
[Entered at the Post Office of New York, N. Y., as Second Class Matter.]
a WeEkly Journal 0f Practical inforwation, art, science, mechanics, chemistry, and manufactures.

## volitionion

NEW YORK, JULY 26, 1884

CASTING A HUGE OANNON
In the ordnance foundry of the South Boston (Mass.) Iron tight, since the entrance of a small quantity of water during inch thick, and upon this floor the casting rests. Great Works is a large pit which is always used when guns of ex- the casting would ruin the work, aud endanger the mould strength is necessary in these parts, since the gun weighs traordinary size are to be cast. The pit is about 40 feet and pit. Next to the iron plates is a brick wall one foot some one bundred and twenty tons, and the whole load is deep, is built in a circular form, and the outside is compos- through, and toside of which is a tbick layer of sand and concentrated upon a space about five feet in diameter. ed of large iron plates riveted together; and as the bottom cement. The floor is of brick mom cement; and is still fur- The mould is prepared in a heavy iron flask that is made of the pit is below the water level, every precaution was ther strengthened by wrought iron girders covered with ce- in sections, and is held together by bolts through flanges and


CASTING A GREAT CANNON AT THE SOUTH BOSTON IRON WORKS,
clamp fastenings. These sections are built up, one upon another, until the mould-placed vertically in the pitreaches to the surface. This is lined with a thick layer of reachent and sand to resist the heat of the melted iron. The cavity in the mould to receive the molten iron is 4 feet 9 inches in diameter at the bottom or breech of the gun, 3 feet 7 inches in diameter at the top or muzzle, and 40 feet long.
The casting is done after the Rodman system-tbat of cooling from the interior. To illustrate the effect of this, the mass of iron we will suppose to be divided into concentric rings, the iuner one of which cools first and contracts, when the second cools, shrinking upon and firmly uniting with the first. The third, fourth, and so on then conl in order. The effect of this, as illustrated in very large guns, is great uniformity of the metal and greatly increased strength, owing to the almost total absence of internal strains and because the pressure arising from an explosion is resisted by the circles formed in the shrinking.
In the guns cast after the old method of cooling from the exterior there was always a quantity of idle metal, so to speak, but by this plan each ring or circle does its part in withstanding the pressure, and the internal strains are so distributed that no part of the iron is subjected to strains in a direction abnormal to those which it assumed when cooling.

This cooling from the interior is effected by a bollow core, consisting of a wrought iron tube, about 9 inches in diameter, covered externally with clay to resist contact with the molten iron, and made perfectly tight at the bottom, but open at the top. This tube forms the bore of the gun when cast. A circulation of cold water is kept up through the interior, as near as practicable to the hot iron, in order to cool the casting from the bore outward, that the desired contraction may be toward the center for the purpose already described. As shown in the engraving, two pipes enter the open top of the core, one for the admission of cold water and the other for the exit of the water which bas become heated by its passage through the core. The large drum shown just above the pit is designed to carry off the vapors arising from the casting.

On July 9 an attempt was made to cast one of these enormous guns. The mould had been made ready, and the furnaces had been going since the day previous. Each of the three furnaces, which are located at a little distance from the pit, as shown in the cut, contained 40 tons
of iron. During the melting small rectangular specimens are taken from the furnace and broken, the appearance of the fracture serving as a guide in regard to the quality of the metal, which is carefully brought to the required standard. The difficulty of breaking these samples, each of which was laid across an opening in a block and struck mans blows with a sledge before it yielded, indicates the great strength of the metal. When everything was in readiness, the furnaces were tapped and the molten iron led to a mixing chamber, from which it flowed to the mould. About an hour after the mould had been filled the heavy iron flask burst open at the bottom, when the column of melted iron, nearly forty feet bigh and about four feet in diameter, instantly settled to the bottom of the pit and formed acheese 13 feet in diameter and 6 feet thick. As the pit was perfectly tight and dry no explosion took place, but as the mass fell to the bottom it went with such force that a small amount was thrown out to the roof, which, together with the foundry fixtures, was burned. The damage to the flask, the recovery of the heavy mass from the pit, and putting it in shape to be remelted, is a serious loss.
Our secoud eugraving shows a gun being moved to the machine shop. The casting is remarkably perfect, no flaws or other imperfections being visible, and even the joints formed by the various sections of the mould being hard to discern. When finished, the gun will be 30 feet long, a portion being cut from each end of the casting, 56 inches in diameter at the breech, and the bore will be 12 inches in diameter. It will be a rifled breech-loader, and the method of operating the breech block will be the "' interrupted screw system," erroneously called the French method. It will be worth $\$ 28,000$-about half the sum that a steel gun would have cost-and, it is calculated, will be able to throw a projectile sis miles.

