing manganese. It is not an ore.-D. A .-It is hornblende.-J. M. L.-It is trap rock ontaining iron pyrites. - E C.-It is hornblend with quartz containing iron pyrites or sulphide contains too much alumina to be useful for lith graphic purposes.-J. W. G.-It is a species of ock very closely resembling that employed fo ithographic purposes. It might, we think, an . ormed by disintegrated granite of quartzos rock, containing minute spangles of iron pyrites,
but no silver.-G. L. W.-It is a quartzose rock lightly discolored by iron. It may contain mall quantity of gold, but this could not be de ermined without a qualitative analysis.

## COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN ac
knowledges, with much pleasure, the receipt o original paper
On a New Form of Chuck. By C. R. w On Locomotive Drive Wheels. By G. C On Working Men's Demonstrations. By J.
On Keeping People Employed. By D. M.
Also inquiries and answers from the following
J. D. F.-E. M.S.-H. F. W.-E. T. P.-B. L. T.

## HINTS TO CORRESPONDENTS

Correspondents whose inquiries fail to appear hould repeat them. If not declines them. The address of the writer should always be given.
Enquiries relating to patents, or to the patenta bility of inventions, assigninents, etc., will not be published here. Al such questions, when initial as it would fill half of our paper to print them all but we generally take pleasure in answering briefly by mail, if the writer's address is given.
Hundreds of inquiries analogousto the following are sent: "Who sells nautical instruments Where can gyroscopes be bought? Whose is the
best lightning rod? Who sells photographic ap paratus? Why do not makers of guns and rifte advertise in the Scientific American? Who makes drop presses? Who sells portable boats, that can be folded up?" All such personal in qurres are printed, as wind be observea, in th column of "Business and Personal." which is pecially set apart for that purpose, subject way be expeditiously obtained.

INDEX OF INVENTIONS

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[Those marked (r) are reissued patents.]
A complete copy of any patent in the annexed 118 urnished from this ottice for one dollar. In ordering please stace the number and date of the patent desired
and remit to Munn \&Co., 37 Park Row, New York city

Advertising desk, J. D. D. Mortime dvertising device, H. H. Browne (r)...
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