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|  | NEW YORK, SEPTEMBER 5, |
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## SIR WILLIAM FAIRBAIRN.

Sir William Fairbairn, the distinguished English engineer, whose portrait we give herewith, died on the 18th of August last, at the advanced age of 85 years. One of the first to undertake the construction of iron vessels in England, thus aiding in founding a manufacture in which that country has, nntil lately, maintained an unrivaled supremacy, the first to substitute iron for wood as shafting for cotton mills, the inventor of the riveting machine, the author of experiments and works which have changed the whole practice of iron construction: to few men do the engineering profession and the great metal industries of the world owe so large a debt.
The record of the long and useful life, now closed, shows, during early jears, that persevering struggle against limited meana snd humble birth, which has characterized the initial
efforts of many of the most famous men. Born in the year progressed and became known as the leading machine ma1789, at Kelso, on the Tweed, his sole education consisted of kers of the city. From this period, it appears, date the insuch rudiments as were taught at the parish school. With vestigations and inventions which eventually rendered their knowledge of writing and arithmetic which is described as author one of the greatest of modern engineers. With the "imperfect," he entered upon an apprenticeship as an en- limited space at our disposal, it is impossible to review all ine wright in the Percy Main Colliery, and when him had expired worked for two years in London as a journeyman. Travel in those days was a necessary part of every workman's education, and Fairbairn availed himself of oportunities to visit various portions if the kingdom, working a short time at every place, and, while not neglecting his books, posting himself thoroughly in every particular of the practical portion of his trade
About the year 1817, we find him settled in Manchester in partnership with Mr. Lillie, founding a firm which steadil

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a double flued boiler for alternate firing, productive of econ omy of fuel and consumption of smoke, improvements of feeding apparatus in millstones, the adoption of a better principle of suspension and the use of ventilated buckets in water wheels, the invention of the riveting machine, and finally, in 1836, the introduction of improved architecture for factories.
Experiments upon canal boats engaged Fairbairn's attention in about the year 1821, and through these researches he was led to examine the advantages of iron for the construc tion of vessels. One of his earliest attempts was the building of a small iron ship, which was set up at his works and carted through the streets of Manchester to the water. His experiments thus begun resulted, five years later, in his development of iron construction in ships of the largest class, at Millwall, London, on the premises afterward occupied by Mr. Scott Russell. Here more than one hundred vessels were built by Fairbairn's firm, ranging from frigates to small boats. It is to Fairbairn that we owe the repeated enforce ment of the fact that a ship is, in many respects, to be rearded as a huge beam or girder.
In conjunction with Mr. E. Hodgkinson, the subject of our sketch conducted a series of experiments, resulting in the determination of the comparative strengths of hot and cold blast iron, of the tenacity of boiler plates of various thick esses, of the best form of section of cast iron beams, of the esistance of hollow tubes to outsice pressure, and also in the general use of wrought iron plate girders in ordinary bailding operations. One of the first edifices ever constructed of iron was a corn mill, manufactured in 1838 by Fairbairn, the castinge, etc., of which were sent to Constantinople, where it is still standing.
Mr. Fairbairn's experiments on tubes were conducted du ring the erection of the celebrated tubular bridge over Menai Straits; and although considerable controversy was engen dered at the time, the original plans of Robert Stephenson were modified in accordance with the results. Stephenson suggested a circular tube supported by chains, but Fairbairn found that a rectangular structure, strengthened by a series of cells at the top and the bottom, and suspenped, withou supports, from pier to pier, was best adapted to the stipulated conditions.
Subsequently to this period, Mr. Fairbairn made researches into the strength of wrought iron plates and rivets for shipbuilding, and also into boiler explosions. He believed hat steam could be worked with greater economy at a pressure of from 150 to 200 lbs. per square inch, and that a high rate of expansion, with two or more cylinders. With his view he first constructed the Lancashire boiler, and sub equently, in 1872, a fire tube boiler, which was tested safely ot 400 lbs . per square inch, and found to stand uniformly he first mentioned high pressure.
Mr. Fairbairn was one of the founders and afterwards Pre sident of the British Association. His published works, be sides a large number of papers on special subjects, are "Iron, Its History and Manufacture," " Mills and Mill Work,' "Application of Iron to Building Purposes," "Iron Ship Building," and three series of "Useful Information tor En ineers," all standard volumes of reference. He was a cor esponding member of the Institute of France, a Chevalie of the $\mathrm{L}_{\text {c gion }}$ of Honor, and a Baronet, the last named honor boing conferred upon him in 1869.

NEW INDUSTRIAL RESOURCES OF FRENCH COLONIES. A French commission has recently carried on extensiv investigations into the resources of the colonies of France, with a view of determining as to whether certain indigenou productions can be utilized for industrial purposes. From he results elicited, it appears that active measures will be taken for the introduction of some products and for the cul tivation of others. Special attention is to be given in the Réunion Islands to the cultivation of vanilla. Plantation are established, which will be renewed every ten years, and are designed solely for the propagation of healthy slips for distribution, it being hoped that, by this means, the gradual disappearance of healthy plants may be checked.
The Tahiti Islands furnish the finest variety of mother of pearl now known; but commerce therein is at present car ried on by English and German merchants. French govern ment officials have been supplied with funds, and efforts will through them, be made to establish a French trade, both in this substanco and in tortoiseshell. Ramie is found in large quantities in Tahiti, but is to costly a production to figure in commerce. Another variety, also adapted to tex tile manufacture, has been recognized in the Antilles and in French Guiana. The crop averages about 3,420 pounds to the acre, the white fibers being some 6 feet in length, and worth 18 cents per pound. This yield per acre is superior to that of sugar. The sap of the balata minusops, or Guiana gutta percha tree, was rejected, in 1867, as valueless, on accoun of the friable properties of the resulting product, and the esinous effervescence which appeared thereon. Some frag ments of the plates employed in the tests have lately again been experimented upon, and the material is now found to possess all the qualities of good gutta percha. The former defects were due to bad preparation. Further investigations into this product will be inaugurated.
The commission has also found a large deposit of valuable fertilizer in the bones of the cod from the fisheries of St. Pierre and Miguélon. The remains are rich in phosphate o lime, and contain 21 per cent of ossein.

Jumping of Gas Flame.-This is caused by water con densing in some low place in the fittings. Have the pipe cut, and a $T$ piece put in, with a small tap,so that water may be let out before turning on the gas.

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## THE TORPEDO PRACTICE AT NEWPORT

The torpedo practice during the recent fleet drill at Key West, it will be remembered, was not exactly of a nature calculated to impress the public mind with a sense of the remendous destructive force of bags of powder poked out on the ends of sticks; and consequently, since that time, lurs upon our naval torpedo system have been more frequent than commendations for the efforts of the very zealus corps of officers, who, for several years past, have been uietly working and experimenting, at their station on the bleakest of the islands in Newport Harbor. With the publication of the excellent results of the recent trials at Newport, however, the cloud which has obscured the labors of he experimenters is dispersed; and we must admit that, in lieu of sticks and powder sacke, the torpedo officers, Proessor Moses Farmer and Lieutenant John P. Merrell, have eveloped for us a means of warfare of terrible efficiency
The recent trials took place on successive days, in the presence of a congressional committee, and a large concourse of spectators. The initial experiment was the explosion of ground torpedo of fifty pounds of powder enclosed in an ron-cased shell. This was blown up by Professor Farmer's dynamo-electric machine. Two fifty pound torpedoes were then fired by the contacc of a boat with the circuit closers; and the blowing up of apparatus improvised from ordinary water breakers followed, to show how easily these destrucive weapons could be constructed from the simplest materials, and without special machinery.
The plane table was used in the explosion of a three hun dred pound torpedo, the current being established at the in tant the approaching vessel was seen through properly adusted sights. A column of water, two hundred feet high, marked the tremendous violence of the escaping gases. An attempt was made to blow up an old hulk, by the aid of submarine torpedoes; but through some mal adjustment of the latter, the vessel, though badly damaged, was not detroyed. An excellent feature of the operation was, the fring of a torpedo through a mile of cable, the main object eing to show that this means of offense or defense could be safely carried on beyond the range of the enemy's fire. An explosion of 500 igniters simultaneously, proving that sevoral mines could readily be blown up at once, concluded the experiments of the first day
An old coal schooner formed the objective point of the second day's operations, the interest of which was greatly hightened by the participation therein of the new ironclad torpedo boat Intrepid. This vessel is a small steamer, built expressly for torpedo manœuvering. She steams at a rate
out in the stream, the Intrepid backed astern for about a mile in order to get good way on, and then rushed ahead at full speed. The Harvey torpedo, which she towed on her starboard side, was brought in contact with the hulk and at the instant of touching, fired by an electric fuse, smashing in a huge hole in the vesael's side. Immediately the Intrepid dashed up for a second trial, and this time exploded a spar torpedo, rigged out from her port side, directly under the bottom of the fated craft. A fearful explosion, followed by the hurling aloft of great fragments of wood and masses of water, showed that the weapon had done its work. The ship was literally torn to pieces, leaving but a few large portions drifting about. A second torpedo blew these out of existence, and the total disappearance of hulk marked the close of, probably, the most successful extended series of torpedo experiments conducted under naval auspices in this country.

RECENT METALLURGICAL RESEARCHES.
Some facts of interest to metallurgists, in gold and silver, are to be found in a recent memorandum of Mr. Chandler Roberts, chemist to the British Mint. We learn that the spectroscopic assays, begun last year, have been successfully prosecuted, giving results that prove that, for purposes of quantitative analysis, the spectroscope must form an auxiliary of the highest value. It is stated that differences of composition amounting to less than $\frac{1}{10000}$ part may thus be determined.
Mr . Roberts quotes the interesting results obtained by M . Serol, of the Paris Mint. This chemist finds that, while a silver copper alloy containing 71.893 per cent of the former metal is homogeneous, in all alloys containing more silver than this amount the center of the solidified mass is richer than the interior. A mass of 112 ozs . of silver copper alloy, melted, carefully stirred, and allowed to solidify, was found not to be homogeneous. The silver accumulated at several points, not bearing any apparent relation to the geometrical form of the mass. A homogeneous plate was at last obtained by assaying all parts of a plate of standard silver and cutting off those portions which varied from the required standard. Perfectly pure gold was obtained by reducing the chloride of gold with oxalic acid and fusing in a clay crucible with bisulphate of potash and borax. The electrolysis of cyanide of gold and potassium gave a product containing $999 \cdot 9$ of fine gold in 1,000, while reduction of the chloride with sulphate of iron and subsequent fusion gave only 99985.

## PROTEOTION FROM LIGHTNING.

During a recent thunderstorm in the village of Trumbull, Conn., a family of three persons, husband, wife and child, who had taken refuge on a feather bed, wereinstantly killed by lightning; the house had no rods. In the same village, during the same storm, a dwelling house, which had two lightning rods upon it, was seriously damaged. Several of our readers, who have seen the accounts of these disasters, and others who cite analagous examples, have had their faith in feather beds, as a place of safety during thunder storms, severely shaken; while some of them would fain believe that lightning rods serve to destroy rather than to preserve life and property. We are asked to print something upon the subject; and we cheerfully comply, premising, however, that there is little that is new to be said, and that the subjoined information has for the most part been heretofore reiterated in our columns.
are feather beds a protection from lightning?
Feather beds are not a protection from lightning, and the popular belief that they are, doubtless results from a misapprehension of the laws that govern the passage of electricity. The human body is a better conductor of electricity than feather beds or other objects ordinarily contained in the apartments of dwellings, and therefore, a priori, when the lightning enters an apartment, the human body is likely to form one in a chain of inductions, determining the path of an electrical discharge, unless better conductors are in its vicinity to divert this action.
What is the safest place during a thunderstorm?
The only place of absolute security in a thunderstorm is an iron building; or next in safety is a building properly protected by lightning rods.
Houses constructed entirely of iron manifestly stand in no need of lightning rods at all, because the electric fluid, on striking so good a conductor, would rapidly diffuse itself in all directions and flow into the ground, provided, of course, that the construction of the building is such as to allow its free escape.

## re lightning rods of any real value

Unquestionably they are. Examples are numberless where the lightning has been seen to fall upon the rods of buildings and descend harmlessly to the earth; while the fact is undiaputed that the principal damages suffered from lightning are in connection with buildings that are not provided with conductors. Notwithstanding these facts, some people are apt to be indifferent whether their houses and stores are provided with lightning rods or not, and are always ready to give an example where some building so provided was struck in spite of its protection. Such cases are quoted by the old fashioned "practical men" with much satisfaction, because they hail in them what they are pleased to call the victory of their sound common sense and the discomfiture of thescientific man. This class is, however, rapidiy dimin. ishing in numbers under the influence of the extensive diffusion of scientific education among the people.
It may be well to assure unbelievers that the efficacy of It may be well to assure unbelievers that the efficacy of
the lightning rod is no longer an open question, and that any
ailures are attributable to bungling or ignorant construc tion. It would be an easy matter to multiply statistics in proof of the assertion; but none would carry with them more force than the following statement obtained from
"Between 1810 and 1825 ,before rods were introduced, no less than thirty-five sail of the line and thirty five frigates and smaller vessels were completely disabled; and in 200 caeses recorded, 300 seamen were either killed or injured. When the lightning rod was introduced, every mast was furn'shed with capacious conductor permanently fixed and connected with bands of copper passing through the sides of the ship under the deck beams, and with large bolts leading through the keel and keelson, and including, by other connections, al the principal metallic masses employed in the constraction of the hull" (Harria). Since the adoption of this arrange ment, "it appears that damage by lightning has positively raniehed from the records of the navy
In England, the various telegraph companies suffered serious damages by every thunderstorm, by the destruction by lightning of their poles. The poles are now pros.
with emall lightning rods, and all damage has ceased.
with emall lightning rods, and all damage has ceased.
In this country the Western Union Telegraph Company has auffered in the same manner, especially, saye a recen number of the Journal of the Telegraph, "upon the plains and prairies,where every lightning atorm formerly shattered and destroged more or less of our poles, but which are now fully protected by a conductor (No. 8 wire) placed on every fifth pole. Wherever telegraph poles are provided with such lightning rods, all damage is provented. Where the pole are not provided with rods, damage ensues.
WHAT IS THE PROPER SIZE AND MATERIAL FOR HOUSE LIGHTNING RODS?
According to the best authorities, a copper rod of one inch n diameter, or an equal quantity of copper under any other form, will resist the effect of any discharge of lightning hitherto experienced. The copper rod is therefore the safest and best material that can be used, but it is expensive. Iron rods of one inch in diameter are very commonly used, and, if pointed with solid copper and properly put up, are effica cious in the great majority of cases. The particular form of the rod makes no difference. It may be round or square, twisted or hollow, composed of one solid piece or made of wires twisted together. It is the quantity of metal con tained in
the form.

WHY SHOULD THE ROD BE POINTED?
The reason for terminating lightning rods in a point is as ollows: When a thunder cloud highly charged with positive electricity comes up, it repels the positive electricity of all bodies on the surface of the earth coming within its influence, and caures negative electricity to accumulate in them. This is called induction, and it always takes place before a discharge. Now it has been discovered that, when electricity is accumulated in a body in this manner, it can most readily escape by sharp points because in them it meets with the least resistance. A lighted candle held near the prime conductor of an electrical machine furnished with a point will be nearly blown out by the current of air produoed by the escape of the electricity. Lightning rods are
therefore provided with sharp points to allow the accumu lated negative flaid to pass off readily into the air and neu tralize the positive flaid of the thunder cloud.

HOW SHOULD RODS BE MADE AND APPLIED?
The object being to make so good a passage for the light ing to the ground as to remove all danger of its leaping to some conductor in the house, the greatest care must be taken not to have any break in the conductivity. As it is incon venient to manufacture or traneport the rods in one piece, the different parts must be in intimate connection when they are put up; it is best to bave them soldered and the joint protected from the air and moisture.
The point of the rod ahould be extended a little above the chimney or higbest part of the building, and should be astened in contact with the building by staples or cleats Glass insulators should not be employed. It makes no dif ference in conductivity whether the rod is painted or not painted.
No building can be said to be properly rodded or protected against lightning, unless the lower part of the rod or ter minal under the ground is made quite extensive. The ex tremity of the rod should connect with masses of good con ducting materials, such as old iron, or iion ore, or coke, o charcoal, laid in trencher, or the rod itself should be elonga ted, sunk deep in the ground, and carried a considerable distance from the building, and put in connection with water or moist earth if possible. The golden rule for safety
is: "Provide the largest possible area of conducting surface is: "Provide the largest possible area of conducting surface for the terminal of the rod."

## LOOK TO YOUR TERMINALS.

A lightning rod which is not properly connected with the earth is quite dangerous. The very common method of merely sticking the lower end of the rod down into the dry earth near the surface of the ground is bad, and endangers the building, because dry earth is such a poor conductor, and the amount of rod surface in contact with the earth is so small. Under such conditions, a portion of the electric cur rent will be likely to find an easier path to the earth, through the building than through the rod; and a part of the electricity will therefore leave the rod, etrike into the building, and down In various directions into the earth, making havoc as it goes
As a measure of prudence, house owners should look to the terminals of their lightning rods, and place there a consid
orable amount of the conducting materials above named.
By adopting this simple expedient, many buildings, oth
wise unsafe, will be rendered comparatively secure from damage by lightning.
As an electrical conductor, well burnt charcoal ranks next to the metals. Metallic ores come next to charcoal. Water and moist earth, which are so frequently recommended as terminals for lightning rods, are among the poorest of conductors.

One of the best protected buildings that we have heard of is that of Mr. John Knox Smith, an intelligent English mer. chant residing at Singapore. His country bouse is built on a prominence, upon a bed of iron ore, with which the house lightning rods are made to communicate. The lower ends of the rods thus have a very extensive conducting surface and the protection afforded is considered perfect. Thunder storms and lightning strokes are very frequent, but the house has never been injured.

PROTECTIVE AREA OF RODS
It was supposed to have been established by Charles and Gay Lussac that a lightning rod protected an area whose radius was double the hight of the rod extending above the building, but this rule is no longer reliable by reason of the extensive use of metals in the shape of pipes, etc., in the construction of the buildings of our day.
water and gas pipes should be connected with the LIGHTNING ROD.
When electricity finds several paths to the ground, it will prefer the best, it is true; but some portion will also pass along the poorer conductors. If, therefore. any metallic substances lie within the area supposed to be protected, they are in danger of being struck. This is especially true where pipes of a building. It is a good with the lightning rod; if the rod is atrack, the electricity will then have an excellent path into the ground and will be rapidly diffused over the vast underground network of pipes The danger to the inmates of the house of being atruck rom these pipes is less than that of receiving a shock from he powerful induced currents, liable to be developed in hem, if unconnected, during a thunderstorm.