## Novel Form of Earth Plates.

A novel form of earth plate, in which a continuous process of depolarization goes on, bas been devised by Mr. Justin Halisz, chief electrician to the Galician railways. In a square hole in the ground, about two meters deep and one meter square, there is placed a bed of coke of moderate thickness. Above this layer there is formed, by aid of a wooden tube, a column of coke six inches square reaching above the ground level, the earth being filled in around the tube. Near the upper part of the column, a few inches above the ground, there is placed a large piece of coke which has been immersed in molten lead, and to this there is connected a copper rod to which the conductor is attached. By this arrangement, the gas which forms in the soil can escape between the fragments of the coke and through the coke itself, and thus the earth contact is kept from polarization.

The Belgian Government bas officially invited all foregn governments to take part in the Universal Exhibition, which will be opened in Antwerp the 2d of May, 1885. The works, which have made this port one of the finest in the world, will then be completed and inaugurated.

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MUNN \& CO., Editors and Proprietors. pUbLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

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Co., 361 Broadway, corner of Franklin street, New York

## NEW YORK, SATURDAY, JULY 26, 1884.

## RFMOVAT.

The Scientific American Office is now located at 361 Broadway, cor. Franklin St.


TABLE OF CON'TENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT NO. 4.47,
For the Week ending July 26, Lss4.
Price 10 cents. For sale by an newsdearers.





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## conaress and the patent office

Congress has made a slight increase in the appropriation for the Patent Office for the vear ending June 30, 1885. The Commissioner asked for $\$ 650,000$ on account of salaries for those employed in the department, but was allowed only \$597,170; this, with the various changes made, will give an actual increase of 52 in the number of employes. It is to be regretted that Congress could not have been induced to deal more fairly with the inventors of the country. The Patent Office badly needs more room, and its business should have been confided to a separate and independent department, as was so ably advocated by Senator Platt. But, even if such action was rather crowded over than fairly considered, on account of the nearness of a presidentia campaign, there was no good reason for cutting down the appropriation asked for by the Commissioner to increase the force in the office.
The business of the Patent Office has been notoriously in arrears for more than a year past. According to a report made by the Commissioner in April, there were at that time over 5,000 cases pending in the different divisions of the office. A large proportion of these were cases which had not yet received the first inspection of an Examiner, applicants having to " wait their turn" in a manner but little less tedious than if they were litigants before the Supreme Court. In each one of the twenty-five divisions the Examiners also re port an urgent need of more room, as well as of additional help, it being impossible to keep the records and the data for reference in proper order for expediting the work. The in justice thus done to inventors is utterly inexcusable, for the re ceipts of the office above its expensesduing 1888 were $\$ 471$, 000 , and the surplus on the 1st of January last was $\$ 2,676$, 476. This is money which the Government has taken from inventors for the exclusive purpose of paying for the conduct of the business, and it is neither law nor equity to divert it from that channel. The inventors bave paid eunugh to have their business notonly done well but promptly; and for them to be compelled to wait for months to have their claims passed upon, from insufficient departmental facilities, is a great injustice. Some improvement may be possible with the increased appropriation for the ensuing year, although the increase is not what it should be, and it is more than likely that it will be overbalanced by the growth of the business of the Patent Office during the next twel ve months. Of the many bills introduced for the nullification of pa tents uot one of which was passed, it should be particularly remembered that they did not die with the session. The snake is not killed, but was only scotched, by the indignant remonstrances which the proposed legislation elicited. These dangerous bills will remain on the calendar, and in the same position before committees, at the opening of the next session in December, as they were left at the adjournment. It behooves all who are interested, therefore, not to cease in their watchfulness, or in their active efforts for the prevention of such reckless legislation, while the present Congress is in existence, or until next March.

## DRIVING BY FRICTION.

For many purposes for which gear wheels were formerly used surface friction wheels are now employed. If the surfaces are properly matched as to material, and are sufficiently large as to area, there appears to be no reason why friction wheels cannot he more extensively employed than they have been heretofore. One of the objections has been that there must be an end thrust, which by its friction absorbs much of the power. It is a baseless objection, as may be seen in the friction clutch of the overbead countershaft of the lathe, and in many other situations where the release of the friction is the easiest and most natural move ment. To be sure, in this case the amount of contact is very large-the entire circumference of the pulley-but the principle is the same; for where the pulley friction clutch must be held as a one with the moving pulley, so the friction wheels are one so long as they are in contact, and their contact is a mere point against the circumferential contact of the pulley clutch.
An objectionable method of employing the friction driving is to use a metallic surface against a wooden or a leather surface; two surfaces of wood are better; but if iron and leather or iron and wood are used together, the driver should, in all cases, be made of the softer material. For when the driver is throwu in contact with the driven, it must make a number of revolutions before its contact will be sufficient to start the driven wheel. It is evident, therefore, that if the driver is of iron while the driven is of some softer substance, it (the driver) will wear a crease that will injure the surface of the driven wheel. It is much better, where it is practicable, to make both the driving surfaces of wood.
Excellent wheels are made of maple-hard rock mapleand of lignum vitæ, the lignum vitæ wheel to be the driven and the maple the driver. The wheels should be a cast iron spider made to receive the wood, which should be sawed into wedge-shaped or radial segments, so that the end grain of the wood bears and makes the contact surfaces. Excellent results bave beeu obtained, also, with hard rubber (vulcanized) aud wood, where there was no oil to rot the rubber, and for small wheels there is nothiug better than raw hide as prepared for pickers for lonms and for small gears. This will stand oil and resist its disintegrating influence.
One of the advantages of friction wheels over cogged wheels is that when they are started there is no shock, but oniy a gradual coming up to speed Another is their noise.
lessness; but the epicycloidal cutting of gear teeth latterly has made this objection untenable, as gears can be run as silently as belts. But a great advantage is the very slight movement necessary to connect and disconnect, the actual surfaces requiring to be merely and barely separated to in sure a stoppage of motion.

