a Weekly journal of practical information, art, science, mechanics, cilemistry, and manufactures.

## Vol $_{\text {[NEW }}^{\text {LIV.- No. }}$ SERIEs.] 19.$]$

## THE DEEPEST FOUNDATION IN THE

 WORLD.In November, 1884, the Govern ment of New South Wales, Austra lia, invited bridge builders throughout the world to send plans and tenders for building a double-track steel railway bridge across the Hawkesbury River, some thirty miles north of Sydney. This resulted in bids from firms in the United States, Canada, Belgium, France, England, Scotland, and Australia. The plans were referred to a commission of three eminent English engineers, who decided that English engineers, who decided that the superstructure were meritorious enough to warrant selection, the plans of the Union Bridge Company, of this city, for the foundations, were the only ones that could be recommended.

NEW YORK, MAY 8, 1886.


THE HAWKESBURY RIVER BRIDGE AUSTRALIA.

The bridge will have a totallength of 2,896 feet, composed of five spans of 416 feet each between centers of piers, and two spans of 408 feet each. The width will be 28 feet between centers of trusses, the design of which is shown in the accompanying perspective view of the completed structure. All of the superstructure is to be of mild steel, having an ultimate tensile strength of not less than 67,000 pounds and not more than 73,920 pounds per square inch of section. One of the requisites is that when heated to a cherry red and cooled in water of $82^{\circ}$, the test pieces, cut either lengthwise or crosswise from the material, must bend double without flaw or crack to a curve having an inner radius of $11 / 2$ times the thickness of the plates.
(Continued on page 292.)

the deepest foundation in the world.-sinking the piers for the hawkesbury river bridge, new sodth wales, australia,

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NEW YORK, SATURDAY, MAY 8, 1886.

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## OPPOSITION TO NOTABLE INVENTIONS

Those who by reason of constitution, habit, or ill humor are continually opposing progressive ideas and inventions might learn a profitable lesson, if they would glance for a moment at the history of almost any of our important improvements, and study, through the perspective of several decades, the ungraceful position of those who then maintained a similar attitude toward the advanced projects of their times.
In the presence of electricity, we may find the incertain gas flame and the harmful products of combustion comparatively objectionable, but for upward of half a century we have considered its illumination a great advantage, after the more primitive methods of lamp and candle. When first introduced, however, our ancestors can scarcely be called enthusiastic about the fluid, if the following curious document represents at all correctly the popular sentiment on the subject. The list of names appended to the petition includes men who were at that time prominent among those most noted for their intelligence.

Philadelphia, Nov. 28, 1833.
Remonstrance Against Lighting with Gas.
To the Honorable the Select and Common Councils of the City of Philadelphia:
Gentlemen: The Subscribers beg leave respectfully to remonstrate against the plan now in agitation for Lightiva the City with Gas, as
they consider it a most inexpedient, offensive, and dangerous mode of they consider it a most inexpedient, offensive, and dangerous mode of
lighting. In saying this they are fully sustained by the accounts of Ex-
plosions, Loss of Life, and great destruction of property, where this mode of lighting has been adopted.
We consider Gas to be an article as ignitable as Gunpowder, and nearly as fatal in its effects: as regards the immense destruction of pro-
perty, we believe the vast number of fires in New York and perty, we believe the vast number of fires in New York and other cities,
may be in a great measure ascribed to this mode of lighting; the leaka may be in a great measure ascribed to this mode of lighting; the leakage
of the pipes and carelessness of stopping off the Gas, furnish almost of the pipes and carelessness of stopping off the Gas, furnish almost
daily instances of its destructive effects. When we consider that this daily instances of its destructive effects. When we consider that this
Powerful and Destructive Agent, must necessarily be often left to the care of youth, domestics and careless people, we only wonder that themasequences have not been more Appatins. It is also an uncertain
lightyemetimes suddenly disappearing and leaving the streets and houses in total darkness.
The Waters of the Delaware and Schuylkill, now considered the most pure and salubrious in the world, as many long voyages have fully tested, must soon, we fear, experience the deterioration which has reduced the
Watrers of the Trames to the present impure and unhealthy State, for WATERS of the THaMES to the present impure and unhealthy State, for
no reservoir will be able to contain the immense fetid drains from such an no reservoir will be able to contain the immense fetid drains from such an
establishment, and very soon the river must be their receptacle to the destruction of the immense Shoals of Shad, Herring, and other fish with
which they abound: the same cause must produce like effects which they abound: the same cause must produce like effects. Salmon, have nearly all disappeared. The constant digging up of the streets, the circumstance of the gas pipes which at the intersection of each square must come in contact with the water pipes, are difficulties and evils which we would anxiously avoid.
In conclusion we earnestly solicit that the lighting of our city with oil
may be continued.
may be continued.


But unreasonable as these apprehensions now appear, they were scarcely comparable with those excited a few years previously by Stephenson's newly invented locomotive. At a time when the commerce between
Liverpool and Manchester was absolutely crippled for want of adequate transpertation, and a company of gentlemen who had sufficient confidence in the eminent inventor to risk the necessary means stood ready to undertake the construction of a railway between the two cities, so powerful and so prejudiced was the opsome time remained very doubtful. When the proposition was before Parliament, in 1825, pamphlets were issued offering every possible objection, and the news papers declared the scheme impracticable and per nicious. It was affirmed that the cows near the line of the road would stop grazing and the hens no longer lay eggs; that birds would die from the poisonous gases discharged from the smokestack, and the preservation of pheasants and foxes be no longer possible.

People were seriously assured that the sparks would certainly set fire to fields and houses, while the air would be polluted with smoke. Prospective passengers were warned that they could not breathe in a train going so rapidly, and that they would be made worse than seasick. Farmers were frightened by the statement that there would be no further use for horses, and with extinct, and oats and hay would be unsalable. The boilers, it was said, would burst, the country inns be ruined, and the proper caste distinctions be broken down by such indiscriminate traveling. Failing to convince a people threatened with such a series of calamities, the assailants of the new invention took comfort in the belief that even were the railroad ever built, the weight of the locomotive would completely
prevent its moving, and that the trains could never be worked by steam. Stephenson's tunnel was found very depressing; it was stated that "the sudden emersion in the gloom of the tunnel and the clash of re-
produce a momentary shudder, an idea of destruction, a thrill of annihilation !"
Yet these gtatements came from men not altogether unaccustomed to progress. The humiliating failure of their prophecies might well restrain more modern doubters from placing limitations upon the possibilities of the future.

## CONDITION OF THE PANAMA CANAL.

It will be remembered that when M. De Lesseps and his party inspected the Panama Canal, in February, they were accompanied by Mr. John Bigelow, as the representative of the New York Chamber of Commerce. He was, by request, a guest of the Canal Company, and went with the special mission of preparing a report upon the present condition of the work, for American publication. Mr. Bigelow has now returned, and the report which he has presented to the Chamber of Commerce furnishes a trustworthy account of the present prospects of the Interoceanic Canal.
The total length of the projected canal is $461 / 2$ miles. The depth of navigable water will be about $\not 88$ feet. Its course is for the greater part of the way through the valley of the Chagres. A basin 1,600 yards long and 110 yards wide will be necessary at Panama for the accommodation of vessels, and another one, about three miles long, at Tavernilla, to permit vessels to pass each other. The total excavation necessary to accomplish this result is $120,000,000$ cubic ineters. The excavations made up to Dec. 31,1885 , amounted, by contract, to $11,490,196$ cubic meters, and by the company to $1,520,837$ cubic meters. During January, 1886, 1,067,823 cubic meters were excavated, giving a total up to Feb. 1 of $14,678,856$ cubic meters. This left 105,821,144 cubic meters still to be removed.
These figures make any comment unnecessary. Mr. Bigelow states that it is impossible to say what the final cost of the work will be, or when it can be completed. There were at the time of his visit 15,000 men employed. At the present speed, this force can probably excavate $12,000,000$ cubic meters a year. Could the force and machinery be trebled, it would probably be possible to finish the work in 1889. The report mentions as some of the disadvantages to be encountered that the work is in a foreign state, under a weak and unsettled government; in one of the most unhealthy regions on the continent, subject to earthquakes, within 450 miles of the equator, and under a tropical sun, where acclimated labor only is of any service. Everything for the prosecution of the work has to be imported. The country itself supplies absolutely nothing but the site for the canal. So much of the work is experimental that it is believed to be impossible for even the most eminent engineers to make estimates which have greater value than mere conjectures. The most serious difficulties to be overcome may be enumerated under four heads:
First, the control of the waters of the Chagres River, which, in the rainy season, if unrestrained, is liable to which, in the rainy season, if unrestrained, is liable to
flood the larger part of the canal every year. It would flood the larger part of the canal every year. It would
be possible to control the river by the construction of an immense dam, or by the enlargement of the derivative channels by which the flood could be carried off, but either work would be very costly.
Second, the cut through the Andes at Culebra. The removal of some $22,000,000$ cubic meters of earth and rock at this cut through the Cordilleras has been confided under contract to an Anglo-Dutch Company, which engages to finish the work by July 1, 1889. The contractors are to be paid $\$ 32,000,100$. But they have not performed their contract more than one-sixth as rapidly as they agreed to, and at the present rate it will take them fifteen years to finish.
Third, keeping that section of the canal which runs from La Boca toward the Island of Perico, in Panama Bay, from being filled in by the ocean and the Rio Grande. The obstacles to be overcome in effecting this result are regarded as very serious, though not insurmountable.
Fourth, securing the amount of labor required at practical rates. The climate is described as one where "life dies and death lives." The natives, having no wants beyond those supplied by nature, will not work, and the difficulty of securing enough men is tremendous. To supply the deficiency, M. De Lesseps has invented a great many machines, so to do away with hand labor as far as possible.
In conclusion, Mr. Bigelow regards the canal as an undoubted possibility if sufficient funds be provided, but he ventures no opinion as to whether they will be, or what sum or what amount of time would be necessary to complete the work. The report shows that from all sources $\$ 120,000,000$ have been received, but not how $\cdot$ much has already been expended. The International Congress of 1879, which was the parent of the present Panama Canal Company, estimated the total cost at $\$ 213,500,000$. It would seem from the data at hand that at least half of the estimated cost will have been expended by the end of the present year, at which time four-fifths of the excavation, not to speak of the supplementary or precautionary work, will still remain to be accomplished. There is, however, one favorable coneideration in the midst of so
much that is discouraging. It seems that a large part of this expenditure was incurred in preparations for building the canal, more, indeed, than upon the canal itself. This being the case, it may be assumed that the remaining portion of the work will cost considerably less in proportion than that already accomplished. A comparison is drawn between the Suez Canal and that at Panama, but it is admitted that the latter work is vastly more perplexing and more costly. As the spectacle of 60,000 men toiling to connect the two oceans is one which is not likely to be presented during the present decade, it is not probable that the canal, if ever completed, will be within the specified time. It will operate strongly against De Lesseps' schemes for raising more money that not only is the cost of the work an unknown quantity, but the revenues and maintenance are equally indefinite.

## mineral waters of the united states

It appears from Mr. Peale's monograph on the subject that the consumption of mineral waters in the United States is annually increasing. Though the supply for this demand is drawn largely from abroad, the utilization of our native springs is receiving greater attention each year. In the decade beginning with 1873 , the importation of mineral waters of all kinds increased from 394,423 to $1,714,085$ gallons. Since 1883, a smaller quantity has been imported, but the increase in the domestic production has been sufficient to supply the deficiency and maintain the proportionate growth of the total consumption.
As yet, the majority of American mineral springs are unimproved. This is due mainly to the comparative newness of the country, and to the consequent inaccessibility of many of them, particularly in the Territories and extreme Western States, and also to the fact that few of our native mineral waters have been as carefully studied as those of foreign springs. People are realizing the importance of these investigations before a spring can be possessed of any value, for the indiscriminate use of mineralized waters has been shown to be not only unproductive of beneficial results, but in many cases to be absolutely injurious. There are, however, sufficient inducements in the profit arising from a well known and well patronized spring to make their improvement and study a matter of but a few years. Economically, they are interesting to their owners in a number of ways. As places of resort, they add to the wealth and population of the districts in which they occur; and the sale of the water, either on the spot or when bottled and shipped to a distance, is often a source of considerable profit.
Though all spring waters are more or less mineralized, the term is limited to those which contain a sufficient amount of mineral matter to have a medicinal effect upon the system. Mr. Peale adds to this definition, "or are characterized by an unusual degree of heat." Evidently, he is not a believer in the tenets of substantialism, for the savants who support this school have announced the retrogressional discovery that heat, or caloric, is a substance; and since it bethat heat, or caloric, is a substance; and since it be-
longs neither to the animal nor vegtable kingdom, it must, by negative reasoning, be a mineral. The therapeutic value of hot water in the treatment of dyspepsia being well known, hot springs would, according to this doctrine, come under the head of mineral waters, without special mention. It is unnecessary to say that we have omitted them for a different reason. By a coincidence, not unnatural, most hot springs are mineralized, but we see no reason why simply thermal springs should be included in this classification. The hot springs of Arkansas, Colorado, New Mexico, California, and other less known localities are for the most part highly charged with chemical salts and gases. A consultation of the mineral spring localities shows that there is scarcely a State or Territory in all our broad domain which is not liberally supplied with mineral springs, many of which possess marked medicinal properties. The majority of these will be improved and utilized in time, and it is probable that an even larger number will be brought to public notice in the future. What is wanted at present, however, is not so much a knowledge of additional springs as of the waters of those already discovered. Many noted resorts in Europe, which were at one time obscure villages, owe their importance to the discovery and utilization of their mineral waters. It is quite safe to predict that many a lonely spring, which is now tasted only by a passing frontiersman or a thirsty Indian, will some day cause a similar metamorphosis.

## comets fabry and barnard.

Two comets, visible to the naked eye and not far apart, will be the marked features of the northern sky during the latter part of April and the beginning of May. They are known on astronomical annals as comets Fabry and Barnard.
Comet Fabry was discovered on the 2d of December, 1885, by M. Fabry, of the Paris Observatory. It was a very faint telescopic comet, merely a misty speck in destined to attain. It was, however, approaching the
sun, and increasing in size and intensity. It passed its perihelion on the 5th, and is moving rapidly northward. It was seen with the naked eye by a European
observer about the 27 th of March, and on the 8th inst. by an American observer. The former observer found it a difficult object on account of its low position in the heavens and its nearness to the sun. The latter observer describes it as a hazy star with a faint tail, visible in the northeastern sky from 2 o'clock until the morning dawn.
Dr. S. Oppenheim, an assistant in the observatory at Vienna, gives the following ephemeris of the comet until the 30th of June

| Date. | R. A. | Dec. | Intensity |
| :---: | :---: | :---: | :---: |
| May 15 | 3 h .10 m . | $55^{\circ} 47^{\prime} \mathrm{N}$. | $666 \cdot 80$ |
| May $16 \cdot 5$ | 8 h .21 m . | $16^{\circ} 3^{\prime} \mathrm{N}$. | 192.41 |
| May 31.5 | 9 h 12 m . | 27049 s . | 1558 |
| June 30.5 | 10 h .34 m . | $36^{\circ} 41^{\prime} \mathrm{S}$. | $2 \cdot 07$ |

The figures under the head of "Intensity" give the comparative increase in brightness since its discovery, that period being represented by unity.
Comet Fabry will be at its nearest point to the earth about the 1st of May. Its intensity will then be more than six hundred times as great as when discovered.
This is the case according to Dr. Oppenheim's computation, and his estimate is indorsed by Weiss, the director of the Vienna Observatory. Other computers do not give so large an estimate, making the comparative brightness five hundred, four hundred, and even only one hundred times greater than unity. The position of the comet may easily be found on a star map or chart, when the right ascension and declination are given.
On the 1st of May the comet will probably be in the constellation Perseus, and will be visible during nearly the whole night. We say " probably," for there seems to be an unusual discrepancy in the ephemerides of the various computers, and cometic movements are alway uncertain. On the 16 th of May the comet will be found among the small stars of Cancer, and, quickly losing its transitory brightness, will be lost to the view of northWh observers.
We may therefore hope to behold a comet in a good position for observation with the naked eye, and one
that may be easily recognized. But the celestial that may be easily recognized. But the celestial stranger will make a short stay, and observers must eagerly watch for its appearance. Neither must any wonderful show be expected. The highest estimate, six hundred and sixty-eight times the original intensity, is nothing very remarkable, for the comet was nothing but a misty point when first seen by M. Fabry, making its way through the great square of Pegasus.
Barnard's comet, discovered by Prof. Barnard, of Nashville, Tenn., on the 4th of December, 1885, pro mises to be visible at the same time, although it is not as bright as Fabry's. It will he in perihelion some time during the first week in May, and will be at its nearest point to the earth about the end of May. It will be in the constellation Andromeda early in May, when its brightness will be one hundred times greater than when discovered. If computations are accurate, there is a prospect of beholding two comets visible to the naked eye in two neighboring constellations on the early mornings about the 1st of May, in the north eastern sky, and when the moon is not in an aspect to dim the mild luster of their shining.