IS MORE THAN ONE ROD USEFUL?
The more rods on a building the batter, especially if all Multiple lightning conductors are their upper ends. Multiple lightning conductors are useful because each one helps the others, and if the discharge is too great for one. they will be able to carry it between them, but what is more important is this: The less the total resistance of the conductor to earth, the more cartain is it that no other, unde irable line will offer an approximately good path to the earth, and so get a part of the flash. Thus, suppose a singl rod whose resistance is 1 , and that a eeries of bolts, hinges, utters, stove pipes, etc., offers another line (passing per haps through the walls of the house or the body of its occu ant) whose resistance is 2 . Now, under these conditions, flash would be likely to divide itself, and while $\frac{3}{8}$ would go safely down the rod, $\frac{1}{8}$ passing along the other line might burn the house or kill the man. But if two rods were con nected, the resistance in this line would be but half, hence $\frac{4}{5}$ would take this road and but $\frac{1}{5}$ tend to go by the other.
Again, the less the resistance of any line, the higher the op posite charge developed in it by induction, and hence the greater its attractive influence, leading the discharge to pre fer it as a path. This bears upon the importance of connecting all accidental lines of conductors, such as gas and water ipes, with the lightning rods. Insulated, these are opposi ion lines, soliciting the lightning to come into house and traverse them; connectod, they help the
to get and keep the lightning outside.
metal roofs, gotters, leaders, and water tanks
SHOULD BE CONNECTED WITH THE LIGHTNING RODS.
Finally, in the way of general advice, we would say: Con nect all your lightning rods together, and also to your iron ank, and water, gas, or other pipes, not by separate connec tions, but so that there is some connectinn between all,which connection should bs as high up as possible. If you have a metal, then connect your rods together by weans of a good sized conductor running along the ridge of the roof. Bear in mind that, to carry off the heaviest lightning flash known, a copper rod one inch in diameter is not considered too large nd though of course such flashes are of very rare occur rence, they may come. Hence the great value of uniting your different rods high up.

## THE ELECTROMOTOGRAPH...A NEW DISCOVERY IN

 TELEGRAPHY.Within the past few days, we have had under examina tion, in practical operation in our office, a novel electric elegraph apparatus, which presents some very remarkable features, and promises to result in the creation of an entirely ew and advantageous aystem of telegraphy. It is the discovery of Mr. Thomas A. Edison, of Newark, N. J., who is well known as a telegraph engineer of the bighest ability, and the inventor of a larger number of electrical devices,
probably, than any other person living. His improvements are employed upon all the various telegraph lines in this country.
The present discovery relates to that form of apparatus known as the automatic or chemical telegraph, in which sig. als are made and recorded by causing the electricity to pass through paper, the latter being eaturated with a chemical bstance, which changes in color when the current acts ines, dots, and dashes are thus produced with great facil
ity. In the ordinary working of this form of telegraph, the electricity is sent over the line wire by a key, in the usua electricity is sent over the line wire by a key, in the usua
manner, and passes through a pen, atylug, or lever, which
has no movement, bat simply rests upon the paper, the lat-
ter being moved by a weight or clockwork. No magnet and armature are used.
The salient feature in Mr. Edison's present discovery is the produstion of motion and of sound by the pen or stylus, without the intervention of a magnet and armature. By the motion thus produced, he works any of the ordinary forms of telegraph printing or sounding instruments or relays, and is enabled to send meseages, by direct transaission over thoueands of miles of wire, at the highest speed, without re-wri ting, delay, or ditficulty of any kind. More than this, his apparatus operates in a highly effective manngr, under the weakest electric currents, and he is able to receive and transmit messages by currents so weak that the ordinary magnetic instruments fail to operate or even give an iadication of the passage of electricity. Thus, when the common instruments stand still, owing to weakness of current, the Edison t:legraph will be at work up to its fullest cspaci:y. The author has baptized his discovery the Electromotoraph, which is, perhaps, as good a title as could be adopted. We subjoin the following original notes by the author, which explain the peculiar principle that lies at the base of his discovery. These notes, we are cunfident, will be read with very general interest.

## To the Editor of the Scientific American

In my new system of telegraphy, it would seem that a new mode of motion, as witn magnetism; but this is only apparent, not real, if I understand it right.

The electricity, acting by electrolysis, changes the nature of the surface of the paper, either by depriving it of some
constituent, or the hydrogen, in conjunction with the metal constituent, or the hydrogen, in conjunction with the metal which are smoother than the paper in its natural state, in the manner that the surface of rough paper is made smooth by dipping it into sulphuric acid. The strangest thing connected with this phenomenon, however, is this :
In tryicg to ascertain what caused the lever to move, whether it was by reducing the lead by hydrogen to a finely civided powder that actifd as a lubricant, or whither the nature of the surface of the lead werc changed by the ab-
sorption of hydrogen, like palladium, or whether the effect sorption of hydrogen, like paliadium, or whether the effect
were due to the effort of the gases to escape from under the lever: l was led away from these notions by finding that platinum, with sulpuate of quinine, will likewise show the movement. It then struck me that the nature of the paper was cuarged by the electrolysis. To test this, I had a long message received over the Automatic Telegraph wire foom Washington (this wire runs in my laboratory at Newark),
and recording the same on ord nary chemically prepared and recording the same on ord nary chemically prepared
paper. The speed with which the message was sent from tions forming the dots and then passed the strip into the electromotograph (I use this name for the want of a better one), the colorations being in direct line with the lead point. On rotation of the drum, and when no coloration was under th $\rightarrow$ iead point, the lever was caried forward by the cormal friction of the paper.
But the moment a coloration passed under it, the lead point But the moment a coloration passed under it, the lead point
slid upon the paper as uroa ice, the friction was greatly rotating drum.
In this experiment, no battery was connected to the instrument. This proves that electrolysis produces a change in the nature of the paper.
I afterwards fou d that, if a tin pen were used to receive the message from Washington, although no marks were seen, the paper appearing unchanged, yet, on passing the paper
through the instrument, the movement of the lever was mough marked than before Keceiving the message nith a lead pen did not give so good results, although lcad is the lead pen did not give so good results, standing at the head of the twelve meals best when used, standing at the head of the tweive me:als
tried. The next is thallium. On paper moistened with aqueous solution of pyrogallic $\varepsilon$ cid, tin is as gcod as thal-
lium. Of all the solutious yet $t \in s t e d$, potassic hydrate has lium. Of all the solutious yet tisted, potassic hydrate has
been found to give the most marked results. The second been found to give the most marked results. The second
best is sulphate of quinine. Third, rosaniline oxidized ald best is sulphate of quinine
discolored by nitrous acid
A peculiarity of as acid.
A peculiarity of the quinine solution is that platinum shows an action, and shows it when either oxygen or bydro-
gen is evolved on its surface. $W$ ith hydiogen the friction is gen is evolved on its surface. With hydiogen the friction is
lessened, as with all other metals; but with oxygen the triclion is increased. This is so with all the metals subject to axidution ; but it appeared strange, at first, that it would show with a metal upon which the nascent gases $h_{n} d$ no effect. With a lead poict and as lution of the disinfectant known bromo-chloralum, the evolution of hydrogen increases the Silver of the paper enormously.
Silver seldom shows a movement with any solution; and
Sulphuric acid shows least movement with any metal
It appears tu be a matter of indifference as to the char $\mathrm{c}_{\ell}$ cter of the metal used for the drum, which acts as one of the decomposing electrodes. Considering that the lever will clore a secondary circuit under the great pressure used upon the lever, its sensitiveness to electricity is wonderful. With a delicately constructed machine, moved by clock work, which Thave nearly finished, inave succeeded in obtaining a movement of the lever, sufficient to close the local circuit with a
current (through one million ohms, equal to 100,000 miles of telegraph wire), which was insufficient to ciscolor telegraph wire), which was insufficient to ciscolor paper
moistened with potassic iodide, or move an ordinary $£$ alvanmeter needle. Messages may be read from the sound of the lever, when the most delicate telegraph magnet shows no urrent.
The uses of this instrument are many; in fact, it gives an entire new system of telegraphy.
As no second $+r y$ currents
As no secondry currents are generated, as with an electromagnet, to prevent the instant magnetization or demag-
netization of the iron cores, and electrolysis being irstantanetization of the iron cores, and electrolysis being instanta-
neous, it is obvious that the lever will respond to signals ransmitted with great rapidity. I have succeeded in transferring signals from one ciicuit to another at the rate of 650 words per minute; hence it may be used to repeat the rapid ignt ls of the automatic telegraph into secondary circuits. By atiaching an ink whees to the extreaity of the lever, opposite a cortinuous strip of paper moved by clackwork,
messages transmitted at a speed of several huadred words per minute may be recorded in ink. By attaching a local it may be used as a Morse relay to work long lines of tele
Newark, N. J., August, 1874.

## THE TRANSFUSION OF BLOOD.

The idea of returning to an animal blood which has been lost, or, rather, of replacing the vital fluid which has dis appeared through the effects of increasing age or the ravages of illness, by transfusion from the veins of another animal in full health, was known to the ancients. It is de scribed in the "Metamorphoses" of Ovid, and repeatedly alluded to in the works of the old alchemists, who believed that, by such means, ferpetual regeneration of the body might be accomplished. Toward the middle of the seven teenth century, the subject appears to have enlisted the at tention of French physicians and philosophers;and in the month of June, 1667, experiments, which previously had been frequently practised successfully apon the lower ani mals, were for the first time tried upon man. Eight ounces of the arterial blood of a lamb were injected, by Denis, into the veins of a child. Subsequently calf's blood was trans fused into the blood vessels of a maniac, who shortly there after regained his reason. While, starting from these at tempts, the operation was again and again repeated, some imes successful, sometimes the reverse, until it became com mon in the practice of almost every French physician. Too common, however,-whether through the rude means em ployed for forcing the fluid into the veins of the patients, or whether from the lack of skill on the part of the operators, or, more probably, a lack of caution on the part of the lat ter, due to supposed familiarity with all the consequences of the operation-for accidents soon became more frequent than successes. In the course of a few months, failures became the rule and cures the exception; the people became alarmed and finally, in the beginning of 1668, the Parliament of Pa ris proscribed the practice, and the fulminations of Rome closely following, effectually arrested any further investiga tion and experiment. The physicians, however, carefully preserved and printed their records; and from an old trea tise, called the Clysmatica Nova, printed in Brandenburg in 1667, wo reproduce an engraving showing how, in those days, the operation was performed, Opening a vein and in serting the end of a common syringe constituted the whol process, in marked contrast to the delicately adjusted instru ments and careful measurements now employed.
For a century the subject was abandoned, to be taken up again, however, at the lapse of that period, by Harwood whose researches showed that blood could not be transfused from one animal to another of different families without kill ing the latter within a few days after the operation. From this discovery date the modern investigations, which have culminated in the acquigition of knowledge sufficient to ad mit of the safe practice of transfusion of blood from man to man.
The early experiments of Denis, and of others subsequent ly, would seem to negative the above mentioned truth, but the details of the operations, as handed down, are very de fective, and in some instances it is known that individuals, at first benefitted by the transfusion, subsequently died from its effects. There is certain evidence, however, that death was repeatedly caused by transfusion between widely differing animals. More modern experimenta, especially those of Prevost and Dumas, prove that the blood of calves or sheep, injected into the veins of a cat or rabbit, is fatal, and mam mifers inoculated with the blood of birds rapidly succumb On the other hand, Lower has shown that the fluid from the veins of one variety of dog acts beneficialiy upon another dog of different characteristics; and from the experiments of Milne-Edwards and Lafond, of still later date, it appears that it suffices for the two animals to be of the same natural group, although belonging to distinc blood was nearly exhausted, was re. animated perfectly by the blood of a horse.
If it is true, then, as facts demonstrate, that, in the case of man or other animal whose life is almost extinct through abundant hemorrhage, revivifi cation may be gained by transfusing a quantity of blood much less than that lost, it becomes an interesting matter to determine to what elements the liquid owes its reanimating properties. Prevost and Dumas show that an injection of serum-that is, blood deprived of fibrin and globules-is utterly without effect. On the other hand, blood containing the globuler, but in which the fibrin has been destroyed by agitation, gives strong revivifying results, and hence, as extended investigation has abundantly shown, the perfect globule
is absolutely indispensable.
is absolutely indispensable.
In order to comprehend the hurtful effect of the blood of sary to take into consideration above alluded to, it is neces the the greatly varying shape of the globules in the blood of various vertebrates. The an nexed engraving, representing these globules very much magnified, will, in this regard, be of interest. No. 1 repre sents human globules imprisoned in the fibrin of coagula ted blood. No 2, the same in rolls. No. 3, globules de tached, showing them as circular biconcave disks, diamete $0 \cdot 00026$ inch to 000017 inch, weight 0000001 grain, surface 0.000004 inch. No. 4, globules of the camel, elliptical disk diameter 0.00031 inch. No. 5, globules of pigeon, elliptical biconvex, diameter 00006 inch. No. 6, globules of frog, elliptical, diameter 0.0008 inch. No. 7, globules of cobitis, round, diameter 0.0005 inch. No. 8 , globules of water lizard,
diameter 00015 inch. No. 9, globules of ammocoetis, diam eter 0.0004 . No. 10, globules of proteus (species of batrachian), diameter 0.0048 . $a$, in all the figures indicates front and $b$ side, views.
The results of later investigations prove that the blood of mammifers may be injected into man without producing hurtful effects, so long as the red globules of the animal do not differ greatly in form and dimensions from those in hu man blood. If the globules become dissolved and soon dis appear in the organism into which they are transmitted they nevertheless produce advantageous though not perma nent results. It would seem, then, that, when human blood is unattainable, that of animals may be used.


THE TRANSFUSION OF BLOOD, A. D. 1667.
The mode of performing the operation at the present ime is graphically depicted in the large engraving on the opposite page, extracted from a French contemporary. The young woman represented as receiving the blood was a ser vant, twenty-two years of age, who had become extremely exhausted through hemorrhage and overwork. She was re ceived into the Hospital de la Pitie, in Paris, and the trans fusion was accomplished by Dr. Béhier from the arm of Dr. Strauss. The aspirator used was so arranged that by no possibility could any air enter with the blood. The latter

blood globules. magnified.
was sent into a cup from the veins of the donor and collected in the inferior part of the instrument, whence it was pumped by a small piston worked by a handle. It was then forced through a canula into the veins of the patient. The instrument, in order to prevent coagulation of the fluid, was first immersed in tepid water, and the tubes used were of gold. Before employment, the apparatus was filled with blood, so that considerable of that obtained from the healthy veins was lost. In all about one ounce, out of three, was admin tered, but this was sufficient to secure restoration to the pa tient, and to enable her, after a lapse of seven weeks, to reume her ordinary occupation.
The New York Medieal Record, of recent date, contains an nteresting paper on this subject, by Dr. J. W. Howe, visit ing surgeon to a charity hospital in this city. He gives an
account of his treatment of an invalid woman, forty years of age, whose pulse was weak and irregular, and at times imperceptible. He says: "I abstracted, by means of the aspirator, four ounces of blood from the median basilic of a healthy man. The blood thus obtained was injected into the cephalic vein of the patient. In a few moments she expressed herself as feeling better. There was an immediate and marked improvement in the volume and force of the pulse. This was so perceptible as to be noticed by all present, and prevented me from transferring any more blood. The next morning I found her pulse still improving and her general condition excellent." The patient subsequently regained her strength and recovered.

## Testing Colors for their Fastness.

For this purpose, Professor W. Stein gives the following schedule of directions
Red.-A small sample of the yarn or fabric is boiled firs in soap water, which should not affect the shade and become but slightly tinged itself; secondly, in lime water, which also should neither affect the shade nor extract it. These tests are sufficient to demonstrate the presence or absence of log. wood, sanders, and aniline

Yellow.-Boil samples successively in water, alcohol, and lime water. Shades which are not fast enough tinge the water and alcohol sensibly, and turn the lime water red. Annatto and turmeric are the most fugitive yellows; fustic is a little faster.
B'ue.-1. Boiled in alcohol, a fast blue should not give a red, purple, or blue liquid. 2. Boiled in muriatic acid and water, or alcohol, the liquid should not turn red, nor should the shade on the yarn or fabric change to red or reddish brown. Purple.-The only fast shades of this class are those derived from combining a vat blue or indigo carmine blue with cochineal, and the madder purple. Boiled with dilute alcohol (one half water), and left to stand ten or fifteen minutes, fast purples suffer no change; nor should they turn brown or reddish brown when boiled with dilute muriatic acid.
Orange. - Boil in water; if it becomes yellow, reddish yellow. or red, the dye is not fast. If the water remains unchanged, boil in alcohol, which should likewise leave a fast orange unaltered.
Green.-Boiled in dilute alcohol, it should not color it blue, green, or yellow; maristic acid should not be colored red or blue.
Erown.-It is very difficult to test these for their fastness. Boiliug water should not change them to red; when steeped in alcohol they should not become yellow.
Black.-Boiled in water and hydrochloric acid, they should not be yellow.

Prevention of Waste in Manufactures.
In the economy of trade and manufactures, there is nothing more interesting than the prevention of waste, or the discovery of a way by which waste material may be turned to a profitable use. A remarkable case in point has recently occurred. In the manufacture of the beautiful blue and violetdyes that make silken textures and the wearers thereof look so beautiful, there has always been produced a large quantity of dark colored substance, known among chemists as Hofmann's gum. In some aniline dye works the accumulation of this refuse amounts to hundreds of tuns, and bas long been a hideous burden. But recently Mr. J. Spiller, a member of the Chemical Society, has discovered that, by the process which chemists describe as destructive distillation blue and violet dyes, quite as good as those extracted in the first instance, can be got out of this gum ; and so, as if by magic, the hideous heaps, now lying on the outskirts of many chemical works in England and on the Con tinent, become as valuable as gold mines, and enterprising chemists reap the reward.
Another instance is reported from Cornwall. The drainage of certain nines there is discharged from a great pit, and flows into the sea. A few enterprizing individuals rented a piece of waste land at the outfall, dug a few catch pits, into which the water pouredi and threw down a sediment ere it finally escaped. This [sediment is ocher, useful for paint and many other purposes, and the quantity collected in this simple way, in one year, was about 2.000 tuns, worth from $\$ 2.75$ to $\$ 5$ a tun. These economizera, however, have let some of their profit slip, for a keen contriver dug a pit to intercept their waste water, and in the same year got $\$ 1,500$ worth of ocher as the reward of
his ingenuity,
One more comes to us from Southern Italy, where the people press the oil from olivesin common wooden presses, and burn the husks as fuel. A Frenchman from Marseilles went among them, and bought the husks at $\$ 4$ a tun, and shipped them to France, where, after treating them chemically, he squeezed them in a steam press, and extracted therefrom 20 per cent of oil.-Chemical Revicio.