## Variations of speed.

The contrivance of step cones with shifting belts is cumbersome and troublesome one for procuring gradations of speed. In many cases it answers its purpose, but in otbers some more sensitive and intermediate device would be better. A change of speed is readily obtained by a change of position of a driven wheel on the face (side) of a driver wheel or disk. The face of this disk may be either straight or slightly dished, and the driven roll or small pulley traverses the face of the disk from the shaft to cir cumference. It is evident that while the driven wheel is nearest the shaft of the disk it will revolve the slowest; and also it is evident that as the driven wheel is run out toward the circumference of the disk it will revolve the faster
The shaft of the driver-the disk-is, of course, at right angles to that of the driven pulley; these relative positions must be maintained. But it does not matter, in practice, whether the disk is on a borizontal or a vertical shaft, so whether the disk is on a borizontal or a vertical shaft, so
long as the driven is so arranged as to be permitted to be long as the driven is so arranged as to be permitted to be
placed in contact with the disk at any point from center to placed in conta
This device, with some modifications, has already been employed in the machine driving of potters' wheels and in the foot driving of sewing machines. But it is capable of a wider adaptation, especially in the machine shop, where sudden changes or quick variations of speed are trequently necessary. The large disk may be of cast iron turned and finished, and the driven wheel of iron, leather faced, or of wood. The progress of the driven wheel from shaft to circuinference of the disk-from low speed to high speedcould be controlled by lever, worked by hand or by foot treadle. It is a much closer and more sensitive device than the present system of absolute changes of speeds on our lathes and drilling machines.

## THE GREELY EXPEDITION.

It was August 18, 1881, that the officers and crew of the Proteus bade good-by to Lieutenant Greely and his little band, twenty-five in all, leaving them in camp, as an advance guard of explorers, in a high nortbern latitude. The exploration in which they were engaged was not one for the advancement of material aims or the ambition of governments to enlarge their dominions-it was one solely in the interest of science, to widen the domain of knowledge, and help us to better know the laws which affect the conditions of life aud growth on this planet, as well as to throw light, if possible, on that great field of research, so largely speculative, in which we are seeking to find out something of the universe. It was not until the 22 d of June, 1884, a little more than two years and ten months after the party had been left on the shores of Lady Franklin Bay, that seven of them, the only living members of the original band, were relieved of their long vigil by the appearance of the vessels of the government expedition under Commander Schley. Seventeen of the others had died of starvation, one was drowned while sealing to obtain food, and of those found alive one died subsequently from the amputation of limbs made necessary by frost bite, so that only six of the original twenty five emained alive to reach home again
The story of the expedition, the plans of the scientific bodies and Arctic explorers which led up io it-in connection with several other observation posts around the poleas well as the futile efforts of 1882 and 1883 to reach and releave the colony at Lady Franklin Bay, have often been told. It was the understanding when the station was estab-lished-subject to the discretion of Lieutenant Greely, as circumstances might affect the situation-that if goverument relief did not reach the station during the summer of 1882, the party would endeavor to work its way southward in the summer of 1883 as far as Cape Sabine, or make its quarters on the west coast as far south as might be practicable, and yet within the possibility of being reached by a relief expedition, but that the route would be on or along the west coast, and not on the Greenland side. In accordance with this idea Lieutenant Greely abandoned his quarters at Fort Conger, on Lady Frauklin Bay, August 9, 1883, and reached Baird Inlet, near Cape Sabine, September 29, with the entire party well up to that time. Great difficulty was experienced in getting to that point, with the instruments and records of observations, and as large a supply of provisions as it was possible to convey. He was obliged to abandon all his boats, and was adrift for thirty days on the ice in Smith's Sound, the party finally making its way across an almost impassable field of ice bummocks to a landing just north of Cape Sabine, where a permanent camp was establisbed October 21.
Here the party found that a very insufficient supply of provisions bad been left, while some of those thus obtained had been left by Sir George Nares as long back as 1875, and were of course much damaged. It was known that supplies had had been left on Littleton's Island, almost opposite Cape Sabine, on the east side of Smith's Sound, but the channel did not close all winter on account of violent gales and the strong currents, and there was no means of reaching the food that was so near. The party was immediately put on short rations, but on May 14, 1884, the last regular food was is-
ued. After this the men were forced to live on boiled sealskin strips from their sealskin clothing, lichens, and shrimps, game having failed despite daily hunting from arly in February.
One had died in January, 1884-the first death of the party-then five died in April, four in May, and seven in June, up to the 22 d , when the rescue was made, and when according to Commander Schley, "forty-eight hours' de lay in reaching them would have been fatal to all." Too high praise cannot be accorded to Commander Schley for the energy with which be pushed north so early in the sea son, fighting his way almost inch by inch through the ice; but it will be remembered with a feeling of sadness, if not of severe reprobation, that three United States vessels, the Yantic, the Proteus, and the Neptune, had visited the near locality of Greely's fatal camping ground, during the summers of $188 \%$ and 1883 , with ample provisions, and come home again without leaving there the supplies that would have prevented these men from starving
It is too early to say what will be the probable value of the information obtained by this expedition. Up to the fall of 1883 its success seems to have been all that could have been desired by its promoters, and in the journey southward copies were brought of meteorological, tidal, astronomical, magnetic, pendulum, and other observations, although some photographs, Esquimau relics, and other things were
necessarily left behind. It is probable, however, that Licut. necessarily left behind. It is probable, however, that Lieut. Greely made all the observations required by the International Conference at Hamburg, under whose directions the various circumpolar stations were established, and that sub stantially all such records have been saved. The dis tinguishing work of the expedition-that which will per-