## PHOTOGRAPHIC NOTES.

Balloon Photographs.-We were recently shown a series of excellent photographs ( $5 \times 8 \mathrm{in}$. size) made in October, 1885 , by John B. Doughty, photographer, and Alfred More, an amateur aeronaut of Winsted,
Conn. A special balloon was constructed by Mr. More for the purpose, the basket having a centra aperture in the bottom large enough for the lens to project through. It was thought by pointing the lens through the aperture the effect of the gyratory movement of the balloon would be in a measure over come. The exposures made through this aperture however, were no more satisfactory than the plan mostly employed, which was to hold the camera in one hand over the side of the basket and release the shutter with the other
The balloon started off at one o'clock in the afteroon and descended at seven.
Several of the views taken at different altitudes showed distinctly the winding rivers, the peculia contour of the different farms, particularly their irregular shape, and the location of woods and rail road tracks. The views were in fact complete maps of the country over which the balloon floated.
The most curious pictures were of banks of clouds; one in particular, looking toward the edge of fleecy clouds, had the appearance of surf rolling on the beach. During the trip a remarkable mirage effect occurred there appeared to one side of the balloon against a bank of clouds the shadow of the balloon cast by the sun, and also the shadow of an inverted balloon, the bottom of each basket joining, while extending in the shape of a disk from the neck of each balloon was a eautiful circular rainbow.
An exposure was made upon this, but unfortunatel

Doughty made a sketch of the appearance. His decription of the phenomenon shows that it must have Other victurtiful.
Other pictures showed the interior of the balloon while inflated with air, also as it appeared after the descent.
All the pictures were distinct and well focused, and were taken with an ellipse Prosch shutter at its highest speed.
The use of the balloon, in combination with the camera, for taking panoramic and bird's eye views is likely to be extended, but it will be particularly valuable in case of war for securing correct maps of the location of the enemy's lines. By using sensitive paper in place of heavy glass plates, larger pictures can be taken without increasing the load.
The sensation of floating along quietly in the air is aid to be very agreeable.
Exhibition of Photographs.-We were recently in vited to inspect a very creditable exhibition of photographs representing the first annual exhibit by the Pittsburg Society of Amateur Photographers, of Pittsburg, Pa.
Much of the work shown was of a high character for so young a society; some architectural views by Mr. Geo. S. Orth, instantaneous views by Mr. A. S. Mur ray, the president, landscapes by Mr. W. S. Bell, por trait composition by Mr. J. B. Clark, mechanical views and blue prints by Mr. Perrine, were all excellent speci mens of amateur work.
This society, being located in the midst of a great manufacturing and railroad center, has abundant opportunities for making a photographic record of the progress of important industries.
The exhibition was opened by a reception on Thursday evening, April 15, and terminated on the evening of the 16 th with a lantern exhibition, at which there was a large attendance.

## the remington type writer.

Some time previons to the failure of the firm of Remington \& Sons, all the rights to manufacture their celebrated type writer had been secured by the firm of Wyckoff, Seamans \& Benedict. As the latter firm now owns every department, they will, in the future, make a strong endeavor to improve, if possible, the Remington type writer, and will use every means to keep the supply equal to the demand, which has not been the case in the past, although noless than ine hundred machines were sold during the month of March.

## Gambetta's Brain.

At a recent meeting of the Anthropological Society of Paris, a report by MM. Duval and Chudzinski was read on the brain of M. Gambetta. The third frontal convolution was highly developed, the upper part of it being reduplicated.
Reference was made to the brains of persons of low intelligence, and also to the prominence of Broca's convolution in the brains of Wulfert, the lawyer, and Huber, the philosopher, described by Rudinger. In each of these latter savants, who were remarkable for their dialectical and rhetorical ability, the convolution was more wavy and complex than in ordinary brains, this being especially marked at the base, but there was no reduplication at the upper extremity of the convo lution, as in Gambetta's. In the present case there were other indications that the brain was not that of an ordinary person. The right quadrate lobe was very complicated, and divided into two parts by a furrow branching off from the occipital fissure. Of these two parts, the inferior was divided into several little convolutions by a furrow with numerousstellate branches. The occipital lobe was very small, especially on the ight side. Altogether the brain had a pecaliarly fine appearance, due to its great and somewhat diagrammatic regularity, especially in the frontal region.Lancet.

## oling wood.

Wagon makers or repairers can save their stock from worms by oiling with linseed oil. Single trees, double trees, neck yokes, spokes, and cross bars that are of white hickory, and are kept in stock for a year or more, will be eaten by worms if not kept in a dark place or therwise protected. Coal and kerosene oil are good also, and the expense of applying is but little. Linseed oil is preferable, as it acts to some extent as a wood filler, filling the pores, and thus aiding the painting which follows in its proper place. Some manufacturers oil all their white hickory stock before ship ping.-Lumber World.

The famous South Metropolitan Station gas holder, of London, 214 feet in diameter, over 150 feet high, and $5,500,000$ cubic feet capacity, long held its position as the largest in the world. It has now been eclipsed by a pair of holders erected recently at the Birmingham (Eng). Corporation Gas Works. Each of these is contained in a tank 240 feet in diameter, is said to be 150 feet high, and to hold 6,400,000 cubic feet.

## WAGON COUPLING.

This coupling, for connecting the front and rear ends of a wagon, is the invention of Mr. B. L. Farquhar, of Gratis, O. To the forward ends of the bars of the rear hound is secured a casting formed with side re cesses to receive the hound bars. The reach is of cylindrical form, and is received in the sleeve on the casting and extended through a round hole in the rear bolster. The forward flattened end of the reach is secured by the king bolt in the usual way. The reach is prevented from moving in either direction through the sleeve by two rings held by pins passing through holes in the reach. A series of holes in the reach permits of changing the position of the rings to lengthen or shorten the wagon. As the reach is


## FARQUHAR'S WAGON COUPLING.

free to turn in the sleeve, it is evident that in pass ing over an uneven road, either the forward or rear axle may be inclined at any angle without straining the reach, or the rear hound, or the king bolt; and in case of the wagon turning over, this construction avoids breakage by allowing the reach to turn freely and independently of its attachment to the rear part of the wagon

## LEVELING APPARATUS FOR STEAM BOILERS.

This apparatus for automnatically keeping steam boilers in a level position is designed particularly for use on road locomotives or traction engines. One end of the boiler is provided with one or two cylinders; the lower end of the piston rod carries a roller resting on a guide attacked to the bolster of the truck of the boiler. The front end of the boiler is the reby supported on the fixed piston. The upper end of the cylinder, above the piston, is connected by a pipe with the water compartment of the boiler, while a pipe from the same end opens into the air or may lead to a pump connected with the boiler. Each of these pipes is provided with a valve, and these valves are operated by rods leading to a pendulum suspended from the top of the boiler. When the boiler is in a horizontal position, both valves are closed and the piston is in the middle of the cylinder. When the truck passes down an incline, as shown in the upper view, the pendulum assumes an inclined position to the center line of the boiler, and the upper valve is opened to admit water


KRAMER'S LEVELING APPARATUS FOR STEAM BOILERS.
under pressure from the boiler into the top of the cylinder, thereby forcing the front end of the boiler upward until the pendulum and boiler are again in a normal position, when the valve is closed.
When the truck again reaches a horizontal position, the pendulum swings and opens the lower valve, when the water is forced from the cylinder until the piston reaches its middle position. When the truck passes
up an incline, the water escapes from the cylinder and the forward end of the boiler is lowered, as shown in the lower view. A rigid arm extends from the upper end of the pendulum to a piston rod working in a cyl inder filled with oil; the upper and lower ends of this cylinder are joined by a pipe provided with a valve. The speed of this piston, when changing its position, and consequently of the pendulum, is regulated by the flow of oil through the pipe. When the valve is closed the pendulum remains stationary. The use of this device, by keeping the builer. constantly level, will prevent the flues from burning.
This invention has been patented by Mr. John M. Kramer, of Maria Stein, Ohio.

## Don't Undervalue the Boy.

The following sound reasoning we find in the Ameri can Agriculturist. It would be a benefit to both fathers and their sons if its precepts were more often regarded.
Too many men make their boys feel that they are of little or no account while they are boys. Lay a responsibility on a boy, and he will meet it in a manful spirit. On no account ignore their disposition to investigate. Help them to understand things. Encourage them to know what they are about. We are too apt to treat a boy's seeking after knowledge as mere idle curiosity. "Don't ask questions" is poor advice to boys. If you do not explain puzzling thịngs to them, you oblige them to make many experiments before they find out; and though experimental knowledge is best in one sense, in another it is not, for that which can be explained clearly does not need experimenting with. If the principle involved is understood, there is no further trouble, and the boy can go ahead intelligently
Do not wait for the boy to grow up before you begin to treat him as an equal. A proper amount of confi dence, and words of encouragement and advice, and giving him to understand that you trust him in many ways, helps to make a man of him long before he is a man in either stature or years.
The Boston Journal of Commerce also makes a good suggestion to parents apropos to the above.
Give him tools, says the writer, and let him find out for himself whether he has got any mechanical taste or not. Do not discourage him, as parents are apt to do, by saying: "Oh, it is no use for you to try to do anything with tools. I never have any taste that way, and of course you have not." If a boy finds he can make a few articles with his hand, it tends to make him rely on himself. And the planning that is necessary for the execution of the work is a discipline and an education of great value to him. The future welfare and happiness of the boy depends on the surroundings of his youth. When he arrives at that period in his life when he is obliged to choose what profession or what line of business to follow, it is highly important that he should take no false step. And if in his youth he has cultivated a taste for any particular branch, the choice of a profession or business will be made more easy.

## George Westinghouse.

George Westinghouse owes his great and rapidly in creasing wealth to his inventive genius. Twenty years ago he was a poor young man, but he struck it rich in his air brake for railroads, and money has since flowed into his coffers in a golden stream. He is one of the most prolific inventors of the age, and has enough good mechanical ideas to furnishevery manufacturing establishment in Pittsburg with successful specialties He is not only highly skilled in theoretical and practi cal mechanics, but is also a thorough electrician. He ex pends an ordinary fortune every year in experiments necessary to the perfection of his inventions. By war rant of the King of Belgium he is entitled to the title of Sir George Westinghouse, having been knighted by that monarch as a recognition of his services to the world as an inventor. He is a native of New York world as an inventor. He is a native of
State, and is about 40 years old.--N. Y. Sun.

## Saw without Teeth.

A saw without teeth, that will cut a steel rail in two minutes, is in operation at the Central-Hudson shops, in Greenbush, N. Y. The saw is run by a ninety horse power engine, more power than is required to run all the other machinery in the shops, and is 38 inches in diameter, and three-eighths of an inch thick at the edge. The disk is made of Bessemer steel, and runs at a very high rate of speed. While in operation a band of fire encircles the saw, and the many sparks flying from the revolving disk resemble a display of pyrotechnics. To keep the saw cool and prevent it from cracking, a tank of water is placed above the machine, from which a small stream runs down and drops on the saw whill cut nearly 3,000 rails before it is worn out. A steel rail, after about six years' constant use, be comes battered at the ends, and by cutting them off the rails can be used in branch and switch tracks. Rails are cut by this machine for the whole line of
the Central-Hudson Railroad. The saw, while cutting, bears down hard on the rail, the end of which is left as smooth as the bottom of a flatiron. One remarkable thing about the machine is that the chips cut from the rail fly back under the saw with such force as to form a solid piece of steel nearly as firm as the rail itself.

## COPYING PRESS.

The engraving shows, both folded and opened, a simple, inexpensive, and portable press for copying let ters. The back of the copying book is inserted in a slot extending the entire length of a cylinder made of


## HAINES' COPYING PRESS.

sheet spring metal. The ends of the cylinder are hem med and formed with creases for receiving elastic bands, which retain the back of the book in place in the slot. The book is formed of leaves folded around a triangular rod and stitched so as to inclose the wood, and is provided with a covering of suitable material, which covers the edges of the leaves when the book is wrapped around the cylinder. The leaves are made of tissue paper, and are prepared for receiving the copy by moistening them. The letter to be copied is placed in the book, a leaf is spread over it, and upon the back of the leaf is laid a moist cloth, when the book is closed and rolled tightly around the cylinder. Then two or three strong elastic bands are stretched over the book. The cylinder, by its elasticity, expands, thereby maintaining between the cylinder and bands a constant pressure upon the book. In two or three minutes the bands can be removed, the book unrolled, and the letter taken out.
This copying press is the invention of Mr. E. M. Haines, and is manufactured by the Haines Copying Press Co., of Dayton, O.

## PERFORATING TYPE AND OVERLAY.

The object of this invention, which has been lately patented by Mr. Julius Mayerhoff, of Carthage, Mo., is to provide a device which, while much cheaper than others now $\overline{\text { In }}$ use, produces at the same time a perforation much sharper and neater than can otherwise be attained, and by the use of the overlay in conjunction with the perforating type to avoid cutting and injuring the rollers. 'The steel perforating type is equal in size to a nonpareil capital letter M, and is made in single type or in sets of any desired number, as shown in the right of the engraving. By making the faces of these types flush with the rest of the form, the inking roller will pass over them without obstruction or injury. By making the perforating type slightly shorter than the ordinary type, and making the overlay project correspondingly beyond the face of the tympan, the further advantage of a voiding both roller and ink is gained. As the type is formed with tapering bore, increasing from the face to ward the base, the little pieces of paper cut out pass down

mayerhoffs perforating type and overlay
freely, and no clogging is possible; when the type becomes filled, the form is raised and the accumulated pieces removed. A strip of soft lead, as shown in the large view, is attached to the tympan or cylinder of a press in such position as to meet the perforating type when the press is working, thereby obtaining a clean, sharp perforation, and both printing and perforating by one and the same operation.

## AN IMPROVED PULVERIZER.

AN IMPROVED PULVERIZER.
The engraving shows a machine for pulverizing ores and similar sabstances, which is simple in construction, strong, and durable. Within the casing, $d$, is a steel lined ring, $a$, within which are placed three wheels provided with steel tires, $b$, and arranged vided with steel tires, $b$, and arranged
in a triangle, as shown. These wheels in a triangle, as shown. These wheels
or rolls are mounted on shafts in bearor rolls are mounted on shafts in bear-
ings in the case; the bearings of the two lower rolls are free to move in vertical slots in the case, so that their weight is carried by the ring which rests upon the upper roll, whose shaft is extended to receive the driving pulley, as shown in the sectional view. pulley, as shown in the sectional The revolution of the wheel, $b$, turns, by friction, the heavy ring resting upon it, while the ring revolves the two lower wheels. The ore to be ground is introduced into the space between these wheels, and is carried up by centrifugal force and crushed between the steel tires of the wheels and the steel lining of the ring. There and the steel lining of the ring. There
is no slip between the rolls and the ring, and the material is crushed by the weight or pressure of ring on the upper roll and the weight of the lower rolls on the ring. The pulverized material passes out through the small slit-like openings, $e$. The machine is not liable to get out of order, and will pulverize a large quantity, introduced either wet or dry, in a comparatively short time.
This machine is the invention of Mr. William H. Howland, whose address is Room 25, No. 39 Broadway, New York city.