Waterproof Paper.-A nice article, transparent and impervious to grease, is obtained by soaking good paptr in an aqueous solution of shellac in borax. It resembles parchment paper in some respects. If the aqueous solution is colored with aniline colors, very handsome paper for artificial flowers is procured.
年

## Curregpouftuct.

## To the Editor of the Srientific American

On Sunday morning, dugust 16 , intelligence reached this city of the death by drowning of Ex.Commiesioner S. S. Fisher and his son, during a pleasure excarsion (in the RobRoy atyle) upon our ioland waters. Last month, Mr. Fisher left Cincinnati, with his son Robbie (who was about twelve years of age), in a fine metallic boat, built at Cleveland, whish was well stocked with provisions and camp equip age; and a few daye afterward they arrived at the beautiful Canandaigua Lake, lying in Central Now York, where they launched their boat and immediately proceeded to make a toui of the long chain of ioland waters which grace the interior of the Empire State, and thence via the Erie canal to Elmira. From Elmira they went to Towanda, Pa., where the boat was again launched in the pictureaque Susquehanna, down which they were passing when the terri ble accident occurred which deprived both of life. On Friday morning the little party left Harrisburg at 7 o'clock At 11 o'clock the boat and occupants were seen just above the falls. At 1 o'clock the boat, with oars, papers, and bag. age, was found flosting down the stream; unguided and alone, below the rapids. The Colonel's body was found near York Haven late in the afternoon of the pame day, about wenty miles bolow the rapids where the accident is sup. posed to bave bappentd; but his son's remains were not recovered until the following Monday, some five miles further down the river. The bodies were embalmed and sent to Cincinnati for interment, which takes place to day.
As a curious incident in connection with his death, it is stated that, on the Sabbath before leaving home, he described to a Sunday School the supposed feelings of Pharaob and his hosts when they were swallowed up in the Red Saa, drawing a vivid and terrible picture of the feelings of drowning men : little thinking that he would so soon expeience that which he so graphically illustrated
The following order was issued yesterday by Commissioner Leggatt :

Unted States Patent Office,
The news of the sudden death of Bon S . S. Fishe
Commissioner of Patents, has cast a pall of sadness over all connected with the Pateat Office. We remember him as an affable, genial, generous friend and companion-a kind, courteous, just, and laborious officer-a high.toned Christian entlema, always commanding the love and respect of al who came in contact with him.
th beginuing of a new era in its history Patent Office was th beginving of a new era in its history. He did more to
adapt the organization to the increased business of the Office more to establish uniformity in the practice and decisions of the Office, and more to make such declsions and practice at tainable and intelligible to the public than had been done bafore. He ably discussed and satisfactorily settled many questions which had long vexed and harassed the Office The im oress of his clear head and strong will are discernible an epich in the history of our patent system.
In memory of his personal and official integrity, of his great a aility as Commissioner, and of his emineert virtues a closed on August 20 , the day of his funeral.

> M. D. Legaetr, Commissioner cf Patents."

The surviving family of the deceased consists of a wif and two child ren, who are probably well provided for, a his practice was very lucrative, his last year's income being estimated at $\$ 45000$ In addition to this, his life was in sured for $\$ 10.000$ in the Traveller's Accident Insurance Company of Hartford, and in the Connecticut Mutual fo he rame amount.
Washington, D. C.
Occabional.

## Hardening and Tempering Tools.

To the Editor of the Scientific American
Your correspondants, "Tools" and Mr. Juan Pattison seem to have great objections to the words "film of oxide, ased by me, as though they expressed something of an oc cult nature and beyond the comprehension of the mechani or artisan; and I judge from the tenor of their communica tions that they have somehow imbibed the idea that my ori ginal letter is the work of a mere theorist, without practica experience. It may, perbaps, be a relitf to them to know that, notwithstanding the giat of my letter was taken from a lecture to the engineers at the Naval Academy, the princi pal points referred to therein were discovered and largely ex perimented upon by the writer during over fifteen years of shop experience of the very best kind, ten of which were passed in one of the frrst and largest establishments in this city, tha; of Mesers. R. Hoe \& Co.
I bave a more elevated opinion of the American mechanic from my long association with bim, than to believe, when h is told that the colors appearing upon the surface of a teol which he is tempering are caused by the union of the oxygen of the air with the metal, that if the time be unduly pro longed in producing it, or that, if in the operation he ex cludes the air from it, his results will be valueless unless so simple, so plain so very practical a proposition as zome hing too deep for him, but rather that he will set himael at once to apply the test of a trial for himeelf.
If the mechanic of today is really so obtuse, he must have retrograded not a little in the past ten or 15 years. I be lieve, however, that this is exactly the reverse of the truth, and I bave long ago become convinced that the known supe riority of the American'mechanic over the average European is mostly due to the fact that he always seeks for the why and the wherofare; he wante a reason for the faith which is
in him ; he is not satiefied to work, like his European brother, by the rule of thumb.
Already Iam in receipt of communications thanking me or a little light let in on difficult'es experienced for years in tempering tools, and for which the communicants could not till now, account. Mr. Rose, Mr. Pattison, and "Tools" may us well think the matter over a litte more carefully; if they will, I must believe that they will not be willing to ig. nore two of the most essential readings of what I have called "our color thermometer."
I have noticed frequently, in discussions of this kind, that on the part of many there appears to be an impression that called theory and practice; but there is no such antagonimm. Correct theory makes good practice. Practice without theo sy is the rule of thumb; and but for theorizers and their theories, the productions of our factories would be today hat they were two hundred years ago
The eminently and thoroughly practical man was very hap pily described in your issue of August 8 , in him who bor rowed your journal from his neighbor in the cars, and who "never learned nuthin' from books in his life." But I am glad to believe that thereare, at this day, few such remaining, that the American mechanic is capable of reasoning and being reasoned with, and that he is always the better for a little good sound theory wherewith to improve his practice

## 62 Cannon street, New York city,

## To the Editor of the Scientific Amervan

Your correspondent, J. T. Hawkins, insists on the value of the fact that the color on steel is caused by a film of ox e. Is this true? The hardness and temper of a piees of steel vary as the carbon contained therein; and why an ox idized surface should be cited as an indication, I do not now.
Nobili asserts that these colored films are the results of a carbonizing treatment, and that this accounts for the non rusting of ateel covered with such coatings. If the fiber hem.
New York city.
J. T. N.

## To the Editor of the Scientific American

The public are apt to believe that all honey which is out f the comb is impure, and that all comb honey is pure. There are several bee keepers in thin neighborhood who produce a great deal of honey for market, and who extract it by a maehine. There are a few about here who feed their bees with sugar sirup, and their bees put it into combs, and it is then sold to persons who believe that none but comb noney is pure. We, however, know that what we extract by our machines is just what the bees themselves bring in without any inducement or compulsion. By the use of the extractor, the yield of honey is increased perbaps five fold but, on account of the unfounded prejudice in favor of comb honey, our producers of extracted honey have some difficulty introducing it.
On account of the prejudice against extracted honey, and lso on account of the ease of putting manufactured honey no the combs, the only way for producers of pure honey to ucceed is to be honest, and gradaally establigh a reputation or honest dealing, which will sell their products at best rates. The idea that honey in the comb is, on that account pure is totally wrong, and sbould be abandoned. Extracted boney (not atrained, but extracted by a centrifugal machine), roperly settled and drawn off into bottles, of which we have in this neighborhood not less than ten thousand pounds tbis eesaon, is as pure as any in the comb, and purer than much of it. The purchaser gets it perfectly free from wax and is not obliged to press it out by the use of his teeth.
I send you, with this, a bottle of honey from each of two of our producers, so that you may judge not only of it quality, but also of the means they are employing to intro ace a pure article in such a manner as to inspire and con rm confidence. I send you aleo a communca rom one of our apiarians, in which he shows his product to
be $79+$ lbs. from each hive. This is a large yield, although this has not been a good eesson here. Last year, this same piary produced about 150 lbs per swarm, another 135 lbs. nd still another about 150 lbs .
H. W. s.

Cincinnati, 0.

## Performance of Small Engines

To the Editor of the Scisntific American:
I have made a amall engine, with a 4 inch cylinder, a 2 nch crank, and a 16 inch pulley, with a 5 inch face. The fly wheel is 26 inches in diameter, weighing 185 lbs . It runs a 40 turns per minute, with from 30 to 40 lbs . of steam. With bis engine I am running 40 feet of 2 inch shafting, and 40 feet of $1_{1} \frac{7}{6}$ inch shafting, 2 engine lathes, 2 speed lathes one for turning wood, and the other for drilling iron), 1 cbucking lathe (awing 30 inches), 2 grindatones, 1 uprigh rill, and a pump for pumping water into the boller; and 16 horse power, and I am now making one of 25 horse pow or, besides doing other work.
My boiler is a six horse upright tubular, with thirty tubes finches diameter. It is not covered in any way, but stands perfectly naked; and I am pumping cold water into th ame. I am running this engine and doing this work at a cost for fuel of 50 to 60 cents per day of 10 hours. I can not tell you the amoant of water evaporated, as I havemad no note of it.
J. Herbert Bullard.

## popdlar fallacies.

The age of war and conflict is fast passing away, and the industrial and commercial age is taking its place. Progress is the world's watchword today; and it is the bosst of the nineteenth century that, since its birth, the march of dis covery and iavention, ind all the sciences and arts most conducive to man's comfort and civilization, has been greater than in any preceding half thousand years. Science is now the measure of a nation's standing: for general scientifio knowledge means education, which means refinement and religion, which means death to superstition. And in this country especially, where education and true religion are so generally diffused, Science seems to have a stronghold upon the respect and admiration of all but the most ignorant and backward minds.
In view, then, of this general diffusion of scientific know. ledge, which in this country, though not in itself astonishing, is yet great when compared with that in most other lands, it does seem remarkable oft-times that so many old and long exploded fallacies should still find credence among the majority of people, and even among the well edacated. It is fairly astounding to see what outrageously ab surd stories will circulate through the popular press, often published in the fullest good faith, and accepted as true by simple minded readera. The scientific boases perpetrated in the United States are almost innumerabie; and that they continue to be published, republished, revamped, and, atrangest of all, believed, and solemnly discussed in journals that ought to know better, does not speak well for the thoroughness of this scientific knowledge, on whose diffusion we so often pride ourselves.
We remembsr a recent example in the story, lately pub lished in a California paper (these hoaxes generally emanate from the fertile West), concerning a magnetic cave, asid to have been just discovered, possessing such powerful attraction that batchets were drawn from the hands of the explorers and flew to the roof, remaining glued there; while unfortunates in bobnailed shoes had to leave their foot encasements behind them. This story, though laughed at by one half the community, was received with open eyes and gaping mouths by the other half, who could not comprehend that the eize of the attracted body might have something to do with the force of attraction.
But it is not merely of these ingenious hoares that we wieh to speak, but of a far more injurious atate of ignorance among the common people. We refer to popular fallacies concerning the sciences of everyday life, and to the general ignorance about the great forces of Nature, and the first principles of Science in all its departments. Some of thees fal'acies are simply ludicrous; others are worse. What absurd blunders are made in watters of bygiene! The prosperity of quack doctors. who have medicines, each one of which will cure all the ills that man is heir to, is a forcible example of the latter case. And where we see newspapers-secuhardly tell whether to call them stapid or wicked.
"By looking into a looking glass inclined at $45^{\circ}$, Northampton, obtained last night a fine view of Jupiter' atellites," says a certain Springfeld paper. How Professor Snell, of Amherst, must have chuckled to read it! Mr.--s wondertul glass would have conferred satellites apon every star in heaven. He should have known that plain looking glass has no telescopic power, and that $\mathrm{h}^{\prime}$ s "satellites" were only repeated reflections,between the quicksilver and the front surface of the glass, of the planet he was gazing at.

Mrs. - was recently saved from death from a light. ning stroke by her son, who dashed a pailfal of cold water upon her. It is supposed that the water carried off the electricity remaining in her body, and saved her!" Such is the Boston Journal's lucid explanation of a simple cure. The poor lady, almost killed by the terrible stroke, was saved by the sudden nervous shock caused by the cold water which her son with such presence of mind threw at her. It is not the presence of electricity in a human body that endangers, nor even the discharge of that electricity, since the body can hold but a small amount; it is the passage through the body of an immense discharge,between clouds and earth, that kills and destroye.
Old maids, and young ones too, throw themselves upon a leather bed for protection from "thunder," or descend to the cellar. An iron bedstead would be safer than either of these places, because it would keep the charge away from them by receiving it through itself. Timid ladies are terriGied when a boiler discharges steam through a safety valve, for fear that it will burst; when the roar of escaping steam is proof positive that it will not burst. And to crown all, some migguided viatims of an insane fever, forgetful that "action and re-action are equal," and that " gain in power loss in time, when the force is given," still labor and trive to create force out of nothing, and make what Science has, time and again, declared impossible, a perpetual motion. Such absurdities of course will never cease, until ignorance ceases. But they are altogether too common among those reasoning and definite knowledge. Superficiality is perhaps the great fault of our common education, espesially in Science, where exactness is so essential. The natural and exact sciences are, we are happy to say, taking more nearly beir deserved stand in our American educational coarses; and we hope the time may come, and come soon, when such nonsense as we have discussed cannot possibly be found,
much less believed in, among those who have been fairly educated;

## medical notes. <br> Copaiba in Croup.

If the following remedy should prove a universal one, the saving of young life would be enormously increased :
Drs. Miller and Lincoln, in the "Transactions of the Medical Society of the District of Columbia," vol. I., No. 1, re late several cases of croup cure by balsam copaiba, and refer to many others. Dr. M. had used copaiva extensively in croup for 30 years, and had before spoken of its efficacy, in the Society. He was in the habit of placing a vial of the balsam in possession of all his patients whose families were subject to croup, directing them to take doses of 20 or 30 drops before sending for medical aid. The result was that, while he was formerly frequently called out at night to at tend croup cases, he was then but seldom annoyed by simi lar calls. So great was the faith of his patients in this re medy that he had often been applied to for his so-called croup medicine. It was especially valuable in the early stage. Dr. Lincoln had never seen copaiba fail if given in the first stage of the disease, and had derived great benefit from it in every period of the complaint. He thought the remedy of great use, even in the pseudo-membranous form of croup. His dose was one drachm which gave promp relief.

## Guarana in Chronic Rheamatism.

Dr. Edward A. Rawson, assistant surgeon to the Carlow Infirmary, says: "Suffering severely from lumbago, and finding all vaunted remedies fail, I tried guarana as an experiment. I took 15 grains in hot water, with cream and sugar. For 24 hours afterwards I had a delightful relief from pain. On the return of the Jumbago, I took another dose in the same manner, and with a similar result. I gradually in creased the dose to 40 grains, and took it regularly once a day for about a week. The lumbago disappeared, I gave up the guarana, and in a few days the pain in the back re-
turned. A 40 grain dose removed it, and it did not return turned. A 40 grain dose removed it, and it did not return
for several days. Whenever it does, I have my remedy at hand." Dr. Rawson goes on to say that he has tried guarana with a variety of patients, rich and poor; and if the pain is acute, coming on with sharp stings, guarana acts like magic; when it is of a dull, aching character, the drug is slower in its action, and several doses must be taken before any de cided benefit can be perceived. He comes to the conclusion that, whenever the fibrous envelopes of nerves, the aponeurotic sheath of muscles, or the fasciæ or tendons are the parts affected, guarana gives either instantaneous or speedy relief, which will last from 12 to 24 hours; and he think that perseverance in the use of the drug, gradually increasing the dose to 40 grains, will finally entirely remove any of the above named kinds of rheumatism. Guarana was ex amined by Martius in 1829, and by Gravelle in 1840. They declare that it stimulates and at the same time soothes the gastric system of nerves, diminishes febrile action, and strengthens the stomach and intestines, particularly restrain ing any excessive mucous discharges; at the same time in creasing the action of the heart and arteries, and promoting diaphoresis.
This medicine is a preparation of the seeds and juice of the Paullinia 8orbilis, a Brazilian plant, of which wonderful stories have been told by travelers. Its effects appear to be various, some of them similar to those of tea and coffee in stimulating the nervous system. The Indians consider it a specific for bowel complaints. Dr. Graville found it advantageous in the diarrhœa of phthisis, sick headache, paralysis, tedious convalescence, and generally as a tonic. Dr. Ritchie recommends paullinia in irritation of the urinary passages. Dr. Herve never failed to derive benefit from it in the most obstinate cases of idiopathic diarrhœe. It cures both headache and neuralgia by restoring the tone of the gastric membrane, and removing all pains caused by irritation of the stomach. Though not an astringent, its peculiar action renders it a most valuable agent in all affections of the bowels, whether simple or chronic diarrhœa, dysentery, or choleraic discharges. In France it has cured attacks of cholera when the evacuations have been at the rate of 30 an hour. It is also said to be prompt and certain
in dysentery, curing the very worst cases. From all apin dysentery, curing the very worst cases.
pearances, no new medicine rivals it in value.
An Ingenious Substitute for the Hypodermic Syringe. In the Edinburgh Medical Journal, Dr. John M. Crombie, states that many medical mon are often deterred from using morphia hypodermically on account of the expense of the syringep, and the pain they cause the patients. To avoid these, he advises the use of emall threads coated with morphia and passed through a fold of the skin by fine needles. The threads may vary in strength from one sixth to one grain of morphia.

## Diabetes.

Dr. O. Schultzer claims great success in the treatment of diabetes under the free use of glycerin, internally, with citric acid, and abstinence from starchy food.-New Re. medies.

The auna the Physician, here named, rays Dr. Collens C. Hunt, in Montor, which is believed to be new as a remedial agent, was first employed by William Elmer, M. D., of New York, who has given it a fair trial for a year or two, with most gratifying results. It not only aids in the digestion of starchy food, but seems to impart vigor to the digestive functions generally, and through this action supplies energy to the brain and nervous aystem. For some of the worat forms of indigestion, the use of diastase has had the effect, in particular, of producing the most tranquil and refreshing sleep, and that where, previously, satisfactory sleep had been almost unknown. This result is attributed
to the digestive power of diastase more than to any other property it possesses. Diastase may be given in the form of a sirup or in lozenges. The dose is from 1 to 2 grains directly after each meal. The sirup should be prepared with glucose rather than with cane sugar; but any sirup has the great objection that it is required to be kept cold, or the diastase is liable to turn sour.

## Iron Purifies Water.

Almost all large water pipes are of iron, as tax payers well know when they are called upon to replace the old rusty mains with new ones every few years. But, according to good chemical authority, the iron has an advantage with its defects. Professor Medlock proved by analyses, several years ago, that iron by its action on nitrogenous organic
matter produces nitrous acid, which Muspratt called " Na matter produces nitrous acid, which Muspratt called "Na-
ture's scavenger." The latter chemist found, as a general ture's scavenger.
result, that, by allowing water to be in contact with a large result, that, by allowing water to be in contact with a large
surface of iron, in about 48 hours every trace of organic matter was either destroyed or rendered insoluble, in which state it could be purified effectually by filtration. Medlock found, on examining the water at Amsterdam, which smelt and tasted badly, that the sediment charred on ignition, and was almost consumed, showing that it consisted of organic matter. He also found that, instead of taking iron from the service pipes, the water before entering those and an ron reservoir contained nearly half a grain of iron to the allon; while in the water issuing from the pipes, there was only an unweighable trace. Before ontering the re-
servoir, the water holding iron in solution formed no deposit; while the water coming from the pipes and freed from iron gave the organic sediment above mentioned. He then made analyses of water-brought in contact with iron, and water not in contact, with the result that the water which had not touched iron contained $2 \cdot 10$ grains of organic matter, and 0.96 grain iron; the other gave only a sligh trace of both, showing plainly that the organic matter in the water was either decomposed or thrown down by con tact with iron; and this water, when filtered, was found to e clear, of good taste, with no smell, and free from organic matter. It is not stated in what shape the iron was held in solution, but it was probably in that of carbonate, the usual iron salt of springs, since carbonic acid is so common in water in general. These facts may be made useful in certain places and ways in effectivg the purification of water rendered injurious and offensive by the presence of organic substances. And if the interiors of iron mains could only be kept from rusting by a swabbing with nitric acid, or by a paint of cbarcoal and plumbago, no much the cheaper.