haps give it most fame-is thus announced by Lieut. Greely: "For the first time in three centuries England yields the bonor of the furthest north," which had previ ously been $83^{\circ} 20^{\prime}$, but was marked at $83^{\circ} 24^{\prime}$ by Lieut. Lockwood of the Greely expedition, on May 13, 1882. The point of observation was named Lockwood Island, where, ' from an elevation of 2,000 feet, they saw no land north or northwest." To the east and northeast of Lady Franklin Bay the party undoubtedly made the best survey yet accomplished of northern Greenland, and, by observation of what seemed to be a distant headland, located it as Cape Robert Lincoln, in latitude $83^{\circ} 35^{\prime}$, longitude $38^{\circ}$ west of Green wich.
At B, in our map, is shown Lockwood Island, the highes northern latitude yet reached, and from whence the obse vation was made, while A marks the highest point attained by Commander Markbam, the most successful British explorer, in 1876. In a subsequent endeavor to go still farther north, the party was turned back by open water, and, as Greely's report says, "barely escaped drifting into the Polar Ocean."
There are many other newly named places, and some material changes will have to be made in the maps of regions hitherto incorrectly laid out, along the west shore of Kane Basin and Kennedy Cbannel, and in the configuration of Grinnell Land, and the north shores of Grant Land and Greenland. Arctic geography will thus, doubtless, be greatly amended, but whether the results attained will prove sufficient compensation for the loss of life of the brave men who were sacrificed is a query which many people will think most unsatisfactorily answered.

Glass Making in Italy.-Colle de Val d'Elsa contains we of the most important glass works in Italy. The value of the annual production amounts to $2,500,000$ lire; its sale extends over all Italy, but more especially in the Roman Tuscau, and Piedmontese provinces.