## an adtomatic cut-odt and lightning arrester.

The illustration shows a simple arrangement for a device calculated for use in telegraph, telephone, and other stations where electrical line instruments are used, one intended not to interfere with the ordinary working of the line, but which will ground the line when the electric current is so greatly increased as to abnormally charge the apparatus, as sometimes happens during thunder storms. The apparatus is mounted on a block, in the center of which is a smaller block, from which project two metallic spring arms that support two electro-magnets wound with coarse, heavy wire, their pole pieces in the center closely approaching, but not in contact with each other. The spring arms project beyond the magnets, and at their ends carry contact points, $h i$, which project inward toward a central standard, $k$, which carries contacts in line and arranged to co-operate with the contacts, $h i$. The standard, $k$, is in electric connection with the ground at $g$ through the binding post, $l$. The line wire leads to the binding post, $a$, thence through the spring arm and magnet to the binding post, $b$, to the line instruments at the station, $c f$, back to the binding post, $e$, through the coils of the other magnet to the post, $d$, and on to the line. The magnets, being made of heavy, coarse wire, will not be appreciably affected by an ordinary current, but when they become heavily charged, will so attract each other that the contact points, $h i$, are brought into electric connection with the contacts that extend from the central standard, $k$, thereby grounding the line.

belt's cut-odt and lightining arrester.
This invention has been patented by Mr. Perley P. Belt, of Columbus, Kansas.

Sunflowers are used in Wyoming Territory lor fuel. The stalks when dry are as hard as maplewood and make a hot fire, and the seed heads with the seeds in are said to burn better than the best hard coal. An acre of sunflowers will furnish fuel for one stove a year.


## HOWLAND'S IMPROVED PULVERIZER.

## improved rotary ventilator.

This invention particularly relates to rotary ventilators for ejecting foul air from apartments or buildings. The bearings for the shaft of the wheel are carried by frames secured by bolts to the front and back of the face plate. The meeting ends of the frames are bent to form a triangular central opening for receiying the bearings, and to provide for uniting the bars to-


## bRIGGS' IMPROVED ROTARY VENTILATOR

gether by bolts. The vanes of the ventilating wheel are of special and peculiar construction. Half of the vanes-alternating with the others-are of arc shape, and are only made to extend partly along their arms from the perimeter of the wheel, thereby, so far as they are concerned, leaving a large central opening through the wheel outside of the hub. This opening is, however, mainly covered by the inner portions of the intermediate vanes, the outer portions of which corre spond with the others. These inner portions are made much wider than the outer ones and are consideraby
extended on both sides, so as to slightly overlap each extended on both sides, so as to slightly overlap each
other. This construction, makes the inner part of the wheel much more effective than in wheels of
wher the usual construction, and leaves an ample space between the several vanes for the passage of the air between them. This is also a valuable feature when it is desired to move air against a pressure, as it prevents the air from slipping back through the gentral opening. The arms carrying the vanes are tangentially, instead of being radially, arranged relatively to the center of the wheel.
In a wheel for blast purposes the arrangement of the blades would be somewhat modified. The outer and inner number of blades would be reversed, and the inner blades would be lapped very much to prevent any return of the air. The angle of the blade would be made to suit the work in each particular case.
This invention has been patented by Mr. Edwin F. Briggs, of 1221 De Kalb Avenue, Brooklyn, N. Y.

Peach Root Tea is a remedy for epilepsy, according to Dr. J. L. Dorset, of Dorset, Va. (Medical Age.) Three or four ounces of an infusion are to be given daily. Dr. Dorset reports one case in confirmation of his view.

A Use for Fire Damp.
The distressing explosions which ocour from time to time in European coal mines, and less frequently in those of America, are in some cases the result of finely divided dust suspended in the atmosphere of the collieries, but for the most part they must be attributed to the presence of marsh gas, the dreaded "fire damp" of the miners. When this hydrocarbon is mixed with air, it forms a highly explosive compound. In the fiery coal pits of England the gas is one of the most serious obstacles to mining operations. It is, however, an excellent fuel, and forms almost the sole constituent of the natural gas issuing from many of the Pennsylvania wells. The proposition has therefore been made, and we believe the actual experiment is now in progress, to drill six inch bore holes down through the coal measures and thus afford an outlet for the gas reservoirs.
The fluid, if found in sufficient quantities, could then be used as a fuel, while the mines at the same time would be relieved of a very undesirable tenant. The coal mines of western Pennsylvania are fairly free from fire damp, the gas being largely stored in the porous Devonian sandstones which lie above the coal measures. Local conditions have, however, dictated a different disposition of the gas in the geology of England. The coal seams themselves are its depositories. Instead, therefore, of possessing an economic value, it is, under the present arrangement, a constant menace to those engaged in winning the coal. It is hardly probably that these borings would have a sufficient output to make their value comparable with that of American gas wells, but the proposition is well worth considering, if for no other reason than the possibility of lessening the fatalother reason than the
ity among the miners.

Instrument for Reproducing at will an Invariable Quantity of Electricity.
The instrument is a voltameter hermetically sealed and thus rendered independent of barometric, hygrometric, etc., fluctuations. The water decomposed by the current during each operation can be reconstituted afterward by passing a spark between two wires sealed in the upper part of the tube.-Marcel Deprez.

## LIGHTNING ARRESTER AND AUTOMATIC CUT-OUT.

A recent invention to afford an improved lightning arrester and automatic cut-out for dynamo-electric machines is shown in the accompanying illustration. When the current is working normally on the circuit, the armature, D , is drawn down to the bottom of the cam, F , turning the sleeve in opposition to the tension of the spring, I, and bringing the bar, G, into contact with the bar, $d$, of the lightning arrester. The line wire, $e$, is connected with the binding posts, $\mathbf{J}$ and $\mathbf{J}^{\prime}$, these posts being connected with the terminals of the magnet, B ; and when the line wire is struck by lightning, the current, in passing from ' $d^{\prime}$ to $d$, to reach the ground through the bar, $G$, and ground wire, $f$, forms an are between $d^{\prime}$ and $d$, when the dynamo current will continue to pass the space between the base of the lightning arrester to the ground for an instant, and the diversion of the current allows the magnet to become demagnetized, thus releasing the armature, D , and removing the bar, G, from the bar, $d$, when the are will be broken and the dynamo current follow its original


## HOREN'S LIGHTNING ARRESTER

path. This device also indicates, by its momentary action, if the lightning arrester is clogged with dust or any conductive material, so as to short-circuit the dynamo and send the current to the ground instead of over the line. This invention has been patented by Mr. John Horen, of Omaha, Neb., and the device is being manufactured by Mr. John Braınan, of 439 Lawrence Street, Denver, Colorado.

The ${ }^{66}$ Remington-Lee" Magazine Rifle.
Major Armstrong, late A. P. D., gave a description of this rifle at the English Royal United Service Institution, March 26. In the course of his remarks, he said that the best of soldiers are naturally inclined in the excitement of action to fire away their ammunition fast; and notwithstanding the strictest orders to keep the magazine in reserve, and use the arm as a single loader, until the occasion arose for a rapid and concentrated fire, the majority in any body of men would be pretty sure to draw on their magazines as long as there was a shot in the locker. An officer then could not possibly know whether his men really had magazine arms in their hands or not, unless he examined each arm separately, emptying from it and replacing all the cartridges.
Several attempts have been made to adopt a repeating or "quick firing" attachment to the ordinary breech loader, so as to convert it for the moment into a repeater, but they all leave much to be desired as regards strength, handiness, sightliness, quickness of action, and, above all, rapidity of adjustment and replacement; with none of them can the result be considered really a magazine rifle. "It is," said the lecturer, "in this direction that inquiry and experiment are naturally tending more and more, and I think there can be little doubt the arm of the future will be the best single loader obtainable, plus a good attachable magazine system. I think you will find that practically that ideal has been attained, as regards the latter half at any rate, in the 'RemingtonLee' rifle, invented and patented by Mr. Lee, and made by Messrs. E. Remington \& Sons, of New York.
'It is at this moment a simple breech loading rifle, with bolt action differing little from other bolt systems except that it is simpler and stronger than most. This particular model is of 0.45 caliber, rifled with five grooves, taking a complete turn in 20 inches; weight about 9 pounds; and takes the United States Service cartridge of 70 grains of powder with a bullet of 405 grains, giving an initial velocity of about 1,350 feet per second. And the action is particularly quick and easy. The details given can, of course, be varied to any extent desired in the manufacture; the important feature is the independent magazine system. The armcan be used indefinitely in its present form as a single loader, until the necessity arises for the quickest and most concentrated fire obtainable, when it is converted in a moment, at the word of command, intoan almost inexhaustible repeater of the most rapid action.

Any desired quantity of reserve ammunition can be served out in the magazines, each containing.five cartridges in no greater space than if they were in the ordinary paper packages. They are made of sheet steel in one piece, with a simple spring to propel and a 'carrier' to guide the cartridges-three pieces in all. They are specially contrived to combine the maximum of strength and efficiency with the minimum of cost, though, if retained, they can be recharged and used hundreds of times. The cartridges are stowed away in them in a moment, and yet are so firmly held that it is scarcely possible to displace them unintentionally, even with the roughest treatment ; while the empty magazine is removed and replaced by a full one in less time than is required to nsert a single cartridge in the ordinary single loader. his quickness of adjustment is a very important eature, for though the capacity of each magazine is small, it it so easily and speedily replaced that the magazine system is practically inexhaustible, being really limited only by the carrying power of the soldier.

The rifle has been fired from the shoulder, as a repeater, fifty times in one minute, daring an official trial in America, a rate much beyond that of any other magazine arm. The magazine in use offers no inconvenient projection nor unsightly feature, while its weight is so disposed that the center of gravity of the rifle is never disturbed, the balance of the arm remaining therefore always the same; and the cartridges lie always side by side in the magazine, where they are really better protected from all possibility of accident than they could be anywhere else. It is evident that the officer can see at a glance, ven from a considerable distance, whether the arm is being used as a single loader in obedience to orders, or f any of his men has brought his magazines into play before the word of command. The charged magaines, moreover, would be carried apart from the loose ammunition until required, in separate pouches, so that to make use of them would involve a distinct and explicit drill motion."

Walls laid up of good, hard-burned bricks, in mortar composed of good lime and sharp sand, will resist a pressure of 150 pounds per square inch, or 216,000 pounds per square foot, at which figures it would require 1,600 feet high of 12 inch wall to crush the bottom courses, allowing 135 pounds as the weight of each cubic foot. Walls laid upin same quality of brick and mortar, with one-third Portland cement added, will resist 2,500 pounds per square inch, or 360,000 pounds per square foot, which would require a height of wall of 2,700 feet to crush the bottom bricks.

THE DEEPEST FOUNDATION IN THE WORLD. (Continued from first page.)
The location of the bridge is one that demanded extraordinary work, not in regard to the superstructure, but in relation to the foundations for the piers. The bed of the river is made up of mud and soft sand, hard gravel being reached at a depth of 185 feet below high water, and as the rails are to be 42 feet above high water the total height from the bottom of the piers to the rails will be 227 feet. Sinking piers to such a great depth has never been attempted, even in this age of wonderful engineering, and on this account principally the methods to be pursued have attracted much atten


Fig. 3.-sectional elevation of pier.
tion both in this country and Europe. The following description of how the work is to be done will, there ore, prove to be of interest.
Like most of the methods of American engineer when called upon to perform an unprecedented work of great difficulty, the chief characteristic of these plans, as now contemplated, is simplicity. The principle governing this undertaking can be readily illustrated by any one. Take two pasteboard tukes, one about one half the diameter of the other, and arrange them con centrically with the lower edge of the small one a short distance above the lower edge of the large one, and then join the lower edges of both tubes witha piece of pasteboard. This will form a thick cylinder, having a cen tral opening, flaring at the bottom. If this be inserted,


Fig. 4.-ENLARGED VIEW OF BOTTOM OF PIER.
flaring end down, in a bucket filled two-thirds with sand and full of water, it will be found to be next to impossible to push the cylinder to the bottom of the bucket; but if the annular space between the two tubes be filled with sand, and then the sand be scooped out from the inside of the little tube, the cylinder wil gradually sink to the bottom of its own accord. This is precisely what will be done in sinking the founda tions for the Australian bridge, and what was done in sinking the foundations, to a depth of 125 feet, of the Atchafalaya bridge on the Texas and Pacific Railad, three years ago
The outer tube in this instance is oblong in plan, be
ing 20 feet wide by 48 feet long. It is made of boiler plate, three-eighths of an inch thick, and the edges of the several sections are brought together and riveted to a T-bar placed upon the interior, thus making the exterior perfectly smooth and free from offsets. At a point 20 feet from the bottom the tube begins to flare and the lower edge is 2 feet larger all argund than the upper portion. Upon the outside of the bottom is secured a steel plate or cutting shoe, 1 inch thick, 2 feet deep, and projecting 6 inches below the edge of the tuibe ; the lower edge of the shoe is sharpened. Within the outer tube are placed, at equal distances apart, three cylinders or dredging tubes, 8 feet in diameter, made of one-quarter inch iron, and united in the same manner as the outer one. The lower part of these tubes is extended to meet the cutting edge, and the innerand outer tubes are rigidly united by a system of bracing, as shown in Fig. 4, which also represents the bucket to be used. The space between these tubes will be filled as the cylinder sinks with concrete mixed in the follow ing proportion: 1 Portland cement, 2 sand, 3 gravel, and 4 broken stone. After the cylinder has reached a solid resting place, the three inner dredging tubes will also be filled with cement, thus making a pier of solid cement from the bottom to the water level. From low water up, the piers will be of cut stone masonry.
In the sectional elevation, Fig. 3, A is a view at right angles and $B$ a view parallel with the axis of the bridge.
Mixing cement! will be done by machinery placed upon a float anchored alongside of the pier. The mixer consists of a square box 16 feet long, provided at each end with an outer ring or collar, which rests upon rollers. A toothed wheel at the outer end meshes with a pinion driven by an engine. The revolution of this box thoroughly mixes the sand and cemient, which are introduced through a curved chute leading from a hopper on a platform just above the box. The requisite quantity of water is admitted at the same time. The mixed cement falls from the outer end into buckets, which are carried by cranes where needed on the pier and dumped.
Upon the opposite side of the pier is moored a large float carrying two sets of hoisting machinery. The booms are so arranged that either dredge can be worked in the center or one of the end dredging tubes. Thus, by making one dredge take two loads from its own end tube and one from the middle tube, the amount of material excavated from each of the three tubes can be equalized.
During the sinking of the piers, it.is not, expected to encounter any formidableobstruction such as a large rock. Trunks of trees may be met, but their presence would not hinder the work in the least, since the great weight of the pier would force the cutting edge of the shoe through them. Tree trunks were met during the building of the Atchafalaya bridge, and in one case where the weight was insufficient to force the shoe through, that part of the log projecting into the tube wasgrappled and the log broken, when the pier was sunk without further trouble.
The contract price of the bridge is $£ 327,000$. The contract for sinking the piers has been let to Messrs. Anderson \& Barr, of this city, who superintended the erection of the Atchafalaya bridge.