## gCimmtific and practical information.

## manganese in seeds.

A chemical analysis made of seeds known as tapayons, which were brought to France by a missionary from China has revealed the remarkable fact that the ash contains 17 per cent oxide of manganese, 14 per cent of magnesia, and
12 per cent of lime. This amount of manganese is much greater than is recognized in the leaves of the beech tree or in any other vegetable.

## copper, a preventive of cholera.

M. Burg, in a recent memoir to the French Academy of Sciences, states that workers in copper are never attacked
by cholera, while the operatives whose labor in other metals by cholera, while the operatives whose labor in other metals is of similar character form no exception. This fact has Sweden, Spain, and Tarkey. M. Barg concludes that cop per acts as a protection against the disease, and advises th use of salts of the metal as a preventive medicine.
scientific mareeting.
There is Science in this last attempt of our transatlantic cousins at household financiering, a great deal more Science than is necessary to accomplish that timeworn desideratum ished. By an ingenious little transfer of checks and ished. by an ingenious little transfer of checks and paid besides. A company sells tickets to a traderman at a premium of five per cent of face value. Then the latter hands these over to his customers in quantities equal in amount to the cost of the goods bought, allowing the 5 per cent for ready cash. Then when the customer gets $\$ 25$ in tickets, he goes to the company and receives a $\$ 25$ bond in exchange. Meanwhile the tradesman's 5 per cent is put out at compound interest, and the profits accruing enable the company to make their own profit and besides pay off the the bonds by ballot. Consequently, the castomer not only eats his cake but more than has it too, for his whole ex penditure is returned with interest.

## sonorous band.

The New York World, in a report of a scientific meeting in San Francisco-the name of the association is not stated-
gives an account of a very curious property of sand which gives an account of a very curious property of sand which
is found in a large drift on the Island of Kanai of the Hawaiian group. The bank is about sixty feet high, quite steep, about one and a half miles long, and extends parallel with, at some hundred yards from, the beach. If, at the extreme south end and for half a mile north, two handfuls of the sand be slapped together, there is a sound produced like the low hooting of an owl-moreor less sharp, according as the motion is quick or slow. Sit down upon the sand and give one hand a quick circular motion, and the sound is like the heavy bass of a melodeon. Kneel upon the steep incline, extend the two hands, and clasp as much sand as possible,
slide rapidly down, carrying all the sand you can, and the slide rapidly down, carrying all the sand you can, and the
sound accamalates as you descend antil it lis lize distant
thunder. In this experiment the sound was sufficient to frighten horses, fastened a short distance from the base of the drift. But the greatest sound produced was by having one native lying on his belly, and another taking him by the feet and dragging him rapidly down the incline, carrying as much sand as possible with them. With this experiment much sand as possible with them. . t ith this experiment
the sound was terrific, and could have been heard many hundred yards distant. With all the experiments that hundred yards distant. With all the experiments that
were made, it seemed that the sound was in proportion to were made, it seemed that the sound was in proportion to
the amount of sand put in motion with a proportionate ve locity. Another consideration seems requisite-that is, its perfect dryness. The dry sand would sound on the surface where six inches beneath it was wet; but if any of the wet sand became mingled with the dry,its property of sounding ceased at once. The sand appears to the eye like ordinary beach sand, but ordinary beach sand will not produce the sounds. It has been said that it lost its sonorous properties when taken a way from the bank, but no diminishing of its onorous qualities, even with the bottle uncorked, was notice able.

## our new gold region.

The practical results of General Custer's expedition in southwestern Dakota are beginning to appear. This hitherto unknown region, as far as entered, has proved to be covered with magnificent timber and grazing, superior even to the famous Blue Grass country, in Kentucky. The valleys are admirably adapted to agricultural purposes, and the scenery is said to be lovely beyond description. In addition to these natural advantages of the country, gold, it is stated, is being found in great profusion, though no official investigation as to its richness has thus far been made. Veins of what geologists term "bearing quartz" crop out on every hillside, and rom forty to fifty particles of pure metal, each as large as a pinhead, have been taken from the washings of a little over a single pan of earth. If the further reports from the expedition prove as satisfactory as this first one, another gold ever and rush of emigrants to prëempt land will be very probable.

## raw hide belts.

In driving centrifugal sugar machines, Mr. J. Mason, of the Island of Bardadoes, found the use of the ordinary eather belts to be troublesome and expensive. He, therefore, substituted belts of raw cow's hide, simply dried in the sun, cut perfectly straight, and the joints, aquare and even titched with aaddler's hemp tbread. He states that in pracice, a belt of this description, will last four times longer than, and cost only one fourth as much as, a leather belt. He uses an 8 inch belt of this kind, to drive a line of 8 inch shafting, from which $2 \ddagger$ inch belts drive the sugar machines.

## Carbonic Acid as a Motor.

The possibility of employing carbonic acid as a motor-the successor of steam, as it is termed by the author-is forehadowed by a paper by Dr. H. Beins, published in the English Chemical Nevos. The writer considers that he has discovered a very cheap way of producing carbonicacid in a liquid state and consequently at high tension. When na trium bicarbonate, or the corresponding salt of kalium, in a dry, pulverized state or in a watery solution, is heated in a closed space, a part of the carbonic acid is given off and condensed in a non-heated portion of that space, so that, at a temperature of from $636^{\circ}$ to $843^{\circ}$ Fah., liquid carbonic acid, says Dr. Beins, can be distilled out of thosesalts, with a tension of from 50 to 60 atmospheres. This liquid carbonic acid, or "carboleum" as it is called, it is proposed to use to develop gas with which engines are to be driven. The paper on the subject contains a dissertation on the advan tages of the plan, but gives co few details regarding its prac tical application, or with reference to the manufacture of the carboleum or liquid carbonic acid, that the gist of the mat ter is summed $u_{j}$ in the above lines.

## Sulphur in Iceland.

Dr. Blake gives a full and clear description of the vast de posits of sulphur occurring in Iceland, and points out the necessary steps for its atilization. For its shipment he re commends the port of Husavik, which is accessible all the year round, and which is situate very near to the sulphur beds of Lake Myvatu, Krabla, and Reykjahlid. The mine are not only rich and extensive, but easily worked. The sulphur can be supplied at half the cost of that furnished by the Sicilian mines, which it is believed will soon be exhaustod. The earth impregnated with sulphur contains from 50 to 60 per cent, and is from three to six feet in thickness. Vapors arising from the interior of the earth continually deposit fresh supplies.

## A Gigantic Grain Elevator.

The New York Central and Hudson River Railway Company is now building at the foot of 60th street, on the Hudeon River, n this city, a grain elevator, capable of holding from $1,000,000$ to $1,200,000$ bushels of grain. This elevator will be used principally for storage purposes for the grain brought on in he company's cars, and intended for transferment to sea go ing vessels and canal boats.

Annatto. - In the two French colonies of Martiniqueand Cayenne, there are more than six thousand acres under cal ture with annatto (bixa orellana), the annual produce being three million pounds. Although French Guiana has nearly five times the extent of land under culture with this plant that Guadaloupe has, it only produces about two thirds of the whole quantity. The production of annatto now exceed the demand, as no fresh use has been found for this coloring substance, unless it is the manufacture of suet butter. An
natio is used to give the yellow color of true butter.

## A NEW MOTOR.

According to the laws of the mechanical theory of heat any difference of $h$ zat may be employed for production o mechanical work. If a cold body, then, be situated in ai that is hotter, the passage of heat to it should be capable of giving mechanical work. The solution of this problem (say the English Mech.anic) M. Enrico Bornardi, an Italian physicist, has recently sought to realize in the following way:
Two similar glass balls are connected together by a thin glass tube, the ends of the tube passing into the balls being bent at a right angle. One ball contains a small tube, by which ether can be poured into the apparatus; the ether is brought to boiling, and, when all air has been expelled, thi small tube is closed by fusing. The quantity of ether inclosed in the system should be such as to fill about three fourths of one ball. At the mid dle of the connecting tube is fixed a piece throug which passes a metallic axis, round which th system can turn. When the ether is equally di vided between the two balls, the apparatus is in unstable equilibrium. The bearings for the axi re supported on the cover of a rectangular case and in this cover is a slit through which the urning system passes. The case is filled with water, into which the balls dip alternately on their being turned round the axis. Each ball is covered with a very fine veil. It is easy to se that this apparatus will take a see-saw motion
Owing to the unstable equilibrium of the sys tem, one of the balls, A, sinks, and all the ethe flows into it, while the rest of the space is filled with the vapor. The ball, $A$, is then in water the ball, B , in air. Hereupon the moisture o the surface of $B$ begins to evaporate, and the bal so cooled that the vapor within condenses from the ball, A, more ether is evaporated, and it is condensed in $B$, till at length $B$ contain more ether than A, and sinks, while A rises; and he same process is repeated. This see-saw mo tion lasts as long as there is water in the case o moisten the surface of the under ball
It would be rather troublesome to utilize this thermo-motor see-saw mechanically; and M. Ber nardi has, therefore, preferred to alter the appa atus in the following way: The two balls of th above described system are connected by a tube the ends of which are bent round (at right an gles) to opposite sides. Three such systems are formed into a sort of wheel, the middle point of the six ballsand the tube being in one plane This wheel is supported at its axis, on the cove of a rectangular case, in such a way that, in its rotation, it is always balf within the case and haif in the air. The balls are covered as before and so much water is poured into the case that, in turning the wheel, one ball is alkays immersed. By giving the wheel a turn, it can be set in continuous rotation; and, with a suitable arrangement of pulleys, it can be made to raise a weight, or do other work.
Such a thermo motor wheel has, for two months, been working a clock in M. Bernardi's laboratory. The balls have a diameter of 0.78 inch; the distance of the middle points of two opposite balls is 31 inches, and the quantity of ether in each system fills three fourths of a ball. The clock main tained in motion by this wheel consumes, in 24 hours, 0.2 of a foot pound. The water level is, by a special arrangement, kept constant. M. Bernardi has had his see-saw working for three months without its becoming necessary to renew the water or clean the balls. He has calculated the quantity of heat which is removed by this apparatus from the surroundings. There was an average of 60 see-saw motions in 24 hours. This was found to be equal to 012 of a foot pound or about half the work consumed in the same time by the clock.

FOLSOM'S IMPROVED LOCKING LATCH This invention is a simple, strong, and convenient door

## Iig. 1


lock, which may be opened by the knob and locted by a kes, but in which only one bolt and one spring are used.
In Fig. 1, the bolt, A, is represented as shot forward so as to lock the door to which the device is applied. In Fig. 2, the same is retracted (dotted lines), and serves as an ordina


BERNARDI'S THERMO-MOTOR
the crossbar, C, to the rear flanges, and allows of the forward motion of the bolt by means of the key acting on the shoulder, F .
At G are one or more pivoted catch hooks which enter recesses in the bolt and slide, during the to and fro motion of the same, with their hook ends along a horizontal guide plate, $H$. The front end of this plate is slotted, and has a slight downward inclination, so that, when the hooks are carried far enough forward, they drop into and interlock with the slots. The key is so made as to enter these slots, and pass between and through them. It then strikes the shoulder, F, and carries the bolt forward. This carries the hooks also far enough forward to drop with their ends into the recesses of the guide plate, so that they thus hold the bolt firmly locked.
To unlock the latch, the key is turned in the same direc ion as before, thereby lifting the hooks out of the gaide plate recesses, when the spiral spring pulls the bolt back to is former condition
The advantages claimed aresimplicity, durability, and also heapness of manufacture, owing to the fewness of parts. It is also very difficult to pick, as the key has to pass a very difficult guard and, as already explained, to strike a number of catches and raise them to a certain hight. It cannot be unlocked with a wire, since every catch must be lifted, and, in brief, every lock must have its own special key. It operates by the knob with as much ease as the ordinary latch, and cannot be thrown back by forceapplied to the knob when locked.

Patented through the Scientific American Patent Agency, June 30, 1874. The inventor, Mr. F. W. Folsom, of Taylor's Falls, Minn., whomay be addressed for further information, desires either to sell the patent or to make arrangements for the manufacture of the device on royalty.
T. Marr Johnson, C. E.

We regret to announce the sudden demise of this widely known engineer, which took place in England, July 22. His age was 48. Between the years 1860 and 1869 he was occupied, under Mr. John Fowler's instructions, in carrying out the works of the Metropolitan Underground Railway aystem in London. He was employed upon many other important works, and held a distinguished professional position. At the time of his decease, he was a member of the firm of George Smith \& Co., builders and contractors.

## Metachloral.

M. Lemousin has obtained metachloral by treating one part of chloral hydrate with three parts concentrated sulphuric acid, and washing the insoluble product obtained until acid reaction ceases in the washing water. The metachloral is then dried by chloride of calcium and reduced to fine pow-
der. It has the same formula as anhydrous chloral $\left(\mathrm{C}_{4} \mathrm{H} \mathrm{Cl}_{3}\right.$ $\mathrm{O}_{2}$ ) of which it is an isomeric modification. It is less caustic than chloral hydrate, and has a great advantage over the latter in not absorbing moisture.

## Spontaneous Combustion.

We are inclined to believe, says Engineering, that one great cause of spontaneous combustion, in cotton and woolen mills, rests on the length of the fiber of the material left as oily waste. The finer this fiber the greater is the danger of oily waste. Th spontaneous combustion, and this beo evident from the fact that in such cases the particles of the materials are in closer contact. In all our large docks of London, Liverpool, etc., thousands of tuns of long stapled sheep's wool, imported from Australia, the Cape, and other places, full of animal oil, remain perfectly safe fcr years. In their transit, the bales containing such wool must have attained a temperature of at least $80^{\circ}$ to $90^{\circ}$, yet we never hear of spontaneous combustion, either in the ships or the docks. But then comes the question of the character of the oil-as to whether the animal or the vegetable is the more dangerous. The late Dr. Graham, in reporting on the burning of the Amazon, considered that rags greased by butter, heaped together, would take fire within 24 hours. We question very much whether silk or sheep's wool is liable to spontaneous cumbustion, even in the presence of abundance of oil. Cotton, jute, all kind of hemp and flax, mixed with oil, have an invariable tendency to spontaneous combustion at summer heat.
The only apparent remedy seems that of maintaining constant ventilation in all waste, etc., containing oil. Frequent turning is essential, and we have tried succersfully the sprinkling of such waste with waste lyes or lime water. It is remarkable that jute warehouses are peculiarly liable to catcl fire in fact, all members of the hemp and flax family are to be more feared than varieties of cot. ton.
A singular cause of fire may be traced to the glass of which the windows of warehouses is made. In the old fashioned kind the " punty' mark is found. This forms a double convex lens, which, concentrating the rays of the sun, constitute a burning glass. That fire should occur from such causes can be no matter of surprise. Water bottles exposed to the sun's rays have sometimes similarly caused fires in private houses by concentrating the heat rays on dressing table covers, etc.

## WEBSTER'S IMPROVED FAUCET.

Our illustration represents a simple substitute for the screw, nut, and spring washer usually employed to secure faucet plugs in place. The inventor informs us that the device has now been in successful use in Brooklyn, N. Y., for several years, and that, in addition to other advantages, it possesses the important one of cheapness, as it can be ma. ufactured for ten cents per fauce
It consists of a spring key, A, punched out of ordinary brass, and inserted in a suitable slot in the lower part of the plug. It is claimed to take up all wear, and hence not to work loose, as frequently occurs with the usual screw and washer. By holding the plug in proper position, it also prevents grit or dirt from getting between the plug and the barrel of the faucet, making it self-grinding and obviating the necessity of frequent repair. Finally, by its yielding to expansion and contraction, the device is well adapted for use

with steam or hot water, while, besides, it prevent the chambers from being spoiled by freezing.
Patent for sale ior the United Stater. Froposals for pur hase should be addressed to Theo. L. Webster, M. M., U. S Navy Yard, New York city.

## MANUFACTURE OF MORTAR BRIOKS.

Among the objects at the International Exhibition, Lon don, which, though very interesting, are so modest in ap pearance as to de passed over by most without notice, are a number of bricks made not only without straw, but without barning.
The bricks are practically mortar, seeing that the materials of which mortar is commonly made are those which alone enter into their composition. Sand and lime form one variety of brick; sand, lime, and Portland cement make another Pressure and air drying are the only operations, beyond the first mixing, that are necessary. At first thought it might be objected to such bricks that they would probably be too xiable or too soft for use; but the sight of a piece of good od mortar should convince the doubtiul that the hardening inluences of time and carbonic acid-resulting in the produttion of a marble-like carbonate, and possibly silicate, o lime-are quite equal to those of the kiln. Bricks are also forned by pressure of mixtures of subdivided slag with lime, Portland cement, and blast furnace slag cement respectively The slag cement itself is composed of from eight to ten parts of slag, and one part of lime. But little surprise negd be felt at the employment of slag in the preparation of cemen prince the chitf condition since the chit condition for success is the presenc of a silicate capable of de
composition by limecondition which isfulfilled by powdered slag.
The bricks give a good result on application of the usual tests. They hare a good sound ring, are ver hard, and can be made harious 1 arious ohade color, even enameled, we should
imagine, by a little inge nuity.
The process of morta brick making by the ma chine is simple. Hopper are filled by hand with the materials employed, each into its separate bopper rom this point bopper From tbis point to the re moval of the finished brick all operations are antome tic. Measured portions of each ingredient are caused to fall upon a traveling belt which delivers the mixture into an apparatus, in which it is thoroughly incorporated, and from which it i deposited upon a second eporeling belt a secon raveling belt, which car res it to the press, wher measured quantitis are de ivered into the molds. Th press is hydraulic, consist ing of a circular table re volving horizontally, and of course stopping whe pressure is applied. The table contains six pairs of molds, making therefore one sixth of a revolution between the stoppages for application of pressure Two pairs of molds are ubject to pressure at once wo other pairs being auto matically filled, and the bricks rising out of the re maining two pairs, simul taneously. The bricks are
emoved by hand to bar
ows, and conveyed to the yard, where they are left to har den. The time required for this varies according to the quality of the lime used, and also according to the weather from one to two months, but the hardening goes on for years. Seven strokes per minute are made by the press, giving in that time twenty-eight bricks, or about 80,000 per week, as the result of the labor of two men and four boys, exclusive of wheelers and pilers. When sand is used, from onesixth to one eighth of its weight of lime is necessary; but with slag, as little as one sixteenth of its weight of lime may be slag, as little as one sixteenth of its weight of lime may be ing about 58 cwt . per thousand.
Bricks of this kind have long been in use in the United States. The machine above represented, which we copy from Iron, is made by Messrs. Bodmer, Hammersmith, En gland.