## LABELS AND TRADEMARKS

In the year 1874, the duty of registering labels, hitherto performed in the office of the Librarian of Congress, wa transferred to the Commissioner of Patents. In accepting his office the Commissioner for some reason imagined it a part of his duty, when a label was presented for registration, to exercise judicial functions in deciding whether it was a label or trademark from a prima facie standpoint. The label after one or more examinations was pronounced eligible for one of the forms of protection, except in com paratively rare cases, when something obviously neither one nor the other would be entirely rejected. In the num bers of the Official Gazette prior to 1882 several decisions of the Commissioner on this subject will be found. In virtue of such decisions many labels were refused registration on account of their arbitrary and non-descriptive character, and were brought into the trademark class. The definition of a label that was the working standard of the office was taken from Webster's Dictionary. It reads as follows: "A narrow slip of silk, paper, parchment, etc., affixed to anything, denoting its contents, ownership, and the like; as the label of a bottle or a package." (O. G., August 10, 1881.) From this it was assumed that a label must be descriptive of something connected with its object, and everything in the shape of an arbitrary or non-descriptive symbol the Commissioner refused to register except as a trademark.
This practice prevailed until the year 1881, when two very mportant events took place. The first of these was the passage of the new trade mark act of March 3, 1881. This was to replace the old statute, which bad been declared un constitutional. By it the additional restriction was placed upon trademarks, that in order to be subjects of protection by the United States courts they must be used in commerce with foreign nations or some Indian tribe. In the old prac tice of the Patent Office almost anything that they decided to be unregisterable as a label could be registered as a trademark. But this new restriction threw out a great many quondam registerable trademarks, and in conjunction with the Patent Office rulings deprived many labels of any registration whatever.
This state of affairs quickly became oppressive, and the important decision of the Supreme Court of the District of Columbia in the case of the United States vs. the Willcox \& Gibbs Sewing Machine Company came in good time to relieve it. This was the record of the important events alluded to above. The court held that the Commissioner had no right to exclude from copyright registration any label under the guise that it was a trademark. The Commissioner at once accepted this decision, and changed the practice of the office to correspond therewith.
All went satisfactorily under the new ruling, and the interests of private individuals and of commerce at large were equally guarded. The Supreme Court, although it did not base its decision on the intrinsic qualities of labels and trademarks, reached by other ways a thoroughly common sense and practical conclusion. The acquiescence of the Commis sioner in the spirit of the decision was full and complete. Less thav a year ago a new Commissioner of Patents was appointed. At first he followed the revised practice of his predecessor, but recently, in the face of the decision of the Supreme Court, he has returned to the old practice, and exercising his powers of judgment attempts to discriminate between labels and trade marks. No court in this country is in better repute than the Supreme Court of the District of Columbia. It is the great court of appeal from the decisions of the Commissioner, and its decisions would seem to be particularly binding upon his actions. Yet his new rulings are directly in the face of aud contrary to the decision of November 30, 1881, and he apparently wishes to have a decision from a higher tribunal before changing his views.
Leaving for the present the relations existing between the Commissioner and the Supreme Court of the District, we may glance at the hardship inflicted by this course upon applicants for registration of trademarks. On application a fee must tirst be paid, which fee is not returned. If the label is decided not to be registerable as such, the applicant, pocketing his loss, may apply for trademark registration, paying another and larger fee. Here too he may be ruled out, when he is left without any way of recovering his fees, and without any equivalent being awarded him for them. Rulings tbat lead to this result are wrong. The Commissioner has no responsibility in the matter if he will follow the voice of the court, his direct superior. But of his own volition he has taken the responsibility of departing therefrom, and has chosen to inflict this petty bardship upon many who are ill able $t o$ afford it.

## Car Couplers.

According to a statement made before the Master Car Builders' Association, there are now in use in this country 800,000 freight cars, and the average annual expense for inks and pins for each car is $\$ 1.50$, or a total of $\$ 1,200,000$. It is evident that a self-acting car coupler, so made as to prevent the maiming, loss of life, and expense of the common link and pin system, would be an invention of enormous value. Many hundreds of patents have been taken for improved car couplers, but the railway companies, for one reason or another, are shy about introducing them. In Massachusetts a law has been passed compelling all railway companies in that State to put self-acting couplers on their cars on or before $\mathbf{1 8 8 5}$. If other States would adopt compulory laws on the subject, the introduction of improved couplers would soon become general.

## HORSE POWER

The bed frame or foundation consists of two strong planiks crossed at the middle and boxed together: and secared by re-enforcing plates of metal bolted on. The frame is beld in position by driving a puinted stake, projecting from the under side of the frame, into the ground; hook headed stakes are placed at the ends of the planks for additional security In the upper end of the center stake is a deep socket for receiving the vertical spindle that forms the axial support on which the main driving drum revolves. The drum is constructed in sections, in order to be taken apart for ready bandling and removal. The cast metal hub is provided with a collar and set screws for fastening it to the spindle, and is formed with sockets for receiving the tenons of the inuer ends of the spokes, $b$. On the outer end of the spoke is attached a flat plate which projects beyond the end to receive the ends of the wood fellies, $c$, which abut together on the plates and against the ends of the spokes, where they are detachably fastened by key bolts. On top of the spindle is a disk for staying the spokes and rim by the tension rods, $a$; the rods hook detachably in eye studs placed near the outer ends of the spokes.
The drum thus constructed is grooved in the periphery for working an endless wire to drive a countersbaft and pulley, and has one or more sweeps attached for hitching on the horses for turning it. The countershaft to which the rope gives motion by a small pulley is mounted on a bed plate that is staked to the ground by book headed spikes, aud the rope runs between two pairs of grooved faced bevel guide pulleys. These pulleys make a guiding and tightening device, by which the two members of the rope are converged so as to run properly on the driven pulley; when they are shifted toward the driving drum, the rope is tightened as required. In the path of the horses the rope is covered with $\Lambda$-shaped guards.
This invention, which can be easily adapted for running corn shellers, feed mills, wood saws, pumps, churns, and other farm machinery, has been patented by Mr. R. F. Rasmussen, of New Albuquerque, New Mexico.