## A Shetland Tirl.

A Dumfermline tourist, who visited Shetland last year, says the Miller, of London, England, has given a graphic description in one of the local papers of what he saw in the course of his tour. One of the things which came under his notice was one of the primitive grinding mills called the "tirl" mills of Shetland. He had seen numbers of these in a half ruinous condition in the more northern parts of the mainland, indicating that they were being superseded by some superior sys. tem. These "tirl" mills are very low erections, generally built in the side of a brea, down which a stream from some hidden hill loch finds its way. By a simple sluicing apparatus the stream:is turned when wanted to run under the floor of the mill in a steep, sloping artificial channel. In this channel is placed an upright circular shaped piece of wood, having an iron spindle in the center. The lower end of the spindle is fixed in the channel, while the upper end finds its way through the floor of the mill and is attached by a cross piece to the upper millstone. The circular shaped piece of wood is fitted with six projecting boards, against which the water strikes as it rushes down its prepared course, and so sets the upper stone in motion. Through an opening in the center of this stone the corn is fed in by hand, and the meal, as it is ground, percolates from between the stones, and falls on a clean clay or boarded portion of the floor, from whence it is gathered. The stones are about thirty inches in diameter and from three to five inches thick. Grinding mills of a more modern type are now, however, es. tablished in several districts among the islands, and gradually the "tirl" is being replaced by the superior article. Still the "tirl," and even the quera, driven by hand, are found in use in various parts of both Shetland and Orkneys.

## How Magenta is Made.

The London Chemical Review translates from Dingler's Polytechnisches Journal an article by P. Schoop on the arsenical process of manufacturing magenta, containing facts all the more interesting here, now that Americans are embarking in the anilin industry.
The melting pot used is of cast iron, 1.35 meters in diameter and 1 meter in height, set over a suitable furnace. The lid can be lifted, if need be, and pushed out of the way by means of a pulley and crane. The stirring apparatus is kept in action during the entire time of heating. A small aperture serves for tak ing out samples of the melt. The charge consists of :

## Arsenic acid, $194^{\circ} \mathrm{Tw}$ Arsenic acid, $194^{\circ} \mathrm{Tw}$ <br> Arsenic acia, 1 <br> Anilin for red..... . ........ecere, same sp. gr. as above. 300 "

The firing up is so managed that the distillation begins in about seven hours, and that then 10 liters pass over every hour. After the lapse of twenty hours the heat is increased so that 20 liters may pass over hourly. When 400 liters have been distilled off, the melt will already have become thick, whereupon the fire is slackened. As soon as the contents of the pot become pasty they are scooped out, and the melt when cold is broken.
The distillate is mixed in a parting funnel with about 100 kilos salt, upon which the oil speedily separates. The salt solution is diazotized. $\cdot$ precipitated with a solution of naphthol, and orked up into naphtholorange. More advantageously it is converted into saffranin.
The melt is ground up, wet to a fine, thin paste, in lots of 100 kilos, and passed through a filter press. The filtrate is evaporated in an iron steam pan for the recovery of the arsenic acid, while the press cake is again stirred up with lukewarm water and filtered once more. The filtrate from this serves for grinding up the next melt. The crude melt, after washing, is a yellowish-green powder, which is twice lixiviated in a suitable extraction kettle with boiling water. About a tenth part of the melt is treated in this kettle with 3,600 liters water and steam at a pressure of 1.5 to 2 atmospheres. After four hours the whole is passed through a filter press, and the residue again treated in a second kettle with 3,600 liters water in the same manner. This second decoction is run into the first kettle, which has in the mean time been charged again. The remainder, after this double extraction, forms one part of the poisonous, useless.residưes. The color decoction of one lot, after standing for half an hour and depositing certain impurities, is mixed hot with 200 kilos rock salt, whereupon, after heating, the muriate of the color separates out almost completely. In the liquid drawn off after standing for two days a little more color is thrown down by the occasional addition of a little milk of lime, and is worked up separately. The remaining lyes, containing much arsenic, are precipitated with lime, and this precipitate forms the second portion of the poisonous residue.
The precipitated crude magenta is purified by a systematic fractional precipitation. The crude magenta, forming one-fifth of the melt, is dissolved in a wooden cask in 1,000 liters water, boiling up by means of steam, and 40 liters of a 4 per cent solution of soda are gradually added. A greenish or golden resin separates out on the sides and on the surface. The liquid is then passed through a coarse filter into a wooden vat, and mixed with two liters muriatic acid to prevent the separation of chrysanilin and delay the crystallization of the magenta. Upon the liquid is laid a lid with wooden rods, which, as well as thesides and bottom, are in two days found covered with fine crystals. The motherliquor is run off, the crystals are dried in the air and afterward in a drying room at $104^{\circ} \mathrm{F}$. The yield is 20 kilos of crystals, while about 4 kilos magenta remain in the mother-liquor and 15 to 16 kilos resin are separated out. From the mother-liquor the color is precipitated by soda lye, and about 40 kilos of it are dissolved in muriatic acid. Here we proceed as in the purification of the crude magenta, about one-third of the coloring matter being separated out as a resin, and crystals of magenta being obtained on cooling. In this motherliquor there remains very much chrysanilin. By preliquor there remains very much chrysanilin. By pre-
cipitating with soda, and evaporating the colored mass cipitating with soda, and evaporating the color
with acetic acid, cinnamon brown is obtained.
The resin which separated on purifying the crude magenta (resin No. 1) is dissolved in muriatic acid. On boiling the said liquor a resin separates out, consisting chiefly of mauvanilin, an almost worthless substance. By soda a portion of magenta is again separated, and on cooling the filtrate a little more is obtained. The lye, after the separation of this portion of magenta, is mixed with resin No. 1. Resin No. 2, obtained by purifying resin No. 1, is again dissolved in muriatic acid and boiled, when some more mauvanilin is deposited and is removed. From the hot solution salt precipitates cerise. After filtration the color is washed, neutralized with muriatic acid, and evaporated down in iron pans heated by steam, yielding thus the cerise of commerce. In the filtrate from the precipitate of cerise, the magenta remaining in solution is precipi-
tated with soda, and the base mixed with resin No.

2, whereupon a further purification of the lye-pro ducts is undertaken, yielding grenadin and maroon.
To test the magenta for the presence of chrysanilin, muriatic acid is added to the hot solution in water, and zinc powder is added in small portions until the red color disappears. If the magenta was free from chrysanilin, the solution will then be colorless. Otherwise, it is yellow.
Except for the manufacture of acid magenta, the Except for the manufacture of acid magenta, the
magenta obtained according to the above process is magenta obtained according to the above process is
used only in preparing common reddish rosanilin used. o
blues.

## BALE AND BOX HOOK.

In the common form of box hooks the shank is fastened in the handle by being passed transversely through it and then riveted. A shank thus fastened is apt to become loosened and turn in the handle, while the fingers between which the shank is passed are liable to become chafed. With the hook herewith illustrated the fingers are passed through the


THE SAN JOSE BALE AND BOX HOOK.
opening.formed by the handle and the prongs of a fork formed on the upper end of the shank ; the turning of the hook is prevented, and there is no wear between the fingers. To prevent the chafing of the outer sides of the fingers by their coming in contac with the box or bale, there is provided a leather guard as shown in the upper view, or a metal frame, as shown in the lower view. The handle is slightly extended toward the front, thereby allowing a firmer grasp to be taken of it and a more easy and accurate guiding of the hook.
This invention has been patented by Mr. Philip J Stockinger, of San Jose, Cal. These hooks can be see at the San Jose Agricultural Works.

## DEVICE FOR SEPARATING TEETH

The separator of teeth invented by Dr. H. A. Parr, of New York city, is a continuous circular wedge, so constructed that teeth can be separated in a few minutes, with little pain, in most cases without any. When the arch is crowded, or the teeth are irregular, cavities form between them, by pressure and unnatural contact, and cannot be filled without separation; and when the position of the teeth is mechanically changed, absorption takes place when the pressure is either on the anterior or posterior surface, while a process of ossific deposit takes place in the space from which the tooth is moved.
In the system followed at present, the teeth are wedged apart by the aid of wood, cotton, rubber, or


## PARR'S DEVICE FOR SEPARATING TEETH.

ome such material, and often remain separated number of days, causing pain to the patient and un necessary labor to the operator. Frequently, the eeth have to be trained back to their former position. During the separation the ossific deposit formed has to be displaced, which in some cases it is difficult to do, and not unfrequently the teeth operated on remain separated for life. The herein described instrument was invented by Dr. Parr to do away with these difficulties.
The device may be adjusted to the centrals, bicus pids, and molars, and is particularly adapted for irre gular teeth.
$b$ represents an angular bar, tapered to a point and terminating at each end in the sockets, $d$, through
ends of which are tapered to a point and meet at an acute angle directly opposite to the angle of the bar, $b$. $a$ and $b$ may be brought together by turning the nuts, c $c$, which can be done with the fingers or with wrench. In case the teeth have not been sufficiently separated by turning the nuts, $c c$, additional pres sure may be brought to bear by means of the wedge, $g$, which may be used on the buccal or lingual surface. The vertical screws, $e e$, are for adjusting the instrument upon the teeth so as to prevent undue pres sure upon the gums.

## Rectangular Proportion.

W. Barnes.-Oblong rectangles are the forms of manifold planes in buildings and house gear-doors, windows, room sides, room floors, tables, boxes, bookcases, books, and pictures; and therefore it is worth while to learn whether there is a more or less comely form of rectangles, or of their outer trames. Of the square, which is a shapefast figure, and which, with the circle and equilateral triangle, makes a harmonic triad, there is no need that I should now discourse; but to many other cases of rectangular forms I think harmonic proportion may yield good effect. I like the effect which it has afforded in the framings of pictures. In the framing of a picture we have often found a third harmonic term to its length and breadth, and have then taken the whole, or a half, or a quarter of that third quantity for the width of the frame. On the taking of a half, the sum of the widths of the two sides, or two ends, makes up the third term of the triad, and on the taking of the quarter the third is found in the sum of the widths of the four frame sides.
If we would frame harmonically a print or drawing with a margin within the frame, we may get the width of both its frame and margin from a third harmonic dimension to the length and breadth of it, and then divide this third dimension into two parts, which shall be the latter two terms of a harmonic triad, of which the first is the whole dimension; and a square picture may be framed in harmony by taking for the harmonic triad (1) the width of the picture and two breadths of the frame; (2) the width of the picture; and (3) the wofold width of the frame.
I think that door frames, shutter frames, and the mantelings or frames of fireplaces may be often fitted for the better to the spaces they bound by harmonic proportions of widths; and though the lettering pieces of bound books are often set on their backs without symmetry either of width or place with the height of the book, yet, if the back of a book were divided into six-spaces, and the lettering piece should take up the third from the top, it would be in harmony with the book's height both in place and measure, since the six spaces of the whole back and the three below and the two above the lettering piece would make a harmonic triad. So, again, I have reason to think well of the elevation of a church of which the heights of the tower, of the nave, and of the chancel are a harmonic triad, while another is made by the ground widths of the nave, of the chancel, and of the tower. It might be worth while also to try whether a steeple would not be graceful if, at three harmonic spaces of height, it diminished by a harmonic triad of widths, or whether a spiral line or a stream or path made to wind through a lawn would not be of graceful bends if at three harmonic spaces it went off from its axis by the measures of a harmonic triad of ordinates.-The Architect.

## Expansion Produced by Amalgamation.

It has been accidentally observed by the authors that the amalgamation of brass is accompanied by great expansive force. If the edge of a straight, thick brass bar be amalgamated, it will be found that in a short time the bar is curved, the amalgamated edge being always convex, and the opposite concave. The authors always convex, and the opposite concave. The authors
imagine that a similar action may be the primary imagine that a similar action may be the primary
cause of the phenomena presented by the Japanese " magic mirrors." Japanese mirrors are made of bronze, and have a pattern cast upon the back, and although to the eye no trace of it can be discovered upon the polished reflecting surface, yet, when light is reflected by certain of these mirrors on to a screen, the pattern is distinctly visible in the luminous patch formed. In a paper before the Royal Society, they have shown that this is due to the polished side opposite the thinner parts of the coating being more convex than the others, a conclusion verified by the fact that the pattern is reversed when formed by a convergent beam of light. Such a condition of things would evidently reult from a uniform expansive stress taking place over the reflecting surface, the thinner-and, consequently, the weaker-parts becoming niore convex or less concave than the others. The authors have hitherto attributed this inequality of curvature to a mechanical distortion to which the mirrors are intentionally submitted during manufacture, to produce the general convexity of the polished surface; but they now think it possible that the use of a mercury amalgam in the process of polishing may have an effect in the production of this inequality of curvature.-Profs. W. E.Ayrtion of this inequalit
ton and.John Perry.

## A Singular Poisoning Case.

The Pharmacetutical Journal and I'ransactions for March 27 gives an account of a singular instance of poisoning in Nottingham, whereby two children lost their lives and two others were made very ill. The deadly dose in this instance was an apparently harmless cough mixture containing the following four ingredients: Sirup of violets, sirup of squill, wine of ipecac, and oil of sweet almonds.
The symptoms that appeared in two or three of the children that had been taking this medicine were very singular, the pulse being intermittent. In the case of one of the children that died, there was an intermission of every third or fourth beat of the pulse. The heart's action was very much interfered with, there being an intermission of one in four or five beats. of one in four or five beats.
The pulses of the third and The pulses of the third and mitted, so that it was evident that there was some peculiar action in their hearts. In considering these symptoms, it seemed to the medical men that there were only one or two preparations twhich were likely to produce that action. One was a mixture of digitalis, or dommon foxglove, and the other the sirup of squill.
In order to ascertain whether the action was due whether the action was du placed in the hands of Dr. Truman, the public analyst, who injected samples therefrom under the skins of frogs. In the case of the mixture made by the independent. chemist there was no slowing of the heart in an hour and three-quarters, when he killed the frog. In the case of the mixture made by Mr. Wakefield there was a total cessation of the heart's action in seventeen minutes. The mixture made by Mr. Wakefield was much more bitter than that made by the other chemist.
Dr. Truman, on considering which of the four ingredients of the mixture was most likely to contain the gredients of the mixture was most likely to contain the
poison, came to the conclusion that it must be either poison, came to the conclus
the ipecac or the squill. The wine of ipecac gave purely negative results in both cases. He then injected ten drops of the sirup of squill from an independent chemist into a frog, and that slowed the heart's action from twentyfoar beats a mirute to ten in two hours and a half, when he killed it.
The same amount of Mr. Wakefield's sirup of squill was injected in the same was, and it produced a way, and it produced a
slowing of the heart's action from twenty eight beats a minute to fourteen in forty-four minutes, and a total cessation of the heart's action by death in two hours.

He afterward made another series of experiments, in which he took larger quanties of the sirup of squill, and he had quantities of it from two independent chemists as well as Mr. Wakefield's. He repeated the experiments in peated the experiments in the same way. Inthe case of the first independent chemist there was no slowing of the heart's action in forty minutes. In the second case there was a slowing of from thirty-one to ten beats a minute in fortyseven minutes, and in $\mathbf{M r}$ Weven minutes, and in Mr. W akefield's case there was
a slowing of from thirty-
to the latter, and the result not due to any accidental characteristics with digitalis. The squill is a bulb gath- being the case, it would naturally follow that the mixing or dispensing of the medicine, the coroner had ered in Russia and Germany. In a squill there is power expended in doing a certain work would be the prescription made up by an independent chemist, found a minute and innocuous proportion of an active greatly reduced, while the capacity, or quantity of and a second time by the chemist (Mr. Wakefield) who principle producing the same effect as digitalis, the rock crushed, would be greatly increased. These originally dispensed it. These prescriptions were quantity of which may be exaggerated by difference desirable results are accomplished by the Sturtevant


Fig. 1.-THE STURTEVANT COMBINED CRUSHER AND STAMP MILL.