## improvements in Sugar Making.

The methods of purification employed in the sugar manufacture depend almost entirely upon the action of lime and its eljmination by carbonic acid. These processes leave, in the saccharine products, a certain proportion of organic matters and mineral salts, which oppose, to a certain degree, the crystalization of the sugar, causing also the formation of molasses and the mingling of the sugar with the residue. M. P. Lagrange has recently devised a method which is
based on the elimination, by the joint action of baryta and phosphate of ammonia of the organic salts of lime, of certain vegetable acids combined with potash and soda, and of the alkaline sulphates existing in the sugar products. By this process, without the aid of lime or salts of lime, M. Lagrange believes that he is enabled to obtain the products, and to secure the best conditions of alkalinity, without forming glucose at the expense of crystalizable sugar. In fac tories, therefore, devoted to the manufacture of cane sugar, it would seem that this improvement is of considerable importance, as doing away with the serious difficulties and large osses due to the glucose formation and the lime salts.
M. Marguérite has recently patented a process for obtaining sugar from molasses by the addition to the latter of cerain salts which provoke crystalization. The process is said to be especially valuable in treating third quality sirups as well as molasses. The operation consists in adding to the spent molasses (containing, say, fifty per cent of sugar, fif teen per cent of salte, and twenty per cent of water) crystalized sulphate of magnesia in the proportion of twenty per cent by weight, together with a little water, to make a


HYDRAULIC PRESS FOR MAKING MORTAR BRICKS.
The New Lake or Sea in Africa
The French government has recently voted the sum necessary for the formation of a great inland sea in Algeria 190 miles long by 36 broad, to the south of Biskra. It is thought, by the Revue des Deux Mondes, that the result of this measure will be a great improvement in the climate of the interior, a great addition to the facilities for inland transport, and the introduction of commerce and civilization into the very heart of Africa. The Chott Mal-Rir, Chott implying the bed of a lagoon, the proposed site of this inland sea is found to bs at least 90 feet below the Mediterranean while the Chott Sellem, with which it communicates, which lies between it and the sea, is 54 feet lower still. A chain of chotts, of smaller area but equal depression, extends thence to within 12 miles of the coast of Tunis, at the Gulf of Gabes, and a canal connecting the nearest chott with the sea would admit the waters of the Meriterranean, and conver the desolate region of Chott Mal-Rir into a great inland sea The estimated cost is only three millions of dollars, and the engineering difficulties, after the experience gained during the construction of the Suez canal, would be inconsiderable.

At a recent sitting of the Academy of Sciences, Pa ris, M. de Lesseps stated that, on the war budget being presented, a sum of $\$ 5,000$ would be applied for to cover the expenses of the definitive survey of the bain. The engineers intrust in. The engineers intrusted with the operation of cutting through the Isthmus of Gabss will then start from Biskra, with the aid, not only of the Governor General of Algeria, but also of the Bey of Tunis, equally interested in the success of the enterprise.
It has heretofore been suggested in the Scientific American that, while it was very practicable to cut the proposed canal and admit the water of the Mediterranean to the desert, the ultimate result, owing to the rapid evaporation, might simply be the formation of an immense deposit of salt. This appears to be also the view taken by $M$. Ch. Honyvet, who, at the above sitting of the Acade my, gave a paper on the subject. He observes that the Mediterranean may, of course, be tapped as they propose, and an immense inland sea formed; but that a vast surface of evapora. tion will thus be exposed to the sun's rays; and that, as the loss of water by this action can only be replaced by the sea through the canal, the end of the whole operation will be the formation of a thick crust of salt at the bottom, whereby all navigation will be stopped in a short time, and millions will have been spent to create a gigantic salt pit, and nothing more.

## Artificial Furs.

Mr. Tussaud, of London suggests an ingenious way
solution of the sulphate marking $10^{\circ}$ Baumé. The whole is then subjected to centrifugal action in a machine having either perforated sides or very fine wire cloth. The sulphates of lime and potash precipitated are retained, and the liquor is then filtered through charcoal and boiled in vacuo. After cooling, a certain quantity of pounded sugar is added to form nuclei, and the sirup is lastly subjected to the ordinary emperature of fillings, the heat being alternately raised and lowered.
After a few days, crystalization becomes exceedingly abun dant, and continues to increase for some time, after which the hydro-extractor is employed. Other salts, such as sulphate and chloride of magnesium, chloride of manganese, sulphates of iron and zinc, and their chlorides, and also the acetates, nitrates, and ammonia salts, though these are not so desirable, may all be used instead of the sulphate of mag. nesia, the proportions of which vary according to the nature of the molasses.
The crystalization of the sugar results from elimination of the potash, the salts of which are prejudicial, its place being taken by the magnesia, whose salts are favorable thereto.

Work has begun in earnest on the Centennial grounds in Philadelphia. Daisies and clover have disappeared, leaving vast expanse of level, bare, red earth, crossed by railroad tracks, and dotted here and there with shanties.
way of preparing the hair or fur of animals for use without employing the skin. The process consists in first soaking the fur in lime water to loosen the adhesion of the hairs. After washing and drying, the piece is stretched upon a board, fur side up, and a solution of glue laid over it, care being taken not to disturb the natural position of the hairs. After the glue has hardened, the skin may be pulled off, leaving the ends of the hairs exposed. The latter are then washed with proper substances to remove fat, bulbs, etc. An artificial skin of gutta percha, or other waterproof substance, is next laid on top of the glue and allowed to dry so as to form a continuous membrane, when the glue is washed out with warm water. These artificial skins are entirely free from any animal odor, and are more durable, lighter, and more pliable than the natural ones.

The Mikado is making almost as good a thing out of his reformation as Henry the Eighth did of his. One of the discarded gods of Japan is advertised for sale in a Japanese paper in the following terms: "For sale, at Kama-Kura, a very fine idol with six arms. It is 15 feet high, and was cast in bronze, at Sheffieid." Sheffield now shares with Birmingham the doubtful honor of supplying, with impartial generosity, missionaries and bibles to the more inquiring among the heathen, and idols to those who prefer to walk in the old ways.
proceedings of the american association for THE ADVANOEMENT OF SCIENCE.
We continue below our abstracts of the papers read before the Hartford convention. Professor E. S. Morse, in a paper on the ascending process of the astragalus in birds, ex pressed the belief that the above process represented the in termedium of reptiles. This view he has confirmed by studying the embryo of the common tern.
Professor Wheildon,on the lobster,said that the process of shedding the shell is generally known, excepting perhap that relating to the large claws. The body opens in a straight line in the length of the back, while the tail, legs, and claws are drawn out from the shell, leaving it entire, as it has been called, an articulated akeleton which is thrown off periodically. It is found that in that portion of the claw near the body a part of the shell decays and falls out, mak ing sufficient room for the passage of the claw. The portion of shell indicated is that emall,smooth part that lies flat upo the body. The lines indicating this portion are to be distinctly seen in all lobsters which are approaching the period of shedding the shell,and these become gradually more dis tinct until that partbecomes semi-transparent and finally decays.
In a paper on the significance of classes among vertebrates, Professor Gill considered that no groups of animals should be combined in classes which are more widely differentiated morphologically from each other than are the birds and mammals. The differences between the extremes of the group of fishes are immeasurably greater than are those between mammals and birds, and still more than those between birds and reptiles. Instead of the old classes, birds, mammals,and fishes, we should have eight,combined in an entirely different manner, namely: (1) Mammals, (2) birds, (3) reptiles, (4) batrachians, (5) fishes, (6) elasmobranchiates, (7) marsupo branchiates, and (8) leptotardians.
Professor B. A. Gould, referring to
the numbers and distribution of the fixed stars, raten that, if we assume, according to hypothesis, an equa number of stars in each hemisphere, there are altogether not less than 15,300 stars as bright as the seventh magnitude. But since the count indicates an excess of bright atars in the northern aky,there may be a thousand more, as given by the formula. The numbers of the Durchmusterung imply the existence of over 200,000 stars as bright as the ninth magni udes, though the magnitudes of faint stars in that work seem given on the average a little too bright. The two classes of considerations-the approxmate method fur nished by the hypothesis of an equable distribution of stars and the existence of a well marked zone of very bright stars as much inclined to the Milky Way as the equator is to the ecliptic, may assist in determining the position of our sun with reference to its own cluster hat of,'the cluster it

## Mr. J. H. Kuppa

## extinct hogs of ohio,

n which he alluded to certain fossil remains of animals of the Iuidae family, found in digging sand in the city of Columbus, O. The skeletons have a close resemblance to that of the South American peccany, and are the first complote ones ever found. There may be sufficient differences to constitate a new species, the most striking peculiarities about the head of these fossils being the small incisors, the somewhat longer canines, the thinner and more compressed cranium, and the eversion of the lower and posterior angles of the lower jaw.

## THE DISINTEGRATION OF ROCES

was the subject of an address by Professor T. Henry Hunt. The change of the rocks in question is a chemical one, which is most obvious in the case of crystaline rocks; the felspar loses its alkalies and part of its silver, being changed into clay, and the hornblende its lime and magnesia, retaining its ron and peroxide. From this results a softening and decay to greater or less depths of the strata, so that, while the beds till retain their arrangement, and are seen to be traversed by veins of quartz and metallic ores, the strata are often so much changed, to depths of one hundred feet or more from the surface, as to be readily removed by the action of the water. This phenomenon is well seen in the crystaline rocks of the Blue Ridge, and not less remarkably in those of Brazil.
According to the speaker, it has been a subserial process, which has been at work during past ages, when the composition of the atmosphere and the climatic conditions differed from those of today, and when carbonic acid, aided by warmth and moisture, abounded. He connected it with hat slow purification of the atmosphere which from very arly times has been going on. He thought it probable that the process of decay had gone on with decreasing energy to
our own times, though it is now insignificant in its action, our own times, though it is now insignificant in its action, wing to changed atmospheric conditions.
the population of the united states
was discussed by Professor E. B. Elliott, in a curious paper in which he described calculations made by taking the differences between the figures as given by the various census, and making suitable interpolations for intervening years. Taking the average of these differences, we find that, had there been no war, the population in 1870 would have been $41,718,000$ instead of $35,558,000$, showing a loss of fully $3,000,000$ people. In 1880 ,the popalation would be $54,017,000$, but making the same allowance, he estimates now that it will be but $50,858,000$. The population lor the present year, 874, is placed at 43,167,000. To statisticians, the table, given for every year from 1780 to 1880, is a very interesting
one, as is also a tabular statement giving expenditures o the government per capita of the population in periods of four yearseach. Except during war times, there has been great uniformity, rarely exceeding $\$ 2$ per head per annum The highest was during Lincoln's first term,averaging $\$ 16.76$ gold,and the lowest during Jackson's first term, $\$ 1.20^{\circ} 5$. The present rate is estimated at $\$ 1.69$ gold, deducting war inuence, or $\$ 637$ counting the same.
Professor W. A. Rogers described the Harvard College ystem of
sending time by telegraph.
The method consists simply in inserting, into the circuit passing through the clock, an ordinary telegraphic sounder At every second beat of the pendulum, the circuit is broken and a click of the magnet is heard. By a simple device the clock is made to omit every fifty-eighth second. When one, therefore, wishes to ascertain the error of his time piece, he has only to watch for the omitted break, and the first click hereafter is the exact beginning of a minute as shown by he time clock at the observatory. At every even five minutes, there is an omission of about 25 seconds preceding. The same speaker, in a paper on the

## PROPER MOTION OF $\boldsymbol{\varepsilon}$ DRACONIS

in right ascension, stated that he found evidence of an iregular proper motion, the star appearing to complete its revo ution in from 40 to 60 years. He also pointed out that no predictions of the plane of this star have been verified by ubsequent observations.
Professor Hough described an interesting apparatus for

## PRINTING THE DIRECTION OF THE WIND,

## well as the velocity, hourly

The apparatus for velocity consists of a movement for giving motion to a set of type wheels, which is unlocked for ach tenth of a mile of wind. Four brass type arms, on which are engraved the letters N. S. E. W., are placed on the prolongation of the shaft, carrying the type wheels for velocity; and these arms, by means of connecting rods, are ttached to the armatures of four electro-magnets. Tele graph wires communicating with the vane shaft and magnets cause one or more of the letters to be elevated for printing whenever the battery current is completed.
By means of a half second pendulum clock, an impression or direction and velocity is made hourly on a slip of paper wo inches wide and eight inches in length, as follows:

| Time | Direction | Velocity |  | Time | Direction |
| :---: | :---: | ---: | :---: | :---: | :---: |
| Velocity |  |  |  |  |  |
| 0 | N. E. | 342 | 1 | N. | 360 |
| 2 | N. E. | 372 | 3 | N. E. | 385 |

The first column is the time, the second the direction, and he third the velocity in miles.
So far as Professor Hough is informed, this is the first and only mechanism for printing the direction and velocity. The total distance traveled by the wind in a day, month, or year is read from the sheet without computation; consequently, he device is eminently labor-saving.
Professor Gill, on the relations of certain genera of canidas, aid that the division, into two groups of wolves and red and ray foxes, does not express the true relation of the animals. He cited certain characteristics to prove that all should be nited in one group.
Professor Le Conte read a paper on the
REPLACEMENT OF INJURIOUS INSECTS,
and mentioned the replacement of one caterpillar which had ecome a great nuisance in Philadelphia by another, equally as troublesome. No sooner had the sparrows exterminated the first than the second variety appeared. Its family is orygia leucostigma. The birds will not eat it. Having atained its fall growth on the tree, it crawls quietly to a neighboring wall or fence, and, fixing its cocoon, undergoes ranoformation. The remedy against theannoyance is, thereore, very simple. Direct the servants, with stiff brushes, to weep the cocoons from the walls and fences, and place round the trees to be protected rings of tin plate inclined at an angle. This will give the trees immunity, because the nsects are not provided with wings for flight.
Professor C. H. Hitchcock discussed the
PHYSICAL HISTORY OF NEW HAMPSHIRE,
ving a sketch of its growth from the earliest times, when an archipelago existed there, up to the present. The first poriod was characterized by the formation of porphyritic ranite, then came a series of gneisses composing the Mount ashington range of mountaing. The Labrador pariod, the ocks of which are composed of granite and felspar, followed, and then the Huronian formation, of very great thickness, ucceeded. The next period was the most extensive, the ocks consisting of mica schist; and the last period shows the area submerged by the ocean in the Helderberg period. occupied the Connecticut valley to the depth of 1,000 feet. In a paper on the pottery of the mound builders, Professur Cox drew the conclusion that the art of manufacturing concrete or artificial stone did not originate solely with the ancient Romans, but that it was alike understood by the rliest aborigines of America
President Barnard delivered a brief address on the

## METRIC SYSTEM

which he said that it will become the sole system in use by civilized nations before the year 1900. He added that the Metrological Society was urging the change in respect to uniformity-a change of only three tenths of one cent upon the dollar-upon our government. That Society will also rge a metrical international coinage; not for immediate use ithin our territory, but for convenience in commercial ex

Whether such a coinage would eventually take the place of our usual currency might be safely left to the future.
Professor Elliot, in another paper on the United States overnment, said that its present borrowing power is 20 per cent superior to that of France, the rates paid by the former being 5 per cent, and those of the latter 6 per cent per nnum. Professor Wm. H. Brewer,on the

## distribution of american woodlands,

said that the flora of the United States contained over 800 trees. Of these trees about 250 species are somewheres tolerably abundant, about 120 species grow to a tolerably large size, 20 attain a hight of 100 feet, 12 a hight sometimes of over 200, and a few-perhaps 5 or 6-a hight of 300 New England contains 80 or 85 species, of which 50 mq reach a hight of 50 feet. The Middle States have about 190 o 105 species of trees, 65 to 67 of which sometimes reach50 eet in hight. Here were originally very heavy forerts. There are still large areas heavily timbered, but the tinbe or all purposes is unquestionably rapidly diminishing and here is no compensating influence going on for incjease In the southeastern region-that is, extending from Vir ginia and Florida-we have about 130 species. In each case these form the conspicuous elements of the landscape Seventy-five attain a hight of 50 feet or more, and about a dozen species a hight of 100 feet. The northwestern region from Ohio to Minnesota, and north of the Oh:o River, is re presented by about 105 to 110 species, 68 or 76 of which may reach a hight of 50 feet. That is the district furnishing at present the largest production of sawn lamber within the United States. Michigan alone furnished in 1870, of the $12,750,000$ of M . feet, 2.250,000: Wisconsin furnished over $1,000,000$-the two States thus producing more than one fourth of the whole yield returned in that year. The south western region, extending from Kentacky to Texas and the Gulf, has about 112 to 118 species, 69 or 65 of which attain a hight of 50 feet, which the authoralso analyzed. West of these last two districts, this treelers belt, extending entirely across the continent from the Gulf of Mexico to the Arctic Ocean, is 350 miles wide in its narrowest part, between latitude $36^{\circ}$ and $37^{\circ}$, and 800 miles wide on our northern border. The Rocky Mountain region consists of from 28 to 30 species, but a vastly smaller number making up the tim ber region. With one single exception, all of the trees with in the United States which attain a hight of 200 feet are found in Washington Territory and Oregon. The forests are entirely of cone-bearing trees and the number of species is large, the number of timber trees being very large and their size and value also being great. In Washington Territory, official reports state that the land will produce from 25,000 to 300,000 feet per acre, and that there are vast tracts "that wou
Mr Por C. Blise two Mr. Porter C. Bliss read two papers, one on a classification
of the Indian languages of Mexico, and the other relating to arks of ancient civilization in that country
Referring to the
REVERSION OF THOROUGHBRED ANIMALS,
Professor Brewer said that it is often claimed that, if the are of man be withdrawn, the improved breed will retrace he steps of its ancestry and revert to its original character istics. For some years Professor Brewer has been investi gating this subject by every possible means, and, finding no instances of the alleged " reversion" to be authenticated, he considers that the pernicious notion should be exposed and refuted.