## IMPROVED OIL CUP.

The engraving shows an oil cup designed for locomotives and marine engines, which consumes a minimum quantity of oil, permits no oil to escape when the machinery is not in motion, feeds faster as the speed increases, and which can be filled without interfering with the regulator of feederi. The oil cup, A, is screwed on a plate provided with a neck, E , screwed into the guide, D , and through the plate, C (Fig. 3), which is formed with a tubular standard, F, through which loosely passes a spindle, J, at whose lower end is a beveled projection, G. Surrounding the spindle is a spiral spring pressing it downward. The spindle is guided by a transverse pin passing into vertical slots in the sides of the standard. On that part of the spindle projecting from the standard is screwed the nut, K, upon which an arm, L (Fig. 5 ), is held by an ornamental nut, M. The arm is provided with a recess for receiving the nut, and with a slit, Y, to allow the spindle to pass into the end of the arm. The cover, $N$, is formed with an upwardly projecting neck and


## IRVINE'S IMPROVED OIL CUP.

with a concentric internally threaded neck, $O$, between which the filling funnel, $Q$, is screwed. In the cover between the necks is a series of apertures, $x$. Secured to the tween the necks is a series of apertures, $x$. Secured to the
arm, $L$, is the spindle, $R$, in the lower end of which is a pin fitting in an aperture extending through the neck, E . If a reciprocating piece of machinery is to be oiled, a beveled block, U , is fixed so as to act on the beveled projection of the spindle. If a revolving shaft is to be oiled, a cam projection, $\mathbf{W}$, is arranged so as to force the spindle upward at each revolution.
Every time the spindle, $J$, is raised, the spindle, R, is also raisec, and a small quantity of oil is allowed to pass through the hole, S , to the moving part. By means of the nuts the
spindles can be regulated so as to feed any quantity of oil. Marked on the standard is a gauge that shows the stroke of the spindle. By partly unscrewing the funnel, oil can find its way to the cup through the holes, $x$. A full set of these oil cups, used for fifteen months on an engine on the C. N. O. \& T. P. Railway, has given entire satisfaction

Relations of Sulphurous Acid to the Blood.
Von Ogata has studied this subject in concluding an earlier investigation, and states that the poisonous effects of the free acid rest principally upon the rapid change of the oxylæmoglobin, whereby the sulphurous acid passes into sulphuric acid at the expense of the oxygen of the blood sulphuric acid at the expense of the oxygen of the blond Air which held a measured amount of sulphurous acid was conducted through two equal quantities of distilled water and diluted blood. After two liters of air had passed through the water, it (the air) smelt strongly of sulphurous acid, and the water had absorbed a large amount of the gas; the air conducted through blond was, however, without any odor after 8 liters of it bad passed through the blood, and the blood itself contained no trace of sulphurous acid, but a corresponding amount of sulphuric acid. An equal mixture of air and sulpburous acid was confined in a receptacle over quicksilver, and the blood, conducted through this, fully absorbed the sulphurous acid. One drop of this blood was added to ten drops of water for spectroscopic examination. The fluid was not red but weakly yellow, and showed in the spectroscope no absorption bands. The instantaneous bleaching of diluted blood by a trace of sulphurous acid was taken advantage of to detect this acid, and it was possible for him with blood in this manner to detect the 0.01 milligramme of sulphurous acid in water. Sulphites do not discolor the blood, not even when acetic or carbonic acid is added. Only by the addition of a strong mineral acid as sulphuric
further information will be furnished by Messrs. J. J. Ir
vine and Bro., of 108 William Street, Chattanooga, Tenn vine and Bro., of 108 William Street, Cbattanonga, Tenn.

## Tale Weight of Currency and Bills.

A correspondent having asked of us how many bills, $\$ 1$, $\$ 5$, etc., it took to make one pound avoirdupois, also how many of the different pieces of our metallic currency to make the same weight, we referred the inquiry to Hon. Thomas C. Acton, U. S. Assistant Treasurer at New York, who kiudly furnishes us with the following:
"Four hundred and fifteen new one dollar U. S. notes, "Four hundred and fifteen new one dollar U. S. notes, dupois, and the number of notes stould be the same of any denomination. It is not, however, perfectly reliable, as the paper upon which the notes are printed often varies in thickness to the extent of one hundred notes in a package of one thousand.
"One pound avoirdupois contains seven thousand grains; thus, by ascertaining the weight of each coin it is a simple computation to arrive at the number of pieces to the pound.
"As the legal tolerance at the mint of one and a half grains upon each silver piece must be taken into consideration, I have caused one pound avoirdupois of each denomination to be weighed, and you have the result in valuation by tale as foilows, viz.