A COMBINED CRUSHER AND STAMP MILL
six beats to one beat per minute in thirty-eight minutes. That fact, Dr. Truman thought, showed that the active agent wast present in the sirup of squill. Mr. Wakefield's sirup of squill was very much more bitter and of very much deeper yellow than constructed other sirups. Both his prescriptions contained for rock grinding that has not adopted some form of the process of grinding is a mutual one, the mill as well as the rock bein ground. The ©Sturtevant mill, here illustrated, is a departure from all old methods, and the results accomplished are so remarkable, and the plan of the machine so entirely novel, as to constitute a matter of unusual public interest.
The Sturtevant mill is a combined crusher and pulverizer, seizing rocks of a large size and compelling them to pulverize each other in a most rapid and remarkable manner.
Making the rock do its own crushing and pulverizing is the novel and principal feature of the machine illustrated by the accompanying engravings. It is apparent that if by means of any mechanical contrivance the rock could be made to act upon and disintegrate itself without being crashed or ground between the faces of metal pieces, the machine would be subjected to a minimum amount of wea quantity of which may be exaggerated by difference of climate, difference in the period of gathering, and it is also present to a greater degree in the outer scales and in the recent bulbs than in the inner part of the dry bulb. The vinegar of squill from which Mr. Wakefield prepared his sirup was purchased from a wholesale druggist, and probably contained an unusually large amount of the active principle of the bulb. Sirup of squill is in very common use as a remedy for coughs, and as it has hitherto been looked upon as rather a harmless medirather a harmless medi-
cine, this is an interestcine, this is an interest
ing and unique case.


Fig. 3.-THE STURTEVANT MILL.-THE REVOLVING HEAd. Fig. 4.-THE REVOLVING HEAD takEN ApART.


Fig. 2.-THE STURTEVANT MILL, WITH HEADS DRAWN BACK TO SHOW THE INTERIOR. mill, which, as will be seen from the following description and the cuts, is very simple in construction. And is so arranged that it reduces the hardest materials with scarcely any damage to itself.
The two cylindrical heads or cups are placed upon opposite sides of a case, into which they slightly project, facing each other, and are made to revolve in contrary directions. The rock is conveyed to the interior of the case (which is kept full) through an opening at the top, and is prevented from dropping below the heads by a cast iron screen. The rock is then immediately thrown out by centrifugal force from the two revolving cups, in opposite directions, and with such force that the rock from one cup, coming in collision with the rock thrown oppositely from the other cup, is broken and pulverized, and the grinding, which would otherwise be upon the mill, is transferred to the material, which is at once reduced to powder; in other words, the mill does not grind the substance, but simply provides the power that compels the rocks to crush thernselves.
The cast iron screen, shown in Fig. 2, in which both revolving heads are drawn back, is composed of small sections which can be easilyreplaced whenever required. The wear upon this screen is slight, as it is always protected from the action of the rocks thrown from the heads by a cushion of interposing material formed by the rocks, which constantly fill the case and cover the screen. The crushed rock passes through this screen and falls into a bin. When necessary to reduce the rock to a greater fineness than the screen outlets al-
low, the coarser part of what leaves the screen is reconveyed to the mill by an elevator for regrinding; that which is fine enough being first removed by the usual apparatus adopted in milling. A suction blower causes the air to draw strongly into the mill, thereby preventing the escape of dust.

The revolving heads, shown with the parts assembled in Fig. 3 and separated in Fig. 4, are each composed of two parts, one of which, A, a simple hard iron cylinder, called a bushing, is removable, and when worn can be easily taken out and replaced. As soon be easily taken out and replaced. As soon
as the mill has been put in operation, a as the mill has been put in operation, a
curious formation is made inside of the head of a conical, cup-like stone lining (Figs. 3 and 5), formed by the caking within the head of the material being ground. This lining is of the utmost importance, as it is a complete shield to these parts of the machine. With the exception of the edges of the bushings, the entire interior of the machine is completely protected from wear by the rock itself.
The elementary parts of the mill are clearly shown in Fig. 5. The end of each shaft carries a head holding a bushing that projects a little way into the case. Within each bushing is shown the hollow stone cone, formed by the packing of the *
rock. The hopper is filled with rocks that the case be hopper is filed with rocks that drop into $\mid$ the late Sir Henry Cole, of the original plan by James the the shafts. Chalmers of the adhesive postage stamp, to be printed indicate the direction of revolution of the two shafts. $\mid$ from a die of various values, for use according to weight Immediately after starting, the stone cones form themselves, and become as hard as the rock itself. When these stone cones have been formed, it is apparent that the centrifugal force given by their revolution will hurl out all the rocks forced into them, in the general direction indicated by the arrows. The flying rocks are sure to collide with those moving in the opposite direction, as their journey is made throu sphere of the same material, for the mill is lsept constantly filled. These collisions the rocks expend their force upon each other before reaching the iron work of the machine.
The iron screen is of very small diameter, and the ground rock is let out at once. This is a great economy, for to strike rock after it is once reduced to the fineness wanted is a serious waste of power, and, in metal-bearing rock, to leave a particle of free metal in a machine to be churned and pounded over and again many times, and worn away, would be often to suffer a great loss.

These īills are manufactured by the Sturtevant Mill Company, of 89 Mason Building, Boston, Mass. They are made in six sizes, with heads from 4 to 36 inches in diameter.

Some idea of their capacity may be obtained from the fact that the 20 inch mill will discharge from sixteen to twenty tons of hard rock per hour, and the 36 inch mill will reduce 1,500 tons of hard rock per day.
These giant grinders are of small size, and all of the power transmitted by the belts acts directly upon the rocks reducing each other.

## The Inventor of the Postage Stamp System.

Mr. Patrick Chalmers, of Wimbledon, has issued a pamphlet claiming that his father, James Chalmers, bookseller, Dundee, was the inventor, in the month of August, 1834, of the adhesive postage stamp. It appears that evidence has come to light, from papers be-
(5.


Fig. 5.-ELEMENTARY PARTS OF THE STURTEVANT MILL.

NEW CLUB EOUSE OF THE ST. LOUIS JOCKEY CLUB.* The three illustrations herewith bring at once before the mind a good idea of the general plan and principal details of a new club house now being erected by the St. Louis Jockey Club, which it is expected will cost $\$ 50,000$. Externally, the outline of the building, cost $\$ 50,000$. Externally, the outline of the building,
as presented in the view from the southeast, is broken into many projections-towers, gables, galleries, and porches being combined in such way as to present a most attractive appearance; but on the opposite side, that which looks toward the race course, there are to be two lines of galleries, 16 feet wide, running the entire length of the building, the ends shown at the right in the first engraving indicating their position.
The second line of balcony and porch will have its floor stepped from the face of the porch back to the wall of the building, as with a grand stand, to give the occupants a better view of the races. The interior of the edifice will be handsomely finished and tastily furnished, after the designs shown in the engravings, for the use of members of the association and their families. Bowling alleys, a billiard room, and ymnasium are to be included in the arrangement.
The floors will be of polished yellow pine and the basement and first and second stories will be finished in hard wood. The walls of the ladies' reception room are rough cast and to be finished with gold bronze. The second story is to be devoted to private parlors and dining rooms. The main hall has the principal staircase recessed in it, inclosed by arches and lighted by a skylight.

Manufacturers Must be on the Alert.
The manufacturer who hopes to hold his own in the fierce competition which characterizes modern industry must of necessity keep a sharp lookout for valuable improvements in machinery, and must introduce them promptly when they are presented. The movement of the industries is always forward. Thousands of ingenious minds are continually studying out methods for making processes easier and more economical. Every month some kind of a device for bettering the way of doing a thing, or for saving a little labor, is patented. The manufacturer who simply ignores these things and runs along heedlessly in the old way, with the old devices, will be left behind and beaten as surely as the earth rolls around the sun. A mill built and filled with machinery twenty years ago, and left unimproved, could not begin to compete with a modern mill containing all the new mechanical improvements. And the way to keep a mill property from deteriorating is to add in every important improvement as is it put on the market. The most successful mills are the mills that do this very thing; and they succeed because they do it.-Textile Record.

* We are indebted for our illustrations on this page to the 1llustrated Graphic News, of Chicago, a recently es tablished pictorial weekly newspaper, which presents many interesting features; and will obtain, without doubt, a large circulation in the West.


LADIES' PARLOR.

## A Cheap Concrete.

A kind of concrete made without cement is said to be coming into favor with Parisian architects. It is composed of 8 parts of sand, gravel, and pebbles, 1 part of burnt and powdered common earth, 1 part of pulverized clinkers and cinders, and $11 / 2$ parts of unslaked hydraulic lime. These materials are thoroughly incorporated while dry into a homogeneous mixture, which is then wetted up and well beaten. The result of this is a hard and solid mass, which sets almost immediately, becoming exceedingly strong after a few days. It may be made still stronger by the addition of a small propor-tion-say 1 part-of cement. Among other constructions to which this material has been appplied is named as an example a house 65 feet by 45 feet, three stories high, standing on a terrace which has a retaining wall 200 feet long and 20 feet high. Every part of this structure was made of the hard, economical concrete, including foundations, cellar vaulting, retaining wall, and all exterior and internal walls, together with their cornices, mouldings, string courses, balustrades, and parapets. No bond iron was used in the walls, and no wood lintels, beams, or posts were required. It is claimed for this material that it is not liable to crack or scale, and is extremely cheap, as it can be made almost wholly from materials to be found everywhere. almost wholly from materials to be found everywhere.
Doubtless a further economy could be realized by employing simple machinery for mixing the materials in both the dry and wet stages.

## Properties of Fluids and Solid Metals.

Professor W. C. Roberts-Austen, F.R.S., Chemist of the Mint, lectured recently at the Royal Institution upon "Certain Properties Common to Fluids and Solid Metals."
He began by drawing attention to the early memoir of Reaumur to the French Academy of Sciences on the ductility and malleability of metals, in which he clearly defined the conditions under which colloid metals would actually flow. The resemblances, said the speaker, between metals and fluids have long been known, and present the following eight prominent points: 1. Rejection of impurities on solidification. 2. Surfusion. 3. Flow under pressure. 4. Changes due to compression. 5. Absorption of gases. 6. Absorption of liquids. 7. Vaporization. 8. Surface tension.
In passing from the solid to the liquid state, the metals sometimes present the same phenomena as water; for instance, water distinctly rejects impurity to $a$ considerable extent when it solidifies into ice; an alloy of lead, antimony, and copper on solidifying will reject much of the lead, and take up the remainder. Water may be cooled down to - 8 degrees without actual solidification, but agitation then determines the immediate formation of ice, and the rising of the temperature of the mass to zero is indicated by a thermometer. Faraday stated that sulphur and phosphorus exhibit in their degree the same effects. The master of the Netherlands Mint has proved that gold master of the Netherlands Mint has proved that gold
and silver behave in just the same way. The lecand silver behave in just the same way. The lec-
turer here placed a small cup filled with molten gold upon the table in the dark; the metal cooled to dull red, scarcely visible, then at the moment of solidification flashed up brightly; and rose to the temperature of its solidifying point. Gold fuses at 1,020 degrees, but the slightest trace of silicon will lower the point at which it softens to the melting point of zine.
In 1726 it was discovered by Louis Lemery that under certain conditions lead exhibits a remarkable property. It is common experience that a spurious silver coin has no "ring," and when a metal is not sonorous, the remark is sometimes made, "It is as dull as lead." In an ancient and perhaps now if lead be cast into the form of a segment of a sphere, that is to say, into the form of a plano-convex lens, it will emit quite a sharp note when struck. The speaker illustrated this by experiment, the lead giving a clear tinkling sound. A piece of lead beaten into the same shape with a hammer gave no ring when struck. It
was true, he said, that the presence of a trace of imwas true, he said, that the presence of a trace of imbut he would now strike a piece of chemically pure cast lead, and they would hear that it was sufficiently sonorous to illustrate his point. The conclusion in 1726 was that the phenomenon was due to the way in which the constituent grains of lead touch each other, also to their shape and size. In the recent discoveries on dilatation by Professor Osborne Reynolds, there seemed to be something of the same kind; in the case of the lead there was a true flow, and a passage of small particles of matter from one position
to another under the hammer. A solid may be very to another under the hammer. A solid may be very
brittle, and yet it will flow ; a horizontal stick of sealing wax, supported only at its two ends, will in course of time bend at the normal temperature of the atmosphere, in which phenomenon there is a slow flow of particles; yet let an attempt be made to similarly bend the same stick of wax suddenly, it will snap. M. Tresca, of Paris, by bringing great pressure to bear upon disks of cold lead, forced the lead to
flow through a small hole, from which it emerged
with a rounded end; when a segment of the issuing jet was cut, the lines of flow could be seen. the pressing of iron and steel there are lines of flow. Mr. Roberts-Austen illustrated this by means of a crosshead sent to him by Mr. Webb, of the Crewe Works. The lines were made visible by etching. Ruskin had once made the remark that as men stamped the cow upon the butter, why not stamp the bee upon the honey? It simply was not practicable, because honey flows at the normal temperature. The lecturer continued that the most im portant application in industry with which he was acquainted, connected with the flow of metals under pressure, was suggested by Mr. Baker for the pre-
paration of the steel for the Forth Bridge. He then paration of the steel for the Forth Bridge. He then it in a lathe, and showed how Sir Henry Bessemer had made cold spun ornamental articles from disks of mild steel, 11 inches in diameter. On applying tension, he said, to steel or iron, the metal will extend to a certain point, then there is a permanent set, after which it will begin to flow, and continue to flow until it breaks. Standard gold will do the same, but the presence of a "trace" of lead will prevent the flow" entirely.
Professor Roberts-Austen next drew attention to the experiments of Professor Walter Spring, of Liege, in the submission of cold and powdered metals to im mense presssure. The apparatus (which was shown) used consisted of a ponderous lever press, with heavy weights at the end farthest from the fulcrum, as well as the means of applying screw pressure. The little piston which gave the pressure to the powder passed through a gun metal cap, which had a tap wherewith it was connected to an air pump, so that the air was withdrawn from the interstices of the metallic grains. In 1882 he (Mr. Roberts-Austen) had repeated and verified M. Spring's experiments and results, some of which are set forth in the following table:
Results obtained by M. W. Spring by the Compression of Finely Divided Metals.
 given by the machine, the metals submitted to its action begin to flow through the fine cracks of the
compressing chamber, just as if the metals were so much treacle; for instance, when tin filings are made perfectly clean, the interstitial air removed, and then submitted to pressure, they form a solid little cylinder with wings where the metal has streamed into the cracks, as exemplified by the result which he then exhibited. He also exhibited a wire of lead which had been pressed into that form from fine powder, which wire had a breaking strain very little less than if it had been formed by a melting process. M. Spring has proved that it is possible to press powdered crystalline metals into masses of another crys that it is possible to actually build up alloys by pres sure. Were the old alchemists, then, right in the idea that bodies never combine except when in solution? Experiment proved that solution is not necessary. Chloride of mercury and iodide of potassium are both anhydrous salts. He would triturate them together by means of a mortar and pestle, and they would see duced. The lecturer then took a little pressed bar, made originally from a mixture of powdered tin, bismuth, cadmium, and lead, in suitable proportions, and proved by experiment that those metals had been compressed into a true alloy, which would melt below the temperature of 100 degrees, or far lower than the melting point of the most fusible constituent of the alloy. He applied the heat by means of melted paraffine, since the bubbles in boiling water would not have permitted a clear image of the experiment to It may be argued, he said, that the heat of the compression of the metals sets up incipient fusion. M. Spring had pointed out that the pressure was ap plied with extreme slowness, and that if atl the work were translated into heat, that heat would not be sufficient to account for the result. M. Spring had also by direct experiment given evidence that the heat was below 28 degrees, and he had asked, Is the union of the metals due to regelation? Faraday dis covered in 1850 the regelation of ice, which had enabled Dr. Tyndall to render splendid service to science by furnishing the key to the explanation of the nature of the movements of vast masses of ice, for gelation. Bismuth is a metal which exhibits the phenomenon of regelation. It is difficult to believe, said M. Spring, that ice alone possesses the property of re
tions-give them the necessary pressure, tempera tures, and times, will not the same results be evolved? of soda in a bottle will slowly unite. May there not, however, said the lecturer, be in the compression of gases an analogy to the liquefaction of gases? In gases the molecules are free, but by pressure they are condensed into liquid form by being brought into spheres of mutual action, and metal, by being powdered, may be said to be coarsely gasified. He regretted that the time allotted for lectures would not permit him to enter into all the particulars he desired to give, but he would add that metals, like liquids, could not only be vaporized, and would absorb gases, but exhibited something like surface tension. He here took a thick horizontal wire of an alloy of gold and silver, resting upon its two ends, and merely touched its center with a soluble chloride ; after the lapse of a minute or two the surfaces of the thick wire cracked, and in such a manner as to suggest surface tension. Mr. Fletcher, he said, had first pointed this out to .him.. Professor RobertsAusten then concluded by pointing to the influence of the facts they had considered on art, on science, and on industry.