## Phosphor-Bronze Axle Bearings.

When two bodies are rubbed against each other (nnder equal ressure,and at equal velocity), the harder they are, the great or is the amount of heat generated; or on the other hand he greater the difference of hardness between the tw bodies rubbed against eachother,the less is the heat produced In the latter case the harder body is more heated than the softer, if of equal size. If, for instance, glass is rubbed against cork, the heating is as 7 to 1 (the copper being heated seven times hotter than the cork); if copper is rubbed against cork, as 4 to 1 .
Theideal of a bearing which would wear little would be one made of the same material as the axle revolving in it, if there had not to be taken into consideration the wearing of the axle itself and the heating. A bearing made of the softest material in which an axle of the hardest material revolves, would be the ideal of a bearing which does not heat, and does not cut the axle, if the wear of the bearing, and deformation by pres ure, etc., had not to be taken into consideration.
In practice the best medium must be found which

1. Does not cut the axle
2. Wears (in itself) as little as possible, and consequently quires a minimum of lubrication
3. Does not heat, even in case lubrication should be neg ected.
4. Is capable of resisting any possible shock without changing its form, or breaking.
Some railway companies desire to use few bearings, at the expense of many axles and much lubricant-(the consump tion of lubricant is always in proportion to the wear of the axle on the bearing)-and therefore use bearings containin from 17 to 20 per cont of tin and 83 to 80 per cent of copper, which alloy,undoubtedly, is too hard,and must attack the axle as has been shown on many railways. Other railway com panies use alloys of lead with more or less antimony, which certainly do not attack the axles, but require much lubricant and wear out very fast. A great number of railway compan ies in Germany takerefuge in the so-called white metal,'which
certainly is the most expensive. The alloys of copper, anti mony, and tin, or so called white metal,are bad makeshifts, as well as the so called lead composition bearings of lead and antimony; for it is impossible to give these alloys a hardness approaching that of the revolving axle without rendering them brittle. If an alloy is used sufficiently hard to avoid great wear, these bearings will heat much and are very brittle On most of the English, Belgian, German, French, and par ticularly on American railroads, white metal, and especiall lead composition, bearings are little used, and this with good reason ; for what would become, for instance, of a white met al besring on an American railroad, where the bearings are subjected not only to heavy loads, but where they have to ravel thousands of miles on rails belonging to other com panies, and therefore are not much looked after.
Gun metal bearings, alloys of tin and copper, are not often homogeneous, with exception of the alloy of 17 to 18 per cent of copper, which is the most trustworthy alloy of tin and cop per. In alloys containing a lower percentage of tin, the later segregates in the form of tin spots, when the alloy cool lowly. All other compositions in use for bearings, such 812 to 17 per cent of tin and 88 to 83 per cent of copper do not make homogeneous bsarings, unless they are cast in chill molds, which in practice is impossible. This hetero geneity of gun metal bearings is dangerous, as it produces gripping, and thereby a rapid wear. This specific quality of gun metal bearings (to grip) is theoretically easily explained In cooling, the softer metal (composed of from 7 to 10 per cent of tin and 93 to 90 per cent of copper), being the less fusible, sets first, forming the skeleton of the bearing; later, the very hard and brittle alloy,containing 17 to 18 per cent of in and 83 to 82 per cent of copper, eets and fills the pores of the softer skeleton. The particles of the harder alloy are asily torn away by the axle if the bearing is not sufficiently lubricated, and these tear the skeleton composed of the softer alloy; this I have frequently observed atrolling mills where the bearings were not sufficiently lubricated, and where par ticles in the form of small flakes peel off.
A good bearing which answers all purposes must not be homogeneous, but must consist of a strong and tough akeleton, the hardness of which nearly equals that of the axle, in order to resist shocks without deformation, and the pores of thi skeleton must be filled with the soft metal or alloy
The nearer the hardness of the skelton approaches the hard ess of the axle, the better the bearing will resist the pres sure or shocks; and the softer the metal filling the pores, the better the bearing is in every respect. Such bearings are now made by melting two or more alloys of different hardness and usibility together, in such proportions that necersarily a se paration into two alloys of definite composition takes place in cooling.
Phosphor-bronze bearings consist of a uniform skeleton o very tough phosphor bronze, the hardness of which may be easily regulated to equal the hardness of the axle, while th pores are filled with a soft alloy of lead and tin.
Such a phosphor bronze bearing may therefore be considered as having its wearing surface composed of a great number of mall bearings of very soit metal encased in the tough and tronc metal which equals the hardness of the axle; on the planed bearing surface this molecular disposition cannot be detected by the naked eye, but, if examined with a magnify ing glass, the truth of the above will at once be seen. An other practical proof can be given by exposing such bearinge o a dull red heat, when the soft alloy will sweat out, an the hard, spongy, skeleton-like mass remains.
Is this consist the great advantages of phosphor-bronze bearings, which is proved wherever tested ; for while the axle partly runs on a very soft metal and thus obviates heating oven if not sufficiently lubricated, the harder part of the bear ing, its ekeleton, does not allow of wear taking place; and as the hardness is arranged to equal the hardness of the Kunzel

Use of Iron instead of Lead Shot in the Rinsing of Bottles.
Lead shot, where so used, often leaves carbonate of lead on the internal surface, and this is apt to be dissolved in the wine or other liquids afterward introduced, with poisonous esults; and particles of the shot are sometimes inad vertently eft in the bottle. M. Fordos states that clippings of iron wire are a better means of rinsing. They are easily had, and he cleaning is rapid and complete. The iron is attacked by the oxygen of the air, but the ferruginous compound does not attach to the sides of the bottle, and is easily removed in wash ing. Besides, a little oxidized iron is notidjarious to health M. Fordon further found that the slight traces of iron left had ao apparent effect on the color of red wines; it had on white wines but very little; and he thinks it might be better to use clippings of tin for the latter.

## Fant Steaming.

One of the finest and fastest steamboats on the Hudson river is the Mary Powell. Recently she made the distanc from New York to Piermont, 28 miles, in one hour, while he actual running time to Poughkeepsie, $74 \frac{1}{2}$ miles, was 3 h 19 m ., or at the average rate of $22 \frac{1}{3}$ miles per hour. Boile pressure, 37 lbs. The Powell is fitted with the ordinary sin gle vertical cylinder, walking beam engine.

Parasites.-It is common to note that each species of animal has its own parasites, which can exist only upon creatures which have more or less kinghip with their host. Thus the ascarix mystax, which torments the domestic cat, i found in all species of felis, while the for, so closely resem bling the woll or the dog, is never troubled with the tenia senata, common in the last mentioned animal.

THE VIBRATIONS OF SOLIDS OPTICALLY STUDIED. Profassor Ogden N. Rood, of Columbia College, communi cates to the American Journal of Science and Arts a new method of ascertaining whether two tuning forks, for ex ample, are in unison, or to determine the difference in th umber of vibrations executed by them in a second. A short piece of fine steel wire is attached to each of the forks, and the latter are supported as shown in Fig. 1. The forks


Fig. 1.
are now set in vibration, and the intersection of the wires iewed agairst a bright background with the aid of a smal elescope. When the difference in phase is 0 , an appear nce like Fig. 2 is produced, which changes to Fig. 3 whe he difference in phase has increased to one half a complet ibration. If the forks differ by an interval of an octave, a almost equally distinct figure will be produced, as is seen in Figs. 4 and 5, which represent the characteristic appearance n this case. Somowhat less distinct and more complicated gures are given by the quint, the duodecimo, and the double ctave.
It is easy with this method to bring a vibrating string into unison with a given tuning fork, or to adjust it so tha the interval shall be a quint, octave, twelfth,or double octave bove or below. It is also easy to ascertain the number of ibrations made by a string in a given case, by the aid of a bridge and a properly selected fork making a known num ber of vibrations, the string being shortened till it furnishes one of the above mentioned figures, and executes hence nown number of vibrations, after which the number of $\overline{\text { i }}$ brations made by its whole length can readily be calculated by a well known law.
To bring two cords into unison, or to produce one of the bove mentioned intervals, a cork cut at an angle of $45^{\circ}$ is placed botween the strings on the monochord, and, supported at this angle, is a amall piece of looking glass of good quality The reflected and vertical image of the farther string wa hen seen in the telescope crossed by the horizontal image f the nearer string; and the mirror being turned so as to eflect,at the same time,light from the sky, all the condition vere fulfilled.
Rods or bars, supported at one extremity or at two nodes, nd provided with fine terminal wires, can by this method e brought into unison, or have one of the above mentioned ntervals established between them. A preferable mode owever, is to study them in connection with the monochor and a tuning fork. The entire string of the monochord is frst brought into unison with a tuning fork, or some defi nite interval established; the cord and rod or bar are then combined at right angles, and the bridge moved till unison again effected, when it is possible to calculate the num er of vibrations actually executed by the bar or plate. If he fine wire is attached to one side of a bell, the number of vibrations executed by the bell can readily be obtained with he monochord in the manner already indicated.
Vibrating membranes can readily be studied in this way yattaching to them a amall piece of fine wire bent with wo right angles, and using them in connection with the monochord or a tuning fork.
The more important of these figures may be easily ren ered visible to a large audience. Wires about a milimeter bick are attached to two tuning forks placed in front of \& aagic lantern; an image is formed on the screen with the aid of a lens of about 0.315 inch focal length; the figures re then well shown, along with certain of their details not particularly mentioned in this article.

## Great Expositions.

A correspondent of the New York Tribune writes from ienna that the loss of the Aastrian government, in its out ays on the recent Great Exposition of 1873, was nine milons of dollars. We have heretofore chronicled the recen uspension of the series of annual World's Expositions, which were inaugurated by the Exhibition Commission in London, and intended to continue until 1876. The losses were so heavy that the Commission was obliged to discontinue them. In view of facts like these, the American people may congratulate themselves that Congress, at its ast session, refused to authorize the squandering of public money on the Centennial Exhibition at Philadelphia. The truth is that this Great Exposition business has "played out." has ceased to be an attraction for the masses, and is chief y useful for the advertising purposes of enterprizing dealorb.
C. H. C. auggests that telegraph companies plant trees on which to hang their wires. "In most sections of the counry, the tree first planted would cost but little more than a pole, and after two or three jears in growth would be a per manent pole which not rot at the bottom or need resetting, and would be seldom struck by lightning. Having many imes seen from three to a dozen poles, in a row, shivered by a charge of electricity running along the wires, the above question arose in my mind."

## Pittsburgh Manufacturers for 1873

Some weeks since, the Pittsburgh Dispatch of this city published a list of sales of houses in Pittsburgh doing a usiness of over $\$ 50,000$ a year. The list was very imper fect; but as it is so difficult to get statistics in Pittsburgh we have compiled from this list, which was copied from the assessor's list, the items relating to our iron, steel, copper and glass industries, believing that, imperfect as they are hey will be of value. We do not give the totals of each in dustry, as this would by no means give the volume of busi ness. We would also say that none of the Allegheny manu acturers are included in this.
In the entire list there are but two houses outside of those connected with the industries given below that did a business of over $\$ 1,000,000$. As will be seen, three houses in the iron or steel business did above this sum, namely: Jones \& Laughlins, J. Painter \& Sons, and Hussey, Wells \& Co.





## IMPORTANCE OF ADVERTISING.

The value of advertisingis oo well understood by old established bustnese ms that a hint to them is unnecessary; but to persons establishing a new manufacturer to work it : upou such a class, we would impress the impor nce of advertising. The next thing to be considered tis the medium hrough which to do it .
In this matter, discretion is to be used at first ; but expertence will soon dermine that papera or magazines having the largest circulation, among eclass of persons most likely to be interested in the article for sale, will and bria 1 kinds of machinery, and to the vendors of any new article in the echanical line, we belleve there is no other source from which the advercinntific Americas.
We do not make these suggestions merely to increase our advertising tronage, but to direct persons how to increase their own business. The Scientific American has a circulation of more than 42,000 copies oe other papers of the kind published in the woria

## NEW BOOKS AND PUBLICATIONS.

The American Garden, a Monthly Illustrated Journal devoted to Garden Art. Edited by James Hogg. Terms
$\$ 2$ a year. Brooklyn, N. Y.: Beach, Son, \& Co., 76 Ful. $\$ 2$ a year.
ton street.
This excellent journal is now in its third year, and the issue for septemr. 1874, commences a new series. It has been placed under the editorsbip Its many and varled aspects. Is widely extended. We predict an extened circulation for this periodical, under the nem management.
dosvillee, Oil City, and Franklin Directory for 1874.
Compiled by J. H. Lant, Titusville, Pa.

## Bectut gumericau aud foretiqu zatants.

Empoved Construction of the After Hulls of Yachts, etc. Empson E. Mideleton, Souchampton, England.-This invention has for itp ena ble them to carry more canvas to improve thelr sailing qualities, and to make them asfer in rough weather and in heavy gales of wind. The inventon consiats in the arrangement of the stern post of yachts and other ves.

Improved Saw Gummer
Jason W. Mixter, Templeton, Mass.-As gumming machines have been the carriage and cutter cannot be adjuated to alter the direction of the cut ; and the catter being placed upon the end of the shaft, but one journal bearingand but one crank can be used. In the present device, by attaching he carriage and cutter shart and feed screw to an adjustaole "way" frame, the operator is enabled to vary the direction of the cutter so as to cut more anard the center of the saw, if desired. The cutter shaft is supported by for operating the machine, which may be applied to etther atralght or circular saws, and without taking the latter from their arbors. The cutter is made detachable, so that tt may be changed to adapt it to the diamete or
slef of the saw.
lmprovement in Securing Knob Roses to Doors.
James Kedey, New York city. - This invention consists in supporting rose plate by a wooden bush arranged within the lock case. The bush
provided with holes, so that a screw from each rose plate may be inserted, or one from each side.

## Improved Guide for Setting Lumber.

Peter Berry, Millerstown, Ohlo. The manner of using the device is as ng up into a horizontal position as the log advances. The head is then thickness of the board or other form of lumber to be cut frum the log. Thereafter, each time a cut is made, the log is adjusted on the head block
its straight stde comes in contact with the head, which thus acts as a
or gage. When the log is belng fed to the saw, it moves in frictional
or gage. When the log is belng fed to the saw, it moves in frititional
act with the head. The thickness of cut can be quickly and accurately
ed by adjusting the shaft in the bearings.
Improved Egg and Fruit Carrier. he under side of the battominn. - Vertical metal bands are fastened to long stiftening straps to sultable hight, belng turned into a right angle at he top to form a lug, for binding over the top or cover. The longitudina side pleces are provided with strengthening pleces, to which vertical bands
Ith top and bottom hooks are fastened. The top hooks of the bands a one side of the carrier are twisted to extend over the cover in longitudt-
nal directiou. The cover is firmly bound to the hook ends at the other side by a plvoted wedge plece, carrited under the same, securing thereby the rigid connection of all the detacbable pleces when the carrier is flle soon as the same is placed under the hook ends, so that the wedge plece is secured in locked posituon.

Improved Fastener for Shade Roller Cords. a oosely through the other. Upon the rod is placed a short drum, which is secured by a set screw, whtch also passes through and serves as a plvot for pusenin, the thumb screw, the drum may be moved down upon the rod to tighten the cord, may be moved up to loosen it, or may be turned upon
said rod to adjust the pulley to the direction in which the cord ts desired to work.
Improved Hat Ironing Machine.
Robert E. Brad, Plainfleld, N.J.- This Invention consist pporting disk, which is rotated in horizontal or vertical or a hat-block位 and spring clamp carry the disk into vertical position. The top of the and brim are finished by the iron in the former position, the side of the ed and adjusted to a second rotating diss, with central aperture, cushion ad spring clamps, for finishing the under side of the brim. The finishing ron 18 made adjustable in any direction, and at different hights on the top the supportling frame, and readily used on elther side, it belng det

Improved Tool Post for Lathes.
It, Chtcopee, and Edward Bonner, Worce
ter, Mass.-The play in a socketed stand worm belog arranged in bearingg attached to the socketed stand, so as to be firmly secured against endwise motion, and so that the worm worke through a slot in the stand into the rack.

Improved Fire Place Grate.
John Bawden, Freehold, N. J., assignor to bimself and G. Combs, of same place.-By a relative construction in three parts, th1s gra e may be packed
and transported in a small compass, while it may be put together and se in the fire place withlittle trouble or it may be put together and se

Improved Breech-Loading Fire Arm.
ace for receiving the shell. On the receiver is a casing tube he handle may connect. This tube is capable of silding on the recelver and is connected by screws with a crosshead, which is employed to force
the needle back to set it for fring the spring. The said crosshead works forward and backward in a mortise, in a tnbe within a recelver, pushing the eedle back by its collar, and then, after setting the needle, going forwar te side a lug, which form a bearing for a sleeve to rest on at its front end the sald sleeve being to lock the inside tube and outside tube in the for
ward position next to the barrel. At the rear end, sald sleeve rests on a ward position next to the barrel. At the rear end, sald sleeve rests on a
sectlonal collar, forward of lugs on the recelver, and the flange on the ront end of the outside tube, which match so as to form a continuous col lar when the parts are put together. The sleeve has a flange at the middle
of the inside, which is notched so as to pass the lugs of the recelver and ock together with them by turning behind them after so passing beyond them. When the needle is to be set, the sleeve is turned so as to allow Ith the lugs; but when the cartriage chamber is to be opened, the sleev curned so as to escape from the lugs and be pulled back with the tube sphich is turned for thus releasing the tube and also for holding it in th which it is turned
ouking position.

Improved Corn Planter.
George $\mathbf{H}$. Hume, Paola, Kan.-A wave wheel on the main shaft actuate sliding plece, which is thereby carried alternately from right to left. causing the dropping of the seed from the seed boxes in the usual manner-
A lever is controlled by the attendant, so that, when the same is thronn orward, a roller ts carried back, lowering runners and marking the furrows for the seed. Another roller, brought forward, ralses the runner
above the ground, for turning the planter from one row into the next, and or gotng to or from the place of work. To each end of the shaft ar firmly applled rotating arms, which strike with their inclined end lugs the plvoted marker rods at both ends of a cross plece. Each lug strikes a rod
simultaneously with the dropping of the seed from the adjoinigg seed box. The rods are carried back into horizontal position after beting pressed
down by band springs. The end of each marker rod ts provided with a heck, which leaves an impression on the surface of the ground after eac ear, tha seed-dropping and row-making operation is interrupted an esumed at the will of the attendant.

Improved Gun Lock.
James Madison Grisham, Towash, Tex.-One end of the main spring is
nserted in a hole in the rear end of the lock plate, and has a point formed pon it, which projects to serve as a dowel pin for recelving the rear en

Improved Compound for Dental Impressions.
Ben amin $H$. Teague, Alken, and Horace Parker, Edgefleld, s. C.-This nvention is a compound for taking dental impressions, consisting of plas oring matter, mixed in proper proportions. It hardens quickly, and may be removed sooner than plastcr from the mouth of the patient, allowing
also, on account of its friability, the breaking away of parts of the fmpres ston and thelr accurate replacing, so that a perfect cast of the mouth ia
obtained.
Moses L. Poirler, Green Bay, Wis.-This invention consists in a pecullar onstruction for securing the cap plece of the pintle, so that it must be arned on the latter before it can be removed. The inclined lower edge of edge of a lower socket part on opening the gate, and slides back thereo by the welght of the same till it arrives at the lowermost point. The gate
thereby self-closing, whether thrown open in elther direction, as the ymmetrically inclined socket edge carries the same back toward the cen er point and retains it therein.
 pens and closes upon the principle of the parallel ruler. Plns are attached to the bed plece, so as to stand arm and rigld. Recesses are made in the
bed to admit disks under a metallic strip, and disks are placed on top of bed to ad.
the strip. Screw threads are cut on the ping, and the disks serve as ecrew
 low and one above the strip for each pln. The screw threads are cut the hote length or the pling, and the roughened surface thus produced pre-
vents the papers from too easily slippling up when the clamp is ratised. Hortises through the clamp recelve the plns when the clamp is pressed
 neven and unllorm appearance.
Improved Adding Machine.
Charles c . Moore and Jacob B. Moore, New York city.-This is an im. proved adding machnne, so constructed as to carry accurately whatever
pumer of wheels be used, bringing each wheel exactly to the required ofnt and leaving it there, and which shall have no lost motton from the perfection of gearing teeth. In a plate a number of counting wheels are
 to recelve the polnt of an ingtrument for turning sald wheens.
tace of the wheels, just within the circle of holes, and concentric thereWitb is is ormed a circle of numbers, consisting of the nine difitt and the
cipher. Upon the faces of the wheels is formed $a$ second circle of numirs, condsting of the nine digts and the c cipher, and so arranged that each mber of the inner circle may be the complement of the number of the uter circle. The wheels are so covered that only one number of each cir
le will be seen at a time, and these will always be the complements of cach other, so that the number seen through one hole will alwa ys indicate through the space of bow many holes the wheels will have to ve turned to bring the wheels to the opoint. In using the machine, the instrument is
inserted in the hole of the wheel odposite the digit of the scale that presents the number to be added, and is moved around to the right otil it strikes a stop. The units, tens, hundreds, etc., are added by
urning the proper wheels. In turning elther of the wheels, as each ten of the column of figures betng added is reached, the next wheel is turned one space, the carrying beting thus done automatically. The wheels are kept from being jarred out of place, or acsidentally turned forward or back,
by springs. Upon the under side of the maln plate are attached ratchet Wheels, to a tooth of each of which is plvoted a push rod, of such a length
and in such a position that, when the figure of the scale shows through the ootch, the forward end of the said push rod may rest against a tooth of he next ratchet wheel, ready to move it one tooth when the first ratchet wheel is again moved. By this construction, as soon as a push rod has pushed the next ratchet wheel through the space of one tooth, it drops
away from sald wheel, and, as tis own ratchet wheel continues to move orward, its movements are so gulded as to keep it away from the teeth the next ratchet wheel untll it is time for it again to operate sald nex rope away

## Improved Explosive Compound.

Improved Explosive Compound.
Charles A. Browne and Isaac S. Browne, North Adams, Mass.-This in ention relates to a new priming compound, which is exploded by a curent of electrictyy or the electric spark, when properly secured in an inter
aption of the electric current. It consists of the mizture of fulminate of nercury with pulverized antimony in various proportions, with an addition antlmonic sulphide or other ingredients, if desired, for producing a

Improvement in Indexing.
Walter Knight, San Andreas, Cal. - The object of this invention is to fur Fh for bookkeepers, accountants, and others, a neat case for keeping the dex of books thereln, it belng so arranged on the desk that it Indicates ereby. The device consists of a case with ope top and front part, whic arries in side grooves sultable frames with the index tables of the name hereby the index table required.