Novel Plan for Producing Diamonds.
To transmute the baser form of carbon into the priceless diamond has been the dream of alchemists for ages. Tbe latest enthusiast in this field bas gone to the trouble of erecting quite an extensive apparatus, by which, with the help of a force of nature, in the manifestation of a flash of lightning, he hopes to attain some tangible result. The experimenter, who is a correspondent of English Mechanics, described his device as follows in a recent issue of that publication: "If a source of heat could be obtained of sufficient intensity to. liquefy carbon or charcoal," he asks, "would it on cooling assume the same crystallized form as glass? The question is, How can a heat be obtaiued some thousand times greater than can be produced by any quantity of galvanic cells or dynamo machines? I propose to utilize a flash of lightning in the following manner: I have erected in my garden a long iron conductor attached to a wooden spar firmly fixed in the ground, and three wide ropes as stays. This is about forty feet high, and the conductor extends twenty feet above it. On the top of the conductor is fixed a copper ball eight inches in diameter; the rod is attached to the spar by iron clasps insulated with gutta-percha. The rod is bent about two feet from the ground, leading into a wooden box containing a tube of biscuit earthenware, and about one inch inside diameter and one foot long. The end of the rod is connected to a piece of copper wire $1 / 2$ inch thick, and passes about one inch into the end of the tubes. The other end has a rod connected the same way, and passes down into the earth. The tube is filled with charcoal or any other carbon. Mr. Swan (of electric light celebrity) suggested lamp black; but this or any other conducting material could be inserted. An earthenware tube I consider preferable to glass, for if an explosion took place, which probably it would, the effects on the carbon could be better seen than among broken glass. I have never yet been fortunate enough to have the conductor struck, as thunder-storms are not very frequent in this tor struck, as th
does decoloration ensue. The sulphurous acid works in the organism as well upon the mucous membrane of the air passages and eyes as by disorganization of the oxybæmoglobin of the blood. The essential cause, however, of death appears to rest in the effects upon the blood, and the gas appears to be a powerful blood poison, as 0.3 per cent in air proved fatal to a number of animals that breathed the misture for some hours.

## COMPOUND AND SELF-ACTING PLUG VALVE FOR WASH

 BASINS.The object of the invention herewith illustrated is to prevent the willful waste of water, the overflowing of the basin, and the escape of sewer gas-three very essential points. The inlet pipe has a plug valve, B, to control in a general way the flow of water to the basin, and the discharge pipe has a plug valve, C , to control the flow from the basin. These valves are turned simultaneously by a bar worked by a suitable bandle, and their apertures are at right angles with each other, so that one valve will be closed when the other is opened, opening into the discharge pipe is a cbamber fitted with a float valve, D, having a stem passing freely through the fixed head of the chamber. Carried at the upper end of the stem is a valve, E , which takes its seat in a casing fitted in a pipe between the valve, B , and the nozzle of the supply pipe. This valve has sufficient play in its casing to leave the passage in the pipe unobstructed and to rise to cut off the flow of water. The small pipe, F, opens into the upper part of the chamber and into the discharge pipe between the valve and trap.
The operation will be readily understood. When the valve, $B$, in the service pipe is open, the valve, $C$, in the sewer pipe is closed; the running water then lodges at the valve, C , backs up into the flood chamber, raises the float, D, which controls the valve, E , thereby sluutting off the supply of water, at the same time forming an additional


FORD'S COMPOUND AND SELF-ACTING PLUG VALVE FOR WASH BASINS.
water seal or trap, in front of the valve, C, which, the inventor claims, absolutely prevents the escape of sewer gas. As will be quickly perceived, this seal cannot be siphoned ${ }_{A}{ }^{\text {out. }}$
Additional information regarding this invention may be obtained by addressing the patentee, Mr. Thomas P. Ford, Jr., 263 Eckford Street, Green point, Brooklyn, N. Y.

## Remedy for Rhus Poisoning.

Fluid extract of serpentaria has been used with remarkable success. It is best applied by placing cloths moistened with the extract upon the affected parts, without any friction. Two or three applications generally effect a cure.

## METALLURGIC FURNACE

Our engraving shows a furnace recently patented by Mr. T. J. Wilson, of 87 Wall Street, Auburn, N. Y., which is designed for heating or reheating blanks. In the left of the cut is shown the furuace, in which coal may be burned on a grate, or a gas burner may be substituted. The hot blast apparatus consists of a fan and the coil of heating pipe, $a$, which is arranged in the flue to be heated by the beat of the furnace passing along it, and which has a discharge pipe passing outside of the wall of the flue and discharging into a hollow bridge wall between the furnace and the flue, to be further heated, and also to protect the bridge wall from heat. From the lower part of the bridge wall the hot air escapes through a small slot orifice into the lower part of the furnace. Outside of the furnace wall the pipe is provided with a valve for regulating the supply of air.