## How to Avoid Premature old Age。

The following good advice is given by Dr. Benjamin Ward Richardson : The rules for the prevention of senile disease are all personal. They should begin in youth. It should be a rule among grown-up persons never to subject children to mental shocks and unnecessary griefs. When, in the surrounding of the child life, some grave calamity has occurred, it is best to make the event as light as possible to the child, and certãinly to avoid thrilling it with sights and details which stir it to the utmost, and in the end only leave upon the mind and heart incurable wounds and oppressions. Children should never be taken to funerals, nor to sights that cause a sense of fear and dread combined with great grief, nor to sights which call forth pain and agony in man or in the lower animals.
To avoid premature old age in mature life, the following are important points to remember :
Grief anticipates age. Dwelling on the inevitable past, forming vain hypotheses as to what might have been if this or that had or had not been, acquiring a craze for recounting what has occurred-these aets do more harm to future health and effort than many things connected with real calamity. Occupation and new pursuits are the best preventives for mental shock and bereavement.
Hate anticipates age. Hate keeps the heart always at full tension. It gives rise to oppression of the brain and senses. It confuses the whole man. It robs the stomach of nervous power, and, digestion being impaired, the failure of life begins at once. Those, therefore, who are born with this passion-and good many, I fear, are-shouid give it up.
Jealousy anticipates áge. The facial expression of jealousy is old age, in however young a face it may be cast. Jealousy preys upon and kills the heart. So, jealous men are not only unhappy, but broken hearted, and live short lives. I have never known a man of jealous nature live anything like a long lif or a useful life. The prevention of jealousy is di ersion of mind toward useful and unselfish work.
Unchastity anticipates age. Everything that intereres with chastity favors vital deterioration, while the grosser departures from chastity, leading to specific and hereditary disease, are certain causes of organic degeneration and premature old age. Thus chastity is preventive of senile decay.
Intemperance anticipates age. The more the social causes of mental and physical organic diseases are investigated, the more closely the origin of degenerative organic changes leading to premature deterioraion and decay are questioned, the more closely does it come out that intemperance, often not suspected by the person himself who is im'plicated in it, so ubtile is its influence, is at the root of the evil.
When old age has really commenced, its march toward final decay is best delayed by attention to those rules of conservation by which life is sustained with the least friction and the least waste.
The prime rules for this purpose are:
To subsist on light but nutritious diet, with milk as the standard food, but varied according to season. To take food, in moderate quantity, four times in he day, including a light meal before going to bed. To clothe warmly but lightly, so as that the body ay, in all seasons, maintain its equal temperature. To keep the body in fair exercise, and the mind ctive and cheerful.
To maintain an interest in what is going on in the world, and to take part in reasonable labors and pleasures, as though old age were not present.
To take plenty of sleep during sleeping hours. To spend nine hours in bed at the least, and to take care during cold weather that the temperature of the bedroom is maintáined at $60^{\circ} \mathrm{Fah}$.
To avoid passion, excitement, luxury.

ENGINEERING INVENTIONS. A car-axle-box brass has been patented by Messrs. Daniel Reynolds and Joseph S. Murray, o face of the arle journal, instead of almost or the face of the axle journal, instead of almost one-half, as
thecommon broad brasses do, and is intended to reduce the common broad brasses do, and is intended to reduc and economize the hauling and driving power.
A car coupling has been patented by A car coupling has been patented by
Mr. George H. Lipe, of China Grove, N. C. This invention has for its special object to provige for easily un coupling cars jammed or crowded together when they
stop, the coupling pin being supported by an apertured stop, the coupling pin being supported by an apertured
sliding plate which is forced back by the approaching car to allow the coupling pin to fall to couplingposition.
A cable traction for street cars has been patented by Mr. Orlando H. Jadwin, of New York city
This invention relates to the gripping attachments and covers improvements on former patented inventions of the same inventor, relative to relieving the cable of the weight of the gripping attachment by a counterbalance
and the means of attaching the grip to the car by links and the means of attaching the grip to the car by links
so the gripping attachment was made to lift with the sot the gripping attachment was made
cable away from its supporting pulleys.

## AGRICULTURAL INVENTIONS

A cultivator has been patented by Mr Norris H. Shepardson, of West Halifax, Vt. It is so made that it can be readily extended or contracted in
width, and can be conveniently turned around and moved from place to place, the invention covering a novel construction and combination of the various parts A plow has been patented by Mr. Wel lington Shaver, of Medusa, N. Y. The construction i fuctively then an ordinary plow, while it is also design d to prevent sods, clods, lumps, or other rubbish from assing over the mould-board into the central part of assing over the mould-board into the ce
the plow, and thus clogging or choking it.
A plow has been patented by Mr. Andrew McLean McGregor, of Moss Point, Miss. This in vention provides for such a construction of plows that
they can be readily adjusted for use as a right or a lef plow, or a right and left plow, as may be required,
which will be strong and simply made, while the vari ons parts can be made small and the implement used a hand plow.
A self-clearing breaking plow colter has been patented by Mr. Benjamin C. Brownell, of Cen-
ter Junction, Iowa. A spindle-like roller with an outwardly fiaring top extends upward and backward from the point of the colter, and operates so that when the
plow catches obstructions they are forced up and catch plow catches obstructions they are forced up and
the roller, which revolves and discharges itself.
A rotary colter has been patented by Mr. John Feger, of Lenzburg, Ill. The object of this in veatition is to make a colter for plows in which the cutting
phates wilt be held securés' To positton, and the parts plates wilf be held seciriely' To positton, and the parts
subject to wear can be readily taken out and replaced by subject to
new ones.

## MISCELLANEOUS INVENTIONS

A latch has been patented by Mr. Francis Keil, of Aew York city. The invention consists of novel locking devices in connection with the dog by which the bolt is retracted by a key from the outside,
and in a peculiar form of key for the outside locking

A chimney support for telegraph wires has been patented by Mr. Albert Potts, of Philadelphia,
Pa. It consists of a frame clamped to the chimney top
and supporting a short telegraph pole suitably braced, and supporting a short telegraph pole suitably braced,
the frame and the pole carrying insulators for supportthe frame and the pole carrying insulators ing the electrical conductors in the usual way.
A wrench has been patented by Mr . Michael S. Weller, of Charlestown, W. Va. It has a
nozel construction by means of which a face section is noyel construction by means of which a face section is
removably held to one of the jaws of the wrench, being an improvement in that class of
$A$ washing machine has been patented D. Mr. Elmer E. Allison, of Hillside, Pa. It consists of a tub with a rubber to be operated to rub and squeeze
the clothes on the bottom of the tub, the rocking of the the clothes on the bottom of the tub, the rocking of the
rubber rubbing and squeezing the clothes between rubrubber rubbing and squeezing t
ber disks and cleats in the tub.
A folding music stand has been patented by Mr. Oswald S . Vaughan. of Glasgow, Mo. It is an arrangement of tubes and rods so pivoted and joined
together that the stand can be folded very compactly for carrying conveniently by a handle, and can be quickly set up as a strong and durable ptand.
A sash fastener has been patented by Mr. Robert Kemper, of Foster, Ky. This invention consists in a special design of a lever, to which is piv-
oted a brace lever, making a simple device for locking sashes so they cannot be raised from the outside, and for holding the sash at any desired elevation.
An extension table has been patented y Mr. George Schmitt, of New York city. This inven formerly patented by the same inventor, and consists in a novel (construction and combination of the various
parts of the table

A saw mill dog has been patented by Mr. Nathaniel J. Cushman, of North Paris, Me. This
invention covers a special construction and arrangement of parts to provide for the carriages of saw mills a dog
for clamping green frozen logs upon the saw mill car for clamping green frozen logs upon the saw mill car
riage while being sawed into boards, planks, or joist.
A riving machine has been patented by with a series of frows or knives is a rotary shaft passed with a series of frows or knives is a rotary shaft passed
loosely through their upper ends, with arms mounted on the shaft between the frows and constructed to remove
the split material, with other novel features, making an improved machine for splitting boards, shingles, etc.

A flood gate has been patented by Mr. John Dailey, of Van Wert, O. It is intended to prevent nimals from passing up or down a stream, but is so
rranged that when struck by any heavy debris it will swing and be automatically raised to allow its passage,
the gate being so mounted that it may be raised quite a the gate being so mounted that it may be raised
distance above the bed of the stream if desired.
A shipping tag has been patented by Mr. John A. Pegg, of Jonestown, Miss. It is a metal lag or label through which the shipping marks are to be punched, the metal plate having serrated edges on two
opposite sides, and fianges, the tag to be secured to a tie opposite sides, and fianges, the tag to be secured to a tie
by springing the flanges with a pair of pliers with wide opposite
by sprin
jaws.
A lead for setting stained glass has been patented by Mr. Jacob Pfleging, of New York city. It is a lead having grooves formed in it in combination
with stiffening strips made of plates of tin or other mewith stiffening strips made of plates of tin or ouch plates
tal, both edges of the strips being grooved, such rendering the panels sufficiently firm and rigid without braces or rods.
A coffee roaster has been patented by Mr. Mathias A. Laska, of New Orleans, La. The stirring arms or blades are placed loosely on the revolving
shaft, and held in contact on the bottom of the roastshaft, and held in contact on the bottom of the roast-
ing pan by a spiral spring, preventing the coffee beans from clogging up the arms, and roasting them equally and effectually.
A stove pipe damper has been patented by Mr. George C.Fraser, of Port Sanilac, Mich. The
pipe has semicircular partitions and pivoted semicircular damper valves arranged therein, so the smoke and draught mast pass through the pipe on a zigzag line, and the partitions stop the sparks, permitting the easy
government and regulation of the fire.
A churn has been patented by Mr. Peter Hauersperger, of Urbana, Ill. The cream box is rectan-wedge-shaped bottom, which permits a small quantity of cream to be churned with as much care as a larger
amount, the churn being an oscillating device which amount, the churn being an oscillating device

A wood carrier has been patented by Mr. Charles G. Fransson, of Norway, Mich. It consists of a strip of canvas so folded as, with gores, to
form a pocket, the ends being provided with bars, the form a pocket, the ends being provided with bars, the
canvas having hand holds to grasp the bars, and the bars also having hooks and eyes by which the canvas

A sheep protector has been patented by Ir. William L. Lewis, of Sweet Springs, W. Va. It ha bout the shape of a horse coat or covering, and is made ial, and sil cloth or rubber fabicor other similar mate snow and moisture, and will thus be an effective pro ector for animals against the weather.
A velocipede has been patented by Mr. Samuel Martin, of Mill Rock, O. It has two driving frame and seat a guide wheel in turning bearings, and frame and seat, a guide wheel in turning bearings, and a
specially devised brake, and it is to be propelled by one, two, or more persons, being adapted to attain a great rate

A windmill has been patented by Mr . Jules R. Desjardins, of Burlington, Vt. It has a nove
mechanism for adjusting the stops that regulate th mechanism for adjusting the stops that regulate the
position of the hinged fans or sails, to provide for
checking the speed of the wheel automatically position of the hinged fans or sails, to provide for
checking the speed of the wheel automatically when
the wind pressure is excessive, and when the wheel is the wind pressure is excessive, and when the wheel is
not in use it can be arranged so that the fans offer no not in use it can be ar
resistance to the wind.

A book clasp has been patented by Mr Jacob Monch, of Offenbach, Germany. It consists in a half of which is threaded with a right handed threa and the other half with a left handed thread, by whic specially devised arms can be spread or contracted, so a
book, album, or file fitted therewith will be adapted to contents of variable quantity.
A vehicle brake has been patented by Mr. James L. T. Linson, of Johnson County, Mo. This and combination of parts, so that when the draught is applied the brakes will be taken off the wheels, and so held, and when the vehicle moves suddenly forward on a down grade,
to the wheels.
A chain bolt for doors has been patent ed by Mr. James B. Hawes, of North Tarrytown, N. Y.
Combined with a sliding bolt and its chain applied to a door and casing or a double door is a supplementary chain with one end connected to the other chain or its support, and the other end detachably connected to the
bolt or its chain, the device being also for use as a door bolt or its chain, the device being also for
fastening when the doors are fully closed.
A whale shaped museum building has been patented by Mr. Anthony Ward, of Brooklyn, N.
Y. It has a movable lower jaw, with movable teeth, to admit spectators, and gravity cars to carry them out, while there are ventilating openings in the back, and
above the back are placed perforated pipes, whereby a fine spray of water can be showered upon the back of

## A shingle the main chamber cool.

A shingle has been patented by Mr. Robert C. Snowden, of Elizabeth; Pa. It is formed of
sheet metal, having interlocking portions and provided with a lateral horizontal flange terminating short of the
end of the shingle, whereby to form a stop for the adend of the shingle, whereby to form a stop for the ad-
jacent shingle, with other novel features, to combine

## and removal.

A tension mechanism for spindles of Hartness, of Torrington, Conn. Combined is a cross pin or key, a spring acting on the key, and a cam plate
on which the key is turned, with other novel features in an improved spindle, intended to allow the tool to yield as the strain approaches the breaking point, but not to A ield until this point is almost reached.
A safety attachment for watches, etc. Aa been patented by Mr. Otto G. Faber, of Washingto
D. C. Combined with a chain swivel having a supple plate with perforations, supporting bail, and oth novel features, to prevent watches from being dropped
out of or stolen from the pocket, while the attachmen is one which can be conveniently applied to a garment. A stove has been patented by $\mathbf{M r}$ Frank Brielmair, of Nashville, Tenn. It has a partition on one side of the firebox, between which and the outer
wall is a compartment having slides, and a perforated outer casing through which a lug on the slide passes, the partition having apertures at its top and bottom, ing of the draught.
A machine for making lead pipe has been patented by Mr. Christopher C. Tracy, of Brook-
lyn, N. Y. This invention consists principally in lyn, N. Y. This invention consists principally in a from the point of alignment with the die holder, thus facilitating the removal of the mandrel as desired for replacing it with others for different sizes, and also th pouring of the molten metal.
A beer and water cooler has been patented by Mr. Joseph F. Shomate, of El Dorado, Ill There is a refrigerating box for receiving the barrel or conducted from the barrel through this cylinder, which is surrounded by broken ice, and the whole being
mounted on castors for ready moving from place to mounted
place.
A gas regulating burner has been pat ented by Messrs. Joseph J. Butcher and Johann H.
Wuster, of Newcastle-upon-Tyne, England. A small permanent flame is used, beside the larger burner whic has to be lighted, and the working part of the apparatu consists of a valve actuated by the pressure of the gas,
the edges of the valve being sealed by mercury, there being a pressum governor, which may or may not be

## NEW BOOKS AND. PUBLICATIONS

The Amateur Photographer. By Ellerslie Wallace, M.D
phia : Porter \& Coates.
The art of photography has, of late, attracted so ing lite the beginner. Of the host of writers who have thus endeavored to throw some light on dark places, pro-
bably none has succeeded better than Dr. Wallace bably none has succeeded better than Dr. Wallace.
His convenient little manual presents a clear and concise description of the different apparatus and processes. An ardent amateur himself, at a time when the professional studio, the author has had an excellen opportunity to study the development and merits of recent methods. So well has he availed himself of this cpportunity, that he is now a recognized authority
on the subject. While the size of the book prevents on the subject. While the size of the book prevent
it from being at all exhaustive, it covers as much ground as the ordinary amateur will haves time to master,
guide.
Assignmen's of Patent Rights. Com
piled and arranged by Schuyler Dur
Office. Washington: Schuyler Duryee, 1886. Price $\$ 3$.