## Improved Water Elevator for Wells. <br> son, Providence, R. I.-In the inner part of the well spout 1

 voted the outer end of a bent arm, the inner end of which projects suff ently to catch upon the edge of the bucket as it rises above the spoutnd $t 111$ it discharges the water automatically into said spout. Upon the ower side of the inner end of the arm is plvoted a small friction wheel hich, should the bucket rise so that the arm catches upon the edge, near ne end of the ball,mayrollalong said edge to a position midway between pout.
improved Ordnance and Methods of Constructing the Same. Perclval M. Parsons, Blackheath, Eng.-These improvements in ordnance relate, first, to the mode of manufacturing the inner tube of the ty of resis usual. It is then drawn down, by hammering or otherwise, until it ap furnace, and is twisted a suffclent number of times, which is accomisbed by fixing one end in a box attached to an axle, which is made to reolve in suitable bearings, while the other end is griped and held station-
ry in fixed jaws, or turned in the opposite direction. It is then reham. mered, and, if necessary, the operations may be repeated. The improve ent also relates to the method of constructing steel lining tubes for guns, intended for insertion into smooth bore cast iron guns for the pur
pose of converting them into rifled guns, or into a cast fron casting for路 ombined in such a manner that the diameter of the ring is increased dur ing the operation, and the metalis thereby extended or drawn out circum-
erentially, and the fibers and any lines of weakness developed by flaws in the original casting areplaced in a circumferential direction. The inner ube having been turned to the requisite size, a sufflctent number of these o form the rëenforce tube. These are then turned, leaving bands at their dges of slightly larger dlameter than the intermediate portion between hem. Another series of rings of the requisite size, in relation to the firs series, are bored out, with an annular recess in each corresponding to a
pair of bands of two adjacent rings of the frst series; this second sertes of rings are then expanded by heat, and placed over the first series in such Hilets formed on the edges of the first sertes wil it into the annular recesses formed in the second series, by which means the rings will be con nected longitudinaliy, and form in effect a continuous tube, and may be reated as such to impart longitudinal strength to the inner tube. The mprovements relate likewhe to the form of the breech end of the lining and the interior of the cast iron casing into which it is inted, and
he general combination of the parts in guns of this description. In guns hitherto constructed on this system, the breech end of the lining tube Where the reenforce occurs, and the recess made in the breech end of the caning to recelve it, have been made conical, which form requires specta atting of the tube. The breech end of the tube is made cylindrical, and reduced in diameter in steps toward the muzzle,as required, and the inte
rior of the casing is made in a corresponding form. The tube is inserted no the cast iron casing at the breech end, and is secured by a breech crew, in combination with which a nut is screwed to the end of the inne
lmproved Bolt for Middings Purifiers.
Joseph W. Wilson, Warsaw, Ill.-By this invention, midalings pariner hat use a fat screen are provided with a bork, constructed as to keep the capacity of the bolt or screen, and enabling a much finer screen cloth
to be used. o be used.

Gabriel Thomas, Reno, Nev.-A Car Coupling. ad to the back of the coupling pin. A spiral spring is placed in a recess
behind the pin, which bears downward on the plate with a constant pres sure, and reacts agalnst a ashoulder to throw the pin down ward. A verti cal bracket spring is attached to the under side of the drawhead, extending up through the link opening, with its end under the plate, so that it wil
naturally support the pin when the latter Is ralsed. When the cars come contact with each other, the end of the link strikes this spring, and pushes it from the plate, and the pin is forced down through the link. For un-
coupling the cars, the pin is ratsed by means of a bell crank which connects coupling the cars, the pin is raised by means or a bell crank which connects
with a rod which extends laterally to the side of the car. This rod has a series of ratchet
by which mean similarly arranged rod extends to the top of the car.
A. H. Willam Schrader, Hoboken, N. J.-This Suvention conststs in subActing raw sugar when suitably molstened to the action of a very high deIr percolates between the granules of the sugar and effects the bleaching and purging of the sugar previous to its dissolution. The invention condmission of steam and water for the purpose of repeating and completing
ce purication, or drawing it off for passiug through the filtering and dis.

Improved Steam Radiator.
James McCarthy, New York
James McCarthy, New York city.-The base of the radiator is made ollow, and on its upper slde are formed openings, which form sockets
orecelve the ends of the tubes. The head of the radiator 18 also hollow, ecelves the upper ends of the tubes. Rode pass through the tubes, are passed through them. By this arrangement the rods and thetr sup porting rods will not impede the passage of steam through the tubes.
The washers in the tubesockets The washers in the tubesockets are hollow rings open upon thelr inner
side, and are spun up out of ring plates of sheet metal. The washers inclently to pack the ends of the tubes steam formly through all parts of the radiator, so that the radiator will heat up
erenly in all its parts. bla alits parts.

Improved Seal Lock.
John S. Lorimer, Detroit, Mich. - An inner removable plate 18 fastened the the notch of the hasp, by a spring. A small knob on the bolt projects
 glass, upon the back slde of which is the raliroad lavel. This shlides in out, a shoulder on a long leg preventing its belng entirely separated from
the lock. When the hasp 1s down, the long leg entirely closes the sllt, and
effectually confnes the plate, so that the seal plate must be broken before eftectually conflines the plat
the lock can be unlocked.

Improved Machine or Cutting Clothes Pins.
Henry Mellish, Walpole, N. H., assignor to Wyman Fint and George $\mathbf{H}$. Melfurcated clothes plas of any kind, but more espectally the kind described
bither in letters patent pranted to same Inventor, dated September 23, 1873 , No.
$143,021, \mathrm{~b}$ y the combination of a stationary channel or groove, In which to alternately move and hold the timber, by means of feed wheels and a hoidlng plate, while the plns are betng cut. When the feed ceases and the plece of wood is stationary, and the cutters ready to work, this plate is
tipped by a cam, which strikes a riband ralses a plate, so that its other end preeses on the wood in the groove and holds it down, to prevent spltting whle it is being cut. This cam is so formed and arranged that the pressure withdrawn. For making the openinga, the cutters penetrate half way through the plece as the lathe is passed through this machine. The next machine cuts the other side in the same manaer, and then the plece of to the plece to give the length of the pin. The cuts in the two sides of e plece are not opposite each other, so that the plece holds together unt1l Is split to separate the pins.

Improved Lamp Cooking Apparatus.
John A. Muller, New Orleans, La.-A common petroleum lamp has its
himney provided with a closely fitting shell of sueet netal, which extends from the neck to the upper rim, and prevents its unequal expansion. The shell aiso serves to a certain extent to retain the heat in its passage hrough
the chimney. The cooking vessels proper cons'st of a boller and several additional vessels, which are fitted into eachother and into the boller, each forming a separate cooking chamber. The botler isarranged at the bottom
with worm-shaped channels, which take up the fisme from the chimney conduct it around the bottom and sides. A convex per articles cook. Ing theretn from burning. The vessels are counected by steam tubes,
which are arranged at opposite sides to compel the steam to spread under he bottom to pestag to the neat
justable Ferrule for Agricuitural Implements. William H. Bowman, London, Ohlo. - The ferrule is made of two halves, errule is tightened by driving up a band. The band takes hold of the on account of an inclined groove and its inner wedge shape, part of the ferrule.
Improved Water Wheel.
Marquis D. Grow, Dubuque, Iowa.-The buckets are made straight and radial, and are formed upon or attached to the body of the wheel. The d1scharges extend rearward from the lower ends of the buckets, and are
curved downward, so as to be convex upon their upper side, as shown They are surrounded by a band, at tached to their outer edges, and the upper. dge of which rests agalnst a, shoulder formed by the thickening of the directly against the buckets. To the top of the gate is bolted a ring, which fits around the edge of a cap plate in which the shaft revolves. To the cap
are pivoted at their angles two elbow levers, the arms of which have short lots formed in them to receive pins attached to the ring. To the othcr necting bar, so that the levers may operate togetber upon the opposite arts of the ring to move the gate. Upon the lower part of the outer side
the gate is formed a flange, upon which rests the outer gate what a flange, formed upon the lower pait of its outer side, In one part of which
are formed teeth, into which 18 geared a governor, so that the gate may be are formed teeth, Into which is geared a governor, so that the gate may be of the wneel.

Improved Pocketbook.
Gabriel Jasmagy. Brooklyn, N. Y.-The object of this invention is to im rove the pocketbook patented by same inventor under date of Aprll 28 , thout stitching, by a lining made of a blank whtch extends contlinuously connection of the partitions, and also with the side flaps of the pocketbook. The invention consists, further, in the arrangement of a blibook
formed as extension of the partition covering, and folding out of sight formed as extension of th
into a section of the same.

## Improved Beam End Protector.

ates to a sheet in casing for the ends of wooden beama as a protection against the influ-
nce of dampness ordestruction by fre. The casing covers the beam end and so much of the contiguous portion as enters the mortise in the brick
or stone wall, and it may also be made of suffictent length to project a or shone wall, and distance from the side of the wall.

## zusiness and zersonal．

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A machine ． For Solid Wrought－iron Beams，etc．，see ad．
vertisement．Addrese for lithograph，etc．
Wanted－Circulars and Price Lists from
Makers of small Water Motors，sultable for running Makers of maill Water Motors，sultable for running
lght machlnery．Address Porter Blanchard＇s Sona
Users of Baling Presses，addressV．Pugsly，N．Y． Millstone Dressing Diamond Machines－
 Engines 2 to 8 H．P．N．Twiss，New Haven，Ct English Patent for Sale or to Let on Roy－
alty．Article made by Machinery very fast．UUed in
 ent by mail，and full particulars given on application
the tinventor and sole owner of Patent，Charics $G$ ．

Wanted－A Parmoner with $\$ 8,000$ to $\$ 12,000$,
manutacturing a Patented article．$\Lambda$ ddreess $G$ ．Schu－ In manuracturlng a Patented article．Address G．Schu－ A thorough Machinist a nd Draughtsman，an
enprienced Foreman，destres employment．Addres Edward Clinton，Philladelpha，Pa．
For Sale－Good Macchine Shop and Foundry
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For Sale－Two Steam Saw Mills and three Wanted－Agents west and south．Asbes－
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Harker \＆Co．，Manufacturing Cnemists， 2111 broad St．，Hechmond，Va．
Deane S Patent Steam Pump－for all pur－
poses－Stricty trrta clases and rellable．Send torclrcular．
 Send for sample and price list．
Wanted－The Manufacture of＂Specialties＂ made mostly of Wood．Sayer \＆Co．，Meadville，Pa．
The Pickering Governor，Portland，Conn． Portable Engines 2d hand，thoroughly over－ The Improved Hoaddey Cut－off Engine－TTh
Cheapest，Best，and Most Economical steam－power in the Untited States．Send for circular．W．L．Chase \＆ Mehanical Expert in Patent Cases．T．D．
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or price ist to Belley，Farrell \＆Co．，Pittsourgh，Ps． Forges－（Fan Blast），Portable and Station－
ary．Kesstore Portable Forre Co．，Phlladelpha，Pa． The＂Scientific American＂Office，New York，
Is fitted with the Minature Is itted with the Minature Flectric Telegraph．By
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paratus tor hoisting and conveyng material oy ron For Solid Emery Wheels and Machinery， Lathes，Planers，Drills，Milling and Index Hydraulic Presses and Jacks，new and sec－
oni hand． Engines，Boilers，Pumps，Portable Engines For best Presses，Dies and Fruit Can Toors，
Bllse w willme．cor．of Plymouth \＆Jay，Brooklyn，N．Y． Price only three dollars－The Tom Thumb
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these goods them．Decided excenience and moderate cost have made
these goods popura．Homer Foot ©Co．，Sole Agents
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 Buy Boult＇s Paneling，Moulding，and Dove－
isilng Machne．Send for irtcular and sample of work． C．C．Mach＇s Co．，Bat lie Creek．Mich．．．Box 227.

## 

P．D．R．and several other correspondents
 will dind explictit directions for bronzling fron casting on p．10，vol．30．－G．M．E．will ind directions for mak
G．W．B asks：How can I polish meer whte wax，and then rub wha ary rag．
W．C．D．asks：Is there any difficulty in
ang a colled plpe，of $1 \%$ or 2 nnches diameter，as a wa using a colied pipe，of $11 /$ or 2 Inches diameter，as a wa－
ter heater in a furnace？The Are pot 1830 inches in di－
 cham ber outstie，the water passing back from radiator
 polnts ta the conl and choke the pipe，preventing a free
and steady clrculation．Is thas so？What stze of pipe
 Yold of platn pipe？A．A much larger plpe will be
necessary to enable you to secure circulation with the arrangement that you propose．The manifold will an
awer very well for the hot water radiator．
B．B．B．asks：In a three mile boat race
would $1 t$ take any longer to turn a stake boat at the end of the frst mile end d a halt and return，than it
row the three miles stralght ahead？A．Teeg．
J．G．asks：In what part of the world was
the Garden of Eden？A．No one knows． If the earth goes round on tits axis，why do we no get to te part where there is no for or or snow，or to
the part where there is no summer？$A$ ．If you will readlly percelve the reason．
Is there anythng produced that will keep coal dust
 Scientific Ambrican．
J．H．K．asks： I am engaged in an experi
ment that requrres the use of a serles of small bellow It will be neceesary thex should be absolutely a arrtlght
and a
and and，as thes will be exposed（probably）to water，it tis
equally hportant they should be waterpoor．WIIt
you tell me mhat material to use，and how to construct Them to gatn these ends？Will gum cloth angerer？If
oo，how shall I fasten it to the heado，and should those heads be of wood or leather？A．We ththk you can ob．
taln rubber bottles or syringes that whll be cheaper and tatinubber bottles or syringes that WIII be cheaper and
more satisfactory than the arrangement that you pro pose．

W．S．P．asks：If a piston were let fall 25 cylluder，would the sudden compression heat the atr
within the cyllnder？If so，would the expansion of that heated alr be great enough to throw the platon as higt as the potnt it tell from？A．There would be som
power consumed in overcoming friction，and some o the heat of compression would be disaspated，so that
the useful effect would not be as great as the power exerted．
What
What would be the pressare of at per square tnch on heated to a red heeat atter belng filled with cold sir at atmospheric pressure？A．Professer Thurston has rub．
tshed a table of the temperatures and pressurea of alr． You can obtaln it from D．Van Nostrand．Your othe
W．S．F．asks：When is the transit of Venus Cake place？Whan was the e ast？When wrill be the
next，or how often do ouch phenomen occur？．Tran Thereare two trang take place in June or Deeember． than a century elappei，atiter whtch hthere are two more
tranalte，elght yeare apart．A tranast was predicted by

 Fidely separated．The next tranifl will take place o December 9．1874，and preparations Lave been made for
Very complete observations．The 1 last transit durth
J．T．B．says：I have moved into a larg J．T．B．says：I have moved into a large
rame houe，which restapon ppon pllarg four feet ligh，
with latuce work between them，so that there is a free crrculation of atr；twe house is lathed and plastered throughout；yet，in a few days，artieles of clothng，
shoes，etc．，$w$ ill mold if put in the closets．Please tell me the cause，and if there taa remedy for it．A．A succes
sion of ralls and damp weather will sometimes produce moldine es in closets，but in your case it is caused most probably by the fresh plasterlag of the house．Plaster
absorbs molsture from the atmosphere tor some time aborbs moisture from the atmosphere for some time
 ed．We remember 8 case in pont，where the newly
plastered walls of the class rooms in a school bulliding jerve as slate，to be used for writing upon in place the ordinary blackboards．They were fnissed ver
handsomely，and the tmitation was perfect ；but in one handsomely，and the Imitation was perfect；but in one
week＇s time the palnt began to run in such streams as


H．A．W．says：You have been calling at the body and braln．Is it not a fact that more persons
are paralyzed on the right side than the left，and may it not be accounted for by the fact that the right alde 1
 that the left bide of the bratn is the tndex or the righ
olde of the body．If you malitain that the lett side or
 would show that the whole system Fas under that in
fuence，the nervois fore on the righ thid and the
muscular system on the left side beling the sufferers． Inches，each cut off at half strove，with 70 lbs． 1 steam ，
with 150 revolutionsper minute geared to ita pinion beling 44 inches in diameter，and the engine＇d ptnion 12 tinches：or a low presure condenstng entine，
of dimensions equal to the task，with a good generator of dimenslons equal to the task，with a geod generator？
A．The eecond would be the most economical，with the ame grade of expanston as the errst．
Where could $I$ learn the millwright＇s trade？A．There are numerous good shops gcattered over the eountry．
It would be well tor you to enter one of them as an ap． oneate，or in
the propretor．
How can an
ing at Washlng
 to the Chlef of the Bureau of Steam Englneering，and
sou will probably obtain a reply．If there is stllia d dif． 5ou will probably obtain a reply．If there is stlli a dif－
ficulty，you might address the Member of Congress from your district．
C．C．A．－The instrument you describe is
implya Imply a pieumatic syringe．It 18 not a novelty，hav ving fect or heat，in our schools for years．
J．A．H．asks：：Why does a glass bottle
burst，when you expose it to the alr ana lay it on red