Numerous questions respecting the assignment of pat ent rights are constantly arising. To answer them in telligently, it has heretofore been nesessary to search
through an almost equal number of works of reference. Mr. Duryee's experience, as Chier of the Assignment Division of the United States Patent Office, gave him digest of decisions relating to the transfer of patent rights. It is the purpose of his work to supply this
want, and as far as we have been able to examine it want, and as far as we have been able to examine it,
he has succeeded admirably. An alphabetical list of cases cited precedes the index. A digest of decisions The proper forms for all deeds respecting the whole or The proper forms for all deeds respecting the whole or will be found a valuable addition to the literature

Education (Wm. A. Mowry, publisher, n) for April contains a number of interesting papers on educational subjects. "The Relation of the
Secondary School to the College," by Mr. Willard, offers several valuable suggestions regarding the adoption of
a uniform standard for admission of students to coleges and the establishment of some degree of co-operation between these institutions and the preparatory scribed in Mrs. Houghton's "Evolution of a ColdeRepublic." is of particular ethical interest Dr. LowRepublic," is of particular ethical interest. Dr. Low-
rey also continues his discussion of the "Philosophical Phase of a System of Education." Current events
The Lidgerwood Manufacturing Company, whose works are in Brooklyn, N. Y., and who just issued a handsome illustrated catalogue of their hoisting engines, of which they make a great variety,
and of their stationary and marine boilers and general nd of their s
team fitttngs.
Messrs. Jones \& Laughlins, of Pittscold rolled steel and iron shafting, couplings, pulleys, pulley stands. binder frames, jib frames, etc. In this conclusions as to the advantages of cold rolled iron and steel, with a list of shapes and sizes of iron and
steel supplied cold rolled by the firm.
Messrs. Guild \& Garrison, of Brooklyn, . Y., describe some of the most important of their logue. Besides making pumps for almost every known industrial use, the firm also make air and gas blowers,

## A competent steam engineer Mer me Address box 5169 , Boston, stating wages.

See Burnham Automatic Engine adv.last and next week
Curtis Return Steam Trap returns all condensations into the boiler without waste. Curtis Regulator Works.
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Wanted.-A Mechanical Draughtsman wanted to go West. One acquainted with wood working machinery preferred. Steady emplyment to a sober and industri-
ous man. Address, with full particulars, stating wages
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odes, pure nickel salts, polishing compositions, etc. \$100 odes, pure nickel salts, polishing compositions, etc. $\$ 100$
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Co., Newark, N. J., and 92 and 94 Liberty St., New York. Grimshaw.-Steam Engine Catechism.-A series of thoroughly Practical Questions and Answers arranged
so as to give to a Young Engineer just the information so asired te to him for properly running an engine. By
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roe Street, Chicago.
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Munn \& Co., 361 Broadway N. y. Free The Knowles Steam Pump Works, 44 Washington
St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and im proved forms of Pumping Machinery of the single and
duplex, steam and power type. This catalogue will be duplex, steam and power type. This
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pages, leather, pocket-book form, $\$ 4.00$. For sale by Munn \& Co., 361 Broadway, New York
Machinery for Light Manufacturing, on hand and
built to order. E. E. Garvin \& Co., 139 Center St If an invention has not been patented in the United States for more thas note year, it mayted still be patented in
Canada. Cost for Canadian patent. \$40. Various other foreign patents may also be obtained. For instructions address Munn \& Co., Scientific American paten
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Presses \& Dies. Ferracute Mach. Co., Bridgeton, N. J.
Iron Planer, Lathe, Drill, and Iron Planer, Lathe, Drill, and other machine tools of Nystrom's Mechanics.-A pocket book of mechanics and engineering, comtaining a memornandum of facts and
connection of practice and theory, by J. W. Nystrom. C.E., 18th edition, revised and greatly enlarged, plates $12 \mathrm{mo}$, , roan tuck. Price, $\$ 3.50$.
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Tools, Hardware, and other specialties made under Supplement Catalogue.-Persons in pursuit of infor mation subject, can have catalogue of contents of the ScI entific Ammitican Supplement sent to them free The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physica
science. Address Munn \& Co., Publishers, New York. Cyclone Steam Flue Cleaners are the best. Crescent mfg. Co., Cleveland, O
Curtispressure Regulator and Steam Trap. See p. 142 cushman's Chucks can be found in stock in all larg ford, Conn.
The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.
Friction Clutch Pulleys. D. Frisbie \& Co., Phila. Tight and Slack Barrel Machinery a specialty. John Greenwood \& Co., Rochester, N.Y. See illus. adv., p. 158 "Wrinkles in Electric Lighting," by V. Stephen;
with illustrations. Price, ${ }^{\text {\$1.00. E. \& F. N. Spon, New }}$ with ill
Iron and Steel Wire, Wire Rope, Wire Rope Tram Astronomical Telescopes, from $6^{\prime \prime}$ tolargest size. Ob servatory Domes, all sizes. Warner \& Swasey, Cleve
land, 0 . "Affiction sore long time he
Physicians were in vain."
Rut had he used Dr. Pierce's " "Golden Medical Discov-
ery," the greatest blood purifier known, he might still be living. For all scrofulous diseases this preparation is sovereign and never-failing remedy. All humors, from a pimple to an ulcer, yield to it. It will cure consumption (which is a scrofulous disea
time. All druggists have it.
Catarrh, Catarrhal Deafness, and Hay Fever permanple applications, made at home. Send stamp for descrip tive pamphlet to Dixon \& Son, 303 West King St.,


(1) J. A. K. writes: I have a telephone wire running from my house to the store: how can I
attach a ground wire to prevent lightning from folattach a ground wire to prevent lightning from fol
lowing the telephone wire into the house or store
A. Carry a wire from your gas fixtures or water pipe
the vicinity of your telephone. Let it terminate a metal comb about two inches long, with forty or ifty sharp teeth like a saw. Screw this to a board
Opposite, and with its teeth facing those of the firs Opposite, and with its teeth facing those of the first
comb, place a second one connected to the line wir comb, place a second one connected to the line wire
near the telephone, between it and the line. Have the teeth of the two combs as close as possible with out absolute contact existing. Use
tachments at each end of the line.
(2) E. R. W. asks : 1. Does it take current of higher tension to run an incandescent lamp hen an arc lamp? A. In general terms, it is the 2. Will a ten inch Grenet cell run a 6 candle power incandescent light? A. No. 3. Suppose I wish to light a private residence with incandescent lamps;
vould it be economical and profitable to use a Ship man aut ize? A. Electric lighting on the small scale with special plant is not economical as a rule. 4. What is
the best battery for telegraphic purposes? A. For closed circuit, gravity (sulphate of copper) batteries are ly used. For open circuit work Leclanche celle
(3) J. T. D.-A solution of orange hellac in alcohol is generally used on the plates of
(4)
(4) C. P. K. asks: Will a solution of ichromate of potash and sulphuric acid corrode or side with lead? Can the same fluid mixture be con tained in a wooden tank coated outside and in with asphaltum varnish? If so, how long would such a
tank last? A. Either tank will answer for battery nid for an indefinite period. If oil of vitriol and chromate of potash, undiluted by water, were used bility cannot be given.
(5) H. W. B. asks : 1. What difference oes it make in the strength of an electro magnet Whether the coils are wound in regular layers or put on
oughly? A. The power of an electro magnet depend on the proximity of the exciting wire to the core and on the number of convolutions. To secure these ends, the wire should be smoothly laid. 2. Which would work tephones wound with No. 34 cotton-covered wire those wound with No. 36 wire? A. The No. 34 wire
telephone. 3. What is the penalty for making, sellelephone. 3. What is the penalty for making, sell-
ing, or using a telephone? A. This is determined in What could be is of course no statutory penalty What could be done to a person for connecting orking of the line, and he could not use it for conversing, but only for listening? A. This might give rise to a suit for infringement or for trespass, or possibly something much more serious than either of these. 5. Where is the best place to take a course in electrical engineering, and also in mechanical engineering, with length of courses? A. The Stevens Institute of Techology, Hoboken, N. J.; the Boston Institute of Tech lege of Cornell University, Ithaca, N. Y. The cours is generally four years.
(6) O. W. asks how to make a cheap nd also a very good battery. I have three glass jars, each about 8 inches high and 6 inches wide. A. Use
flat carbon plates, about 8 inches by 4 inches by $1 / 2$ inch, fat carbon plates, about 8 inches by 4 inches by $/ 8$ inch,
and zincs to match,but thinner. Amalgamate the zincs vith dilung with mercury, keeping the surf used as a rubber for the uther. For exciting fiuid, mix five fiuid ounces of oil of vitriol with three pints of cold water, and after it has cooled add six ounces finely powdered
bichromate of potash. A little nitric acid will improve bichromate of potash. A little nitric acid will improve
the constancy. Each cup contains one plate of zinc and one of carbon; connect zinc of one to carbon of next; not let the plates touch each other under
(7) W. J. McC. asks how to take the sound off an acoustic telephone into a receiver, and also
how to make the receiver? A. Acoustic telephones, called, consist of two similar instruments, one ach end of the line. Each instrument is substan shaped. To its center is attached one end of the line wire, which may be of steel, and which strains the its course by loops of leather or muslin. Sharp bends are prejudicial. The wire must be tightly strained fom drumhead to drumhead. On speaking into one instrument, the sound is repeated in the other. We
efer you to advertisements in our columns. (8) F. D. H. asks: 1. What gears are eared lathe, whose lead screw is 6 per inch 9

$$
\begin{aligned}
& \text { e, whose lead screw is } 6 \text { per inch } \\
& \text { A. Spindle } 12 \text { or } \frac{24}{36} \text { or } \frac{48}{} \text { or } \frac{8}{76} \\
& \text { On screw } \frac{19}{38} \frac{57}{76} \\
& \text { ment will resist the action of alcol }
\end{aligned}
$$

2. What cement will resist the action of alcohol (for an unlimited time), and will attach smooth metal to
A. Glue and whiting if the alcohol is anhydrous.
(9) A. H. H.-The independent cut-o a a steam engine is more perfect in its action and coning by one valve. Engines with independent cut-offs
are more expensive than the plain ones. Govd clean tin cans are worked up into stamped goods, such as
toys, etc., but will not pay freight charges. (10) C. C. S.-In both the Bessemer and Clapp-Grifiths process, the silicon is first oxidized and
combines with the ferrous and manganous oxides to combines with the ferrous and manganous oxides to
form a siliceous slag. The carbon then burns, the disform a siliceous slag. The carbon then burns, the disappearance of the carbon flame indicating the end of
the reaction. We believe that a basic lining has never been used in the Clapp-Griffiths converter, but of fire clay and magnesia which you suggest would not work, as any excess of silica in the slag would on with which it had combined, and the phosphorus would be again reduced by the carbon, or, at such an
elevated temperature, even by the iron itself. You elevated temperature, even by the iron itself. You
would thus defeat the very purpose for which the would thus defeat the very pur
magnesia and lime are employed.
(11) K. E. E. M.-The furnace referred to in our article on the Clapp-Grififths steel process a
having produced 325 tons of pig iron in 24 hours is lo cated atthe Edgar Thomson Steel Works, Bessemer, Pa We believe that it is designated as "Furnace D," an that the diameter of the bosh is 21 feet, the height of the shaft being over 100 feet. As far back as the
spring of 1883 , it had produced 305 tons of pig metal in 24 hours, and we were informed, at the time of our last visit to the works, in February, that the recor
(12) W. R. P. asks the highest temperatare (C. scale) yet produced by combustion, also by elec
tric arc? A. $1,600^{\circ}$ C. in steel furnaces. About $2,500^{\circ}$ C. by hydro-oxygen blowpipe. Probably $500^{\circ}$ highe
(13) N. T.
(13) N. T. G. asks: What will darken he color of a mustache without using common dyes A. There is nothing more satisfactory than the com mon silver hair dyes. An excellent brown dye is de under title of "A Bismuthic Hair Dye." The expressed juice of the bark or shell of green black-walnuts is the simplest form of hair dye.
(14) M. H. S. writes for a recipe for the glaze known as salt glaze, such as is used on chea
yellow and Rockingham pottery. A. Common salt yellow and the oven with protery. A. Common salt in an irriguous smoke. This the salt, heated to redness, receives, and is decomposed into hydrochloric acid and soda, the vapors of which fill the oven. The inside
and outside of the vessel submitted to this process are thus simultaneously glazed. See Wagner's Chemical Technology, under " Pottery.'
(15) F. G. B. desires a receipt for color ing the skin to a dark complexion and a preparation to Spaniard. A. The general principle in making such preparations consists in mixing the dry powder, a little
darker than the desired tint, with some fat, such as petrolatum or lard. A formula for a brown face pain