What is the telescope princlple used for？A．Your
uestion is very Indennite．The telescope of several lenses so arranged as to toring at the poptint of sight，objects magnited several dlameters．Consult an
elementary text book upon optics．
H．S．asks：My finger nails are very brittle In tact，the east pressure cause them to break．Is
here an remedy It so what tis it？A．Bathe the nalls with oll；glycerin will not answer；keep the nalle
cut close．It very kore，you must keep them bathed
Ind J．M．B．says：Please give a formula for
calculating the proper dimenstons or a dy wheel，dimen． Ions and speed of engline betng known．A．You will
fnd rules on the subject on pp． 177 and 288 ，vol．28． J．W．M．－Your idea for an electro－mag－ or nothng belng gatned by tis use；and Instead of ie－
plactng the battery，you only lessen the rellability by omplicaung its machinery
E．H．H．asks：Is there any machinery for what has been the princlpal trouble with machine－cut fles？ A．There are several of such machines，machine．
cut flee belng in common use．They are not，however， equal to hand－cut files，elther in the regularity of the
G．S．asks：How can I harden thin brass Fire，about the thickness of a common sewing needle or a pin，so as to make a apiral apring，by winding it
overa mandrel the thickness of a common penholder？ ．Harden your brase wire by hammering it lightly While it tis on the mandrel a fter it has been wound．
What $k$ kind of glue can I use to glue thick leather What kind of glue can I une to glaue thleck leather on
wooden roller about an Inch in diameter？A．Any kind of superior glue．
To what color must I heat a watch spring to temper t，and must tit not be well hardened before tempering？
To harden such a apring，heat it to $a$ red heat ang
 and tallow untl1 the mixture will blaze on the spring．
When the mixture blazes，keep dippling the spring into it，and then holding it in the flame so that the spring FIll blaze of itself when held away from the flame．
W．G．R．asks：Will immersion in a solu－
 thlnk it will．Try a mixture of te
ower the temperature to $-4 \circ \mathrm{Fah}$ ．
P．J．H．asks：What is the effect of a daily It the eolution or ammonna is according to the regular
ormula，there will be no injurious effecta．Inhaling the vapor of amonenia
detrimental to the halr
N．D．T．asks：Is there any better substance water than the permanganate of potash？If not $w$ ，
 mina 18 used to purty water．If you use permanganate
 water；if the water retatns a plink hue，put a stick or
chlp in it，when the color will shortly dilappear．You Record， 18 n．4．
D．W．S．asks ：1．Will the copper lightning有 eerminates in a half hogshead of running mater．Is it
eafe？No．3．Would It be sater if it penetrated the sround elght feet？A．Yes，and it would be still safer
If you depoasted a cart load or more of well burned charcoal at tithe bottom of the rod，surroundtn
or a length of several feet with the charcoal．
C．M．asks：In your issue of July 18，in
nswer to
D．Q．C．，you have not stated how much niter
to be used．A．In formula mentioned，niter 1010 parts． What 1 供
baltt gase
What is peroxide of lead，and is it known by any more

Is anything mired with the sulphur in which matches
J．E．S．asks：Is it a fact that the water 150
miles from the mouth of the $A$ mazon river 18 sultable or drinktig，or does it mix mrth the
brackish or salt？$A$ ．It 18 brackish．
What number of emery and what grade is most sult－
 that ts，with steel facees and iron backlng；and IInd that Wheels that manutacturers recommend are all right to
cut the steel，but the fron

## ellable dealer．

What would be the actual horse power of a locomo
Ve，with two 1828 tich cylliders，at 130 1bs．per inch， nd 4 eet 6 inch drivers，making 20 miles per bour？$A$ ．
The mean effective pressure of steam in cylliders is re． aired for the solution of this problem．
G．G．McC．asks：What degree of heat is

J．P．A．asks：What is pip among chickens
Is it injurious to the fowle？ Is in thjurlous to the comper what is the hard sub．
stance on the end of chickens＇tongues？

 orlg＇tnates in a maall restcle formed on the thp of the
tongue，the contents of which，beling absorbed，lead to tongue，the contents of which，betng absorbed，lead to
the infammation and the thickening of the skin．The the tinfammation and the thickenting of the sitin．The
common and well known symptom is a white scale o horny substance growting upon the tip of the tongue，by
which the breathling becomes partly Impeded ；the beak Wilch Le breathing becomes partly 18 meded；the beak
18
frequently held open as 11 gasplng for breath，and be appear ruffed or disordered the togue 18 also ver dry and while the appette is not mach 1mpalired，tie
dibordered fowl can eat only with constderable diflcul．
 are we have ever employed，and that，when the disease
as not proceeded too tar，was to tear off the scale witl the nalls of our forefinger and thumb；and it te not dif
Acult，as it tis not adhestve；and then Boswell recom． mends to large lump of fresh butter，which has prestously been
well mixed wrt Scotco snuff．© Thls，＇ is a recipe which we consclentlously and conflently recommend；and agatn we beg to repeat，that，in our
experience，we have never known It to tall，except from experience，we tave never known it to tall，except from
our own neplligence tin the delay of tto application．＇＂
American Poolterer's Companion

E．A．F．T．says：I have constructed a gal hign and 6 inches in diameter，ts made of very thick actd to 10 parts of er（3 Inches in diameter），closed at the lower end wit blottIng paper．In this I Inserta a cllinder of rolled up
sheet zinc， $1 x$ inches dismeter，andcharge ti with 1 part of muriatic acld and 10 parts water．The battery worke very well for sllver rlating；would it aloo do for nicke
plating？ A ．Several cellis of this desecripton may be $\begin{aligned} & \text { used for nccel as well as allver plating on a small scale．} \\ & \text { How should nickel ealts be prepared for plating？．}\end{aligned}$ ． ou will fin a rectpe on p．51，vol．30．
C．W．G．says：I have discovered（near the
waters of Hickory
Creek，Texas），some bones of enor－ mous size；they were cropplng out of the bank．One trom surface of bone to the marrow．One of the upper
1 w teeth measured 11 nches 1 lemgth and $4 \Downarrow 1$ Inches in j3w teeth measured 11 Inches 4 n leng li and 44 Inches in width．The side of the jaw from which these teeth
were taken welghed 25 lbs．，the teeth belng，seemlngly in connected together－About 5 K ，eet awas，I found
 ．Wem＇ght，if you sent on some of the teeth． Yo．can obtant more datat in regard to the stzee of the
skeleton，leagth of body，legs，neck，etc．，we might be

M．E．P．says：Please inform me how to their green color？A．Small cucumbers，but not too young，are wiped clean with a dry cloch．put into a jar， and bolling VInegar，with a handful of salt，poured on
then．Boll up the vincegar every three days，and pour It on them，tull they become green ；then add aliger and green colo Copper，and plckles so prepared are infurious．
What will prevent Insecte from eatlng wall paper？A
You do not tate what the inecta are．Some can only driven awas br putting posin the paste onl ing the paper on the wal
How can I preserve citron to have it like the dried citron we buy？A．Take．cltron and sugar，pound for
pound，and simmer until tender．Allow to dry tin the

C．C．M．，Jr．，says：I have just completed
 amalgam of mercury，zine，and tit．The prime conduc－ tor te made of insulated wood，covered with tin foll
which aets or should act as a good conductor of the which aets or should act as a good conductor of the
electrictty，if any were developed．The negative con－ electrictr，if any were developed．The negative co
ductor is not tinsulated as most are，but 18 made of wood connected with the base．Perrhaps I may have made a
 conductor，namely．the chatn attached to the rubbers
 the prime conductor and the carth．One of the con．
ductors must alwass be ti connection with the carth

A．C．H．asks：1．A tank full of water has
 are opened at once？A．It will take about $7 \%$ minutes．
2．Has the amount of water anythng to do with pressure of the diflierent tisers A．A．Under the eame pressure，a
large tube will discharge more water proportlonally large tube will than amall tube．
tian and
head，or a brown one？A．The one with a whtte head commonly called the bald eaple．
How can I prepare leaves ot plants so as to leave the Vetns only，al hes
Put them in water gud d sired to be remored are nearly decomposed．The length
of time $\begin{aligned} & \text { Ill depend } \\ & \text { upon }\end{aligned}$ the kind or plant．Remove
 heets of blottlog paper．Then bleach by a preparation obtained，use chloride of llme．
 mellling compound formed when osmtum or elther of it heating osmlum in a current of oxygen gas，and con denbes in the cool part of the apparatus in colorless
tranapparent crytals．It melts below 2120 Fah．，and bolla a at a temperature a 11 ltte above tis melting polnt
Its vapor has an Intolerably pungent odor ：attacks the eyes strongly and paiafully，and is excesilvely polson ous．Osmic actd ta dissolved slowly，but in considerable quantity，by water，forming an actd solution．It 18
powertul oxidizing agent，decolorizing Indigo solution separating todine from potassium lodide，converting aldehyde and acetic accld，＂etc．（Fowne O the French Academy；though but a smanl amount，it
was calculated that it was enough to polison the who



G. F. R. asks: How can I bend brass tub
ing without injary to the tube? A. Fill the tube with Ing without injary to the tube? A. Fill the tube with out after the bending is completed. Lead is the best.
H. Z. E. asks: 1 . What is an accurate secfind table below, upon which to base your calculations 2. Is it a natural, or artificial unit or measure? A.
Artifictal. 3. What proporiton does the ordinary ya bear to the length of a pendulum beating seconds? 3. The length of the seconds pendulum-that is to say
of the pendulum which makes one oscillation per second -varles, of course, with the intensity of gravity; at the level of the sea it 18 , according to Sablae: $39 \cdot 020074$ inches
at the equator ( St . Thomas), 89.13983 inches at London, and 39.21469 inches at Spttzbergen
What is meant by the moleculat
A. The molecule is the momallest quantity of matter A. The molecule is the smallest quantity of any el
mentary substance which is capable of existing in separate form. H, for instance, represents the ato
hydrogen, while HH, or H 2 , inalcates its molecule. hydrogen, while HH, or H2, Indicates its molecule.
How does the greenback paper dollar compare wit about $91 / 2$ cents more on the dollar than paper, but 1 t comparative value is constantly varying.
W. S. P. asks: Has the hatching of hen's
eggs by artiflal heat ever beena a uccess? If so, when egge by artiflclal heat ever been a success? If so, when,
where, and by wat process? A. Artitial incubation operation at agricultural and industrial exhbitions.
 ounces per cubtc foot.
Whll not water drve an engine as well as steam or compressed air, if supplied through a sultable plpe from a reservoir 50 ftet above the engine? A. Water will
drive an engline, but not so well as steam or compressed drive an engine, but not so well as steam or compressed
air. because of the difflulty of getting the water into aod out fromthe cyllinder with suffctiant rapldity. Power
from water ts best utlized oy means of a water wheel. I propose to use a friction arrangement, consisting of
a smooth oar, with a dog on each side to clamp the bar, it work accurately? A. Your friction arrangement would, if the springs were powerful enough, drive the
bar ; but it would be liable to spring the bar out of true, If one spring were more rigid than the other, as is ver likely to be the case
tool travel can be changed without stopplng the lathe, and can be cananged from any one feed op any other in 15
seconds. It is very simple in its construction. There are two shaves running lengthways of the lathe bed,
each having a number of wheels, running from large small, on the back, on whicu they are keyed fast, whille on the front one they are not keyed. They are thrown Into action by means of a gear clainp. The clamp 18
made double (so as to worls both ways), the levers of made double (so as to work both ways), the levers of
Which (when out of motion) rest in the middle one of
three notches; and when in the left hand notch, the feed 1s, say, 20 to the inch, whille, when in the right, it will be, sag, 8 to the inch. The front shat imparts motion to
the feed screw, and the back recelves ics motion from the matn spindle, and it can be attached to any lathe. Do you thing it is of any value? A. It would be highly
advantageous to be able to alter quickly the feed of a lathe tool oy a simple contrivance, espectally in lathes whose screw serves the purpose of tool feeding as well as screw cutting. A moderate range of tool feed is,
however, obtanned in lathes having an ind however, obtained in lathes having an Independent tool
feed by simply shifting the belt on the cone which dirve feed by simply sbifting the belt on the cone which dives description to speak decisively of your arrangement,
but should judge that a wide rage of alteration in tool travel could be easily ootained by it.
M. A. G., in answer to several inquiries
about keeplug water pure in clsterns: Wooden or other of bulldings, as ged to recelve rain water from the root of bullaings, as generally made, soon become foul, with
sediment, In a short tlme the water becomes stagnant, and un-
pleasantly odorous. To remedy this, carry the plpe which brings the water into the cistern to within two or three inches of the bottom, thus discharging the fresh Water at the bottom, and causing an entire change of
water every time it ralns. Then there ought to be an opening or valve of some sort at the bottom, by which and scrub the instde as occaston may require. Au auger hole and plug so placed as to be eastly accessible would answer the purpose. Such a clstern placed under a
woodhouse, or ta some secure place out of the reach of frost, with the outlets arranged to oe reached from the dralu, and a pipe to connect with a pump in the kitchen, will bea wonderful conventence in places where soft
water is not easily ootained. I constructed one which has proved very satisfactory after six years' use, in the
following manner a About four or Ave feet outside the ellar, and under a wing of the house I dug down nearly to the depth of the cellar, and of the required size,
say six or elght feet. The ground was a very solid clay; except the surface soll of about 18 inches. This upper portion, in the soft soil, we dug larger, perhaps a foot
or more all round. In this portion I laid a stone wall in lime mortar, so that the inside was even with the lower portion of the clstern; I then placed a plece of iron plpe
from the bottom or the cistern through the earth, into from the bottom ot the cistern through the earth, into
the inside of the cellar,with the end opening over the the inside of the cellar, with the end opentng over the
cellar drain, wedging.the plpe in firmly with small stones I then plastered the entire inner surface of bottom and side (laying a flat stone in the center to stand upon)with the cement called water lime, mixed with sand; putting on a coat of clear cement very thin, with a brush, to cluse any itt le checks caused in drying. The house was
then bullt over it. The rooms were warm and frost never troubled, and through a man hole in the floor we
could go down, and with a broom thoroughly clean the or all household purposes. To fllustrate the water ance of conveytng the incoming water to the bottom,
spoken of above, I note the case of a glass aquartum WIth a fountain In the center, which, though supplled
with running water through the fountang in a With running water through the fountatn, in a few
weeks became offensive in odor, and the fish dled. We then hada plpe put on conveying a portion of the wa ter into the aquarium at the bottom,which did not interfere with the appearance or efflelency of the fountain,
but caused a continuous change of water; and we had but caused a cont1n
no further trouble.
D. Bays: In answer to several of your cor-
respondents who wish to know how to make rubber
 nches wide and about $\%$ of an inch thlick,and of any de. sired length. The name and address should be set up
in common printing type, and the type well oilled ; $a$
 tence, poured in and allowed to set; then the plaster cast is separated from the type. A plece of the soft
vulcanized rubber is then cut of the size of the plaster Vulcanized rubber is then cut of the size of the plaster
mold and lasd upon it, and both together are placed in a screw press, and heat sufficlent to thoroughly sof ten the and left for a short time untll the rubber is perfectly orced into the mold. After the whole is cold, the rub ber is separated from the model, and any irregularitite
trimmed off with a sharp knife ; the rubber stereotype trimmed oft with a sharp knife; the rubber stereotype
is then fastened, with glue or other cement, to a block
H. R. C. sends a description of an improve-
ment upon a leg supporter: On p. 250 of your vol. 30, in
answer to "Sufferer," Dr. Chapman, of New Haven, answer to "Sufferer," Dr. Chapman, of New Haven,
Conn., says: A st1ff and straight fron rod, flattened at each end and padded, of the length of the ler, is fastened arrangement would be uncomfortable to wear, Inas. much as it does not allow of a free use of the knee joint. have made a support for a number of parties which works admirably. The support is made entirely of stee to the heel. The bands placed behind the llmb are three in number, covered with calfskin, and lined over a pad-
ding of thick beaver cloth with soft sheepskin. These ding of thick beaver cloth with soft sheepsikin. Thes
three pleces are stitched together and extended far enough to go around the leg, where

Minkrals, etc.-Specimens have been received from the following correspondents, and oxamined with the results stated:
H. W. S. - We are unable to decide what nust have stem, leaf, and flower, and sometimes it is ourknowledge, that is called the Thousand Dollar Plant either in this country or in Europe. It is doubtiful the plant growing so abundantly in Texas would grow sine colder climate of Germany.-A. J. H.-It is a
spectmen of iron ore, containing a large percentage of
J. M. K. asks ; Can you tell me of the best
reatment for asthma by inhalation?-A. M. G. asks Can you give me a rectpe for cleaning an oll painting R. asks: What size should I make the steamports of cylinder 1X inches diameter $x$ 1* inches stroke, to be
driven at as higha rate of speed as posible, by an up driven at as high a rate of speed as possible, by an up.
right cyllidrical boller without any fues (10 inches in dlameter $x 12$ tnches high), capable of carrying 30 or 40 10s. steam ?-J. E. W. says: I have a great deal of
trouble in obtaining a good light npon my wrik when rouble in obtaining a good light upon my wark whe engraving on bright surfaces. The reflections are so
great at times as to render it difllicult to follow the tra clngs with the graver. I have used shades of variou kinds, but find no rellef. What will remedy the diffleul
ty?-A. C. F. asks: 1 . With what can I size some fanc paper articles for varnishing, the paste of which would best for such articles? It should be pearly traneparent and not readily soluble.-S. M. T. asks : Who made the irst cast iron plows used in America, and in what year were they made?-G. W. asks: What kind of varnisi
would be the cheapest, besides possessing strong ade sive and entirely waterproof qualitles, witn which $t$,
coat paper and not penetrate sald paper but very

## COMMONICATIONS RECEIVED.

The Editor of the Scientific American acknowledges, with much pleasure, the re ceipt of original papers and contributions pon the following subjects
On the Tides of Lakes. By L. L.
On a Mercurial Telescope. By H. On Car Ventilation. Ry S.
On a Chemical Coquette. By S. H. T On Worn Out Clay Soils. By G. V.
On the Influence of the Pole Star. By P.H
On the Influence of the Pole Star. By P.H
On the Alcohol Question. By Z. C. W. Also enquiries and answers from the follow ing:
M.D.-G. W. W.-H. C. A.-S. H.-L. C. J.-R. H.N
O. R.-B.G.-A. H. F.-C. I. A.-H. R. C.

## HINTS TO CORRESPONDENTS

Correspondents whose inquiries fail to ap pear should repeat them. If not then pub lished, they may conclude that, for good rea sons, the Editor declines them. The address f the writer should always be given.
Enquiries relating to patents, or to the paentability of inventions, assignments, etc. will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, the writer's address is given.
Hundreds of enquiries analogous to the following are sent: "Please to inform me where I can buysheet lead, and the price? Where can I purchase a good brick machine? Whose steam engine and boiler would you recommend? Which churn is considered the best? Whomakes the best mucilage? Where can I buy the best style of windmills ?' All such personal enquiries are printed,as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired informati
obtained.

## Index of Inventions

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## and rach braring that date,

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 Amalgama ting apparatus, A. L. Nolf Animal fats, renderitag, J. J. Willis.Ash barrel, sheet metal, r. M. Bell. Auger, earth, G. G. Collins Axles, turntng, R. Zelder (r)
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Baby walker, M. S. Holman...
Bag frame, carpet, M. Schmit
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R\&te tie, cotton, Crone \& Cromer.
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