## Burnt umber.....

Cacao butter
.1 part.
Cacao butter
Oil of neroli.
6 parts.
drops.
Melt the cacao butter, add the umber, and while cooling make an intimate mixture, adding the perfume towar
(16) W. B.
(16) W. M. B. asks: How are silver flowers worked into iron for ornamentation? A. The
design is etched out of the iron by means of acids, and the silver is then brazed in and polished down.
(17) D. H. N. - The largest driving wheel on a locomotive in the world is said to be that of one built for the Bristol and Exeter Railroad, England,
in 1859. It was originally 9 feet in diameter, but its
(18) M. F. D. asks (1) a method for effectually deodorizing carbon bisulphide. A. Distill the 'carbon disulphide with quicklime, the two substances having been in contact for 24 hours. The dis-
tillate to be received in a flask partially filled with clean copper turnings. 2. In a mixture of rubber
cement, with a given quantity of ultramarine blue added, does the ultramarine blue add to the unpleasant odor of the carbon bisulphide? A. We should
think not; but yon can obviate any difficulty of that chink not; but yon can obviate any difficulty of that
chater by using chloroform or ether as a solvent for e rubber.
(19) R. H. R. asks if cast zinc plates will do in a Grove's battery. A. They will answer, but rofled plates are preferable on account of
and uniformity of composition and structure.
(20) C. B. H. asks for black ink for use n the hektograph. A. Use a strong aqueous solution of nigrosine (aniline black) in the proportion of about
1 of the coloring material to 5 or 7 of water. It must of the coloring material to 5 or of
(21) F. R. W. writes: What can be put n melted sulphur to toughen it, so that articles cast from it will not crack when cold? Sulphur alone is
apt to crack if heated unevenly. A. When sulphur apt to crack if heated unevenly. A. When sulphu remains soft, and so plastic that it may be advantageously employed for obtaining impressions of woodcuts and engraved plates; these impressions, as the sulphur again hardens after a few days, are used
as moulds. We know of nothing that can be added to as moulds. We know of nothing that can be added to
sulphur to lessen its brittleness, but it is used a
(22) E. Y. E. desires a sure way to de tert sewer gas in a house, and the remedy. A. There
is no direct way of always certainly detecting the presence of sewer gas. It can be inferentially de termined where defective plumbing exists. The only
remedy is to be sure that your plumbing is perfect. (23) G. A. D. desires a formula which when applied to highly polished brass will keep it
absolutely bright, and free from tarnishing. A. Thinly absolutely bright, and free from tarnishing. A. Thinl
(24) H. H. says: If I have a tank containing compressed air, 10 pounds to the inch, and
the temperature of air in the tank is $80^{\circ}$, what will be the temperature of air in the tank is $80^{\circ}$, what will be the increased space the air would occupy with same
pressure, the temperature being raised to $160^{\circ}$ Fah.? What is the law or rule governing air under such conditions? A. For approximate calculations allow one true rule is that air under constant pressure expand one forty-ninth of its volume at $32^{\circ} \mathrm{F}$. for each degree F . This would give for your ease the following result: 1,000
1,148 parts.
(25) W. M. S. writes: I have bought a ight, and it gives a firing. A. This is a common fault of light guns.
They recoil less with light charges of both shot and powder, but the difficulty cannot be entirely overcome
without permanent weight added to barrel and stock.
(26) R. A. H. writes: I saw a man selling what he called a magic class, a piece of plain win,
dow glass, which by breathing on would display figures. How was this done? A. The drawing is made on the glass by means of soapstone or steatite; when breathed on it appears, and disappears as the moisture from the breath dries away.
(27) A. H. G. asks how to color whiteasily. A. Add brown sienna to the whill not wash of o produce the desired color, and mix with alum or glue
(28) J. M. L.-Sugar, glycerine, and um arabic are the articles used to produce the glossy ppearance of ink.
impede the fiow.
(29) W. H. asks (1) if there is any fluid Fah.) more expansive than mercury. A. No. 2. What is the most expansive metal or other solid known
not destructible under a temperature of $300^{\circ}$ Fah.? . Zinc.
(30) " 4 man ."-There is no necessary reation of resistances between the secondary coil of the
nduction coil and the telephone. The primary of the induction should leave about $1 / 2 \mathrm{ohm}$ resistance; for the econdary and the telephone, 80 ohms is good.
(31) C. H. S. asks about tempering mill picks. A. There is no special art in tempering mill ools for hard substances. Water at ordinary temperaure with a litte salt in it. Do not draw the pick thin, nd use great care not to overheat the corners, which is the cause of all the trouble. A slow, dull fire for thick and grind thin " is an old maxim.
(32) H. \& S. write: We recently bought a keg of poster printing ink (black), which is so thick
that it will not distribute on the rollers. How shall we hin it? A. With boiled oil. You have probably been using yourink in a cold room, and it would, most likely,
(33) W. L.' R. asks: Why is the center of connecting rods of stationary engines made heavier (34) C. Q. H. asks the strongest wood, proportion to its weight, that would be suitable for making framework for a fiying machine? A. Lance
ood.
(35) G. G. McC. asks how to get a black dye or stain for cast iron that can be varnished. Dip ng gall nuts in water, in a glass or earthen jar.
(36) J. H. (of California) writes: I dry quite a good deal of fruit, apricots, peaches, apples. etc., Hare used galvanized iron, but the coating does not last nore than one season. I then coat with shellac varnish. Can you snggest anything better and more last-
ing? A. We know of nothing better than cheese ng? A. We know of nothing better than cheese
cloth on wood gratings, often renewed, for health and eanliness.
(37) G. R. asks the acids and any component parts of fluids that make a mantel piece orna-
ment in a bottle, I think zinc and acetic acid. The ont in a bottle, I think zinc and acetic acid. The
ornament is inside the glass bottle. A. Dissolve 1 unce lead acetate (sugar of lead) in $11 / 4$ pints distilled ater, add a few drops of acetic acid, place the liquid zinc in it by means of a fine thread suspended from
(38) F. E. asks whether water in range wilers heated by water back is suitable for cooking water from the range boilers is a great deal used by cooks, for boiling vegetables and meats. If the boiler is tin lined and much water used through it,
here is less objection. Water that has remained hot in he boiler a short time gives an unpleasant odor, and
(39) W. H. R.-Lead 6 parts by weight, bismuth 7 parts by weight, cadmium 1 part by weight,
(40) G. A. S. writes: I have seen the tatement that the greatest number of revolutions ever
ecorded of a shaft making was 57,000 per minute in a cry fine a shaft making was 57,000 per mine built in light. Is this correct? A. The highest velocity in Wheatstone's apparatus was 48.000 per minute. See cientific American Supplement, No. 165, for fuli
escription. Also Supplement, No. 168, for experiments on the duration of the electric spark with speed of 20,000 per minute. Have no doubt that 57,000 is
(41) W. P. T. says: Please give me the reatest speed of any boat you know of. A. A new
(42) C. F. C. asks how to stop the crack in a plated coffee pot, which got cracked by a fall.
A. It will be necessary to coat with solder, and possiIt will be necessary to coat with solder, and possibly the following simple process will answer: Cut a
piece of tin foil the size of the surfaces to be soldered, piece of tin foil the size of the surfaces to be soldered,
dip a feather in a solution of sal ammoniac, and paint ver the surfaces of the metal; then place them in it so arranged on a piece of iron hot enough to melt the foil. When cold they will be found firmly fastened the foil.
together.
(43) C. S. asks for an ink or similar reparation, which may be printed upon brass or zinc plates, and that will resist muriatic and nitric acids.
Take of chloride of potassium $1 / 4$ ounce, soft water pint. to be kept in glass and used with a quill pen. . An ink that may be printed with upon glass to
resist hydrofuoric acid. A. You will find that it is resist hydrofiuoric acid. A. You will find that it is
the glass that is attacked by the hydrofluoric acid and not the ink. Any carbon ink, such as printer's ink or asphalt ink, should resist the action of this acid.
(44) J. T. H.-Gold is worth per troy ounce $\$ 20.67183$. Rare metals are quoted by the
gramme. Reducing this to troy ounces we have omit. gramme. Reducing this to troy ounces we have, omit
ting fractions: ting fraction
Barium..
Barium.................. $\$ 124.00$ per troy ounce
Calcium.............. 311.00
Osmium................ 93.00
".
Rubidium............... 62.00
Zirconium... ......... 496.00 ".
".
(45) J. P. writes : I have a marble man tel in my house stained in imitation of porphyry. The staining is wearing off in spots, exposing the white marble; what kind of paint or stain can I use to make
it a plain color? A. Marble may be stained or dyed of various colors by applying their solutions to the stone made sufficiently hot to make the liquid just simmer on the surface. Success in the application requires considerable experience. For a brown color,
a tincture of logwood is used; for blue, a tincture of a tincture of logwood is used; for blue, a tincture o
litmus is used; and for crimson, a solution of alkane root in oil of turpentine.
(46) J. H. P. asks whether a wide angle lens is as good for copying or enlarging small negatives as a portrait lens. A. No; it is much slower, and
not as rectilinear. For accurate work a Dallmeyer, Steinhiel, rectilingar, or a Ross rapid symmetrical lens Steinhiel, rectilingar, or a Ross rapid symmetrical lens,
with daylight or a powerful artificial light, is the with
(47) C. C. writes: Suppose it requires 500 pounds of water at $60^{\circ}$ per hour to extract a cer-
tain amount of heat, how much air at the same temperature per hour would be required to extract the same heat, and what is the rationale of the calculation! A. As the specific heat of water is 1 , and the specific heat of air is $0 \cdot 2377$, then $1 \div 0^{\circ} \cdot 2377=4 \cdot 2$ pounds of air to equal 1 pound of water. As air is 773 times lighter
than water, and as your 500 pounds of water is equal than water, and as your 500 pounds of water is equal
to about 8 cubic feet, you will require $8 \times 773$ or 6,184 to about 8 cubic feet, you will require $8 \times 773$ or 6,184 cubic feet of air to equal the cooling effect of 500
pounds of water. You will also require a much larger surface for air cooling.
(48) J. B. says: In the Scientific American of April 3 (query No. 8), A. B. S. asks if
tube sheet that has a crack between the tubes can be repaired successfully. I say yes; thus: drill a hole in the crack midway between the tubes large enough $t$ tap with a taper tap ( 16 thread), so that the thread will cut a little into each tube, then cut a plug a little ta pering and screw it into the hole as tight as it will go
and then cut the plug off a little outside the head, and and then cut the plug off a little outside the head, and
it will be a success, and last as long as the head will, it will be a success, and last as long as the head will,
If the crack is too long for a $3 / 8$ or $1 / 2$ inch plug to fill then 2 or 3 can be put in, but each will have to be pu cut into the first a little, and so on.
(49) J. M. asks : How many horse power will it require to furnish steam for a drying room $14 \times 14 \times 8$, temperature $120^{\circ}$ to $150^{\circ}$ ? How many colls
of pipe, and the best way to arrange them, etc., fo of pipe, and the best way to arrange them, etc., for
drying fibrous plaster plates $1 / 2$ inch thick? Is steam or末öt air preferable? A. You will require about 3 horse power and about 700 feet 1 inch pipe, which may be arranged in a fiat coil just above the floor. For ven-
tilating, have a small inlet for fresh air under the coil, tilating, have a small inlet for fresh air under the coil,
so as to spread the air to all parts of the coil and in so as to spread the air to all parts of the coil and in
the same manner ventilate the top, so as to allow al parts an equal escape for the moist air. Steam is bes for the dry room, a hot air stove is preferable
(50) H. R. H. asks : 1. What is a good material to use to paint a fireplace and also fende
where the japan is burnt away? A. We know of where the japan is burnt away? A. We know of of a fireplace but the hard-baking japan. Has the tunnel under the British Channel ever bee begun? A. About a mile of preliminary tunnel on each
side of the channel has been done. The work waits the uthority of Parliament.
(51) F. W. L. asks: 1. Is there any cement which is suitable to fill cracks in brass such as factorily? A. Use shellac melted in. 2. A good re cipe for brass lacquer. A. Clear shellac dissolved in 95 per cent alcohol. Settle, and decant the clear
lacquer. 3. Is there any cement easy to apply which will make good electrical connections, as, for instance between German silver wire and the brass or copper
plates of a rheostat ? A. Nothing but metallic solders.
(52) W. T. B. asks the distance that steam can be carried to advantage for heating purposes with a pressure of about 100 pounds. Also the best method.
A. It may be carried several thousand feet in wrought iron pipe through subways of brick or wood; pipe should be well felted, and arranged for taking up ex-
(53) F. M. asks if ${ }^{\circ}$ there is any difference in the power quired to move a live or dead weight on a wagon. A. On a perfectly even track there should
be no difference in traction for a load of given weight, whatever its composition may be. On a rough road or cobble-stone street, elasticity in the load becomes
equivalent to springs on a wagon, and if not lessenequivalent to springs on a wagon, and ir not lessen
ing the average power of draught, it mitigates the severity of draught, and in this way makes a differ ence in favor of live or elastic loads.
(54) W. A. S. asks (1) what pigment to ase to color glass paneseither a light violet or light green holic solution of bleached shellac or sandarac and a concentrated alcoholic solution of a convenient aniline color. The latter solution is added to the former just before asing. It is well to heat the glass slightly before coating, and we think that it will be found better to apply putty, that would not be broken off either by frost pamps A. Putty is mo ber ther by frost or very fine, and mixed with linseed oil till it becomes about the thickness of dough; if properly made and used, it is not affected by ordinary cold or damp.
(55) W. S. \& Co. ask a way to cover a cement, etc. A. Asbéstos cement and hair ftlt are
both good. If not available, use a thin sheet iron jacket
set up around the drum, having 2 or 3 inches of space betweeen jacket and drum, which fill with the dry ashes from the ash
is cheap and durable.
(56) E. H. McM. asks how compound sulphate of indigo is made, giving quantities, etc. A. nto 5 pounds of 1 pound of the best indigo finely round; expose this mixture to a heat of about $160^{\circ}$ Fah. for 10 or 12 hours, stirring it occasionally. Great
are must be taken in its preparation to prevent over care must be taken in its preparation to prevent overthe indigo, yielding indigo green and sulphurous acid.
(57) J. S.-The pancratic eyepiece has its best position for definition. They are not much in use for ordinary telescopes. If necessary, use two eye-
pieces. The power to read or define print at a distance peces. The power to read or define prinl at a distance
depends more upon the perfection of the object glass than upon its size. You may be able to read the ScIentific American at from 500 to 2,000 feet, using
(58) G. W. T. asks : Will you please be kind enough to give me your ideas about concrete for
foundations for houses? Which is the most and least liable to give-concrete or piles? I wish to build on a lot which is not very solid ground, and do not know which to use for a foundation. A. If the soil of your lot is simply weak, dig trenches and fill in with concrete composed of 1 part of good Portjland cement 4 parts of gravel, broken stones, or pieces of harts
brick, not larger than a hen's egg, and 2 parts of lean, sharp sand. Piles are principally employed (59) R. W.-Many of the bricks now sed throughout the country are made without the impression, or "frog," as it is called. Those which are wire-cut never have them, and many of the hand-made bricks are not provided with them. It is very doubt tage, in fact, the generally accepted opinion now hat it is a detriment rather than opherwise as it needlessly increases the quantity of mortar in a wall, and therefore weakens it. The object of the mortar is nothing beyond forming an adhesive substance be-
tween the bricks, and it is difficult to see how the frog tween the bricks, and it is difficult to see how the frog can assist such adhesion, which, with good mortar and
bricks properly laid and well wetted previously, hould be perfect. The Philadelphia red pressed brick
(60) H. W. W. asks concerning the cientific American Supplement, No. 535, article headed, "The Condensation of Fumes by Static Elec-
tricity," will you please to inform me what material ricity," will you please to inform me what material if sufficient power can be got from cell batteries? A. The combs may be made of any metal-steel, brass, or ron. Electricity of higher tension is needed than a cell battery will give. Use a frictional or induction machine, as directed in the article;
(61) W. J. W. asks if it is an admitted fact that the clouds have to attain a certain height behat such is the case. As thunder and lightning are he result of an electric discharge between the earth nd the clouds, they are dependent only upon the electrical condition of the clouds and the resistance of the
atmosphere. The distance through which such discharge is possible will therefore vary with these con-
tions.
(62) G. A. H. desires a process for ieaching bones. A. By immersing for a short time water containing a little sulphurous acia, chloride ained in Scientific American Supplement, No con
(63) H. S.-There is no difference obrvable to the eye between mammoth and medium
over seed. Salt that is found in the earth was deover seed. Salt that is found in the earth was debeing inland !salt lakes or lagoons from the sea, the onstant evaporation causing a deposit of salt, as in the reat salt lakes of Utah and Nevada. The salt beds, fterward.becoming covered with earthy material, were reserved as we find them. Salt is a chemical com ound of chlorine and sodium, and is necessary to the animal econom
(64) N. P. M. asks : What will best re move moss and weather discolorations from marble monuments and gravestones? A. Take equal parts of austic potash, quicklime, and soft soap, make them leave for about a week, and apply again and again until leave for about a week, and apply again and again until
he stains have disappeared. A weak solution of aqua ortis or nitric acid may be used if preferred.
(65) D. B. K. asks how to make an inuble glue suitable for gluing spitt bamboo fish rods. weight. Dissolve the rubber and shellac in separate vessels in ether, free from alcohol, applying a gentle heat. When thoroughly dissolved, mix the two solu ons, and keep in a bottle tightly stopperea. This glue of the acids and alkalies. The addition of not over 2
of the action of water, both hot and cold moter er cent of potassium bichromate to a solution of glue, unlight, will make an insoluble cement.
(66) Reno asks how to polish black ith good whiting such colors as will produce. A. Mix possible the color of the wood to be filled. This mixture to be dry. Then give the wood a good coat
of oil, and sprinkle the mixture over the work until it oil, and sprinkle the mixture over the work until it pretty well covered; then with a soft rag or other
soft substance rub this on well. When the filling is soft substance rub this on well. When the filling is
satisfactory, finish with linseed oil, put on with a brush, wipe off, and rub to a polish with fine cotto
(67) L. A. B. desires a recipe for making
violet sachet powder for perfuming clothes, note
root 3 pounds, powdered bergamot peel 1 pound, pow
dered cloves and cinnamon each 6 ounces, powder acacia and orange flowers each 8 ounces, powdered starch 3 ounds.
Minerals, Etc.-Specimens have been ceived from the following c
I. G. G. R.-Wad (manganese oxides) on baelt rachyte. We should like to have communicated to u the locality where this mineral was found.-H. H. C.Your specimen is probably part of the stem of fossi radiate of the general name of crinoids. It has,
think, been artificially polished. It is of no value.

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