WILSON'S METALLURGIC FURNACE
venting the rolls from following in the bottcm of the zigzags, then the pawls would come in contact with the cross bars, thereby holding the car. The roll arms of those pawls which stop the descent of the platform are merely made heavier than the pawls; but those in which the roll arms extend down ward are provided with counterbalance weights. When the pawls catci on the racks the thrust tends to keep them in contact, so that in case they only catch slightly at first they will be forced into the bottom of the racks and se curely engaged by the momentum of the platform. The pawls of the opposite sides are connected together by rods and balance levers, in order that both may engage the racks simultaneously. The rods are made elastic by means of coils in them, as rigidity might cause breakage in case one pawl should strike on top of a cross bar and the other in the notch between the bars.
The elevator platform (Fig. 1) is sus pended from chains that pass over sprocket wheels mounted upon a cross shaft; the chains then pass over pulleys on top of the frame, and thence down to the counterbalance weight. Upon one end of the shaft is mounted a large grooved wheel, in which runs an endless rope which hangs down beside the car within easy reach of the operator. Pivoted to a cross bar near the under side of the wheel is a brake lever, the shoe of which presses against the periphery of the wheel. 'To the other end of the lever two ropes are attached; one of which passes over attached; one of which passes over gases for fuel, there is arranged a superbeating coil of fire $\mid$ grooved pulley and thence to a weight which acts to keep clay (called by the inventor a "decomposer"), consisting of a series of horizontal communicating flues, $c$. This coil is placed next to the chimney and is in a fire clay lined metallic case, which has an exterior protecting jacket of similar material. The decomposer is arranged in the center of the flue, so that it will be acted on at both sides and ends by the heat passing along the flue.
The steam enters the decomposer by the pipe shown beside the chimney, and which is connected with the boiler and is furnished with a valve for regulating the supply. In the pipe, $b$, are two other valves, one where the superheated steam leaves the decomposer and the other near where the pipe enters the furnace chamber. By the first mentioned valve the steam may be retained in the decomposer until properly de composed, and by the other the supply to the furnace may be governed. The steam is discharged into the furvace through numerous jet orifices of a pipe extending from side to side.
Here the oxygen of the steam, uniting Here the oxygen of the steam, uniting
with the carbon of the incandescent coal, forms carbonic oxide, leaving the hydrogen free to burn with great intensity in combina tion with the oxygen of the incoming hot blast. The carbonic oxide, at the same time taking up additional oxygen from the ho blast, burns with great intensity. These changes produce greater heat than the coal alone is capable of. The bianks to be heated are inserted through openings in the chambe above the fire bed. For discharging the ashes without wasting the whole of the fire bed, a temporary grate consisting of bars is shoved in through the front wall and the fire bed into recesses in the bridge wall, whereon the upper portion of the fire will be supported while the rest may be discharged through the lower grate.

## IMPROVED ELEVATOR

Our engraving shows an elevator provided with safety appiances which are simple in construction, effective in operation, and which combine cheapness, strength, and du rability. In Fig. 4 is shown a device for stopping the platform in the upward as well as the downward course, this being neces sary, since some platforms are counterbal anced more than the weight of the empty platform, and are liable to damage by ascend ing rapidly in case they become accidentally disconnected from the motor. In Fig. 1 the device is arranged so as to only prevent the too rapid descent of the platform.
The racks for the ways in which the platform works are made with zigzag side flanges, and cross bars with which catch pawls engage when safety demands the stopping of the platform; the flanges confine the pawls laterally whe thrust in the rack. The pawls are provided with arms tha balance them away from the rack, and bave rolls gravitat ing to contact with the zigzag ways, so that when the speed is not too fast the pawls will not engage the racks. But should the speed overrun the predetermined limit by the breaking of the chains, so that the thrusts of the projections of the ways would be greater on the rolls, or simply pre-

## MASON'S IMPROVED ELEVATOR.

 keeping them off the streets and making self-supporting men and good citizens."
## BENDING MACHINE

An invention recently patented by $\mathrm{M}_{1}$ : W. W. Stokes, P. O. Box 160, Anna, Illinois, consists of a device for the use of blacksmiths, carriage makers, and other iron work ers, for bending stirrup, clip, and other irons by hand. The bed plate is constructed with tbree parallel slots, and is provided with an anvil block and a gauge bar, both o which are firmly attached; the gauge bar has a shifting stop for gauging the distance of the bends from the ends of the


## STOKES' BENDING MACHINE

bars. Alongside of the anvil block is a former block, hav ing one square end and one half-round end, secured with a bolt, nut, and washer, so as to bind it fast to the bed plate either parallel with, or obliquely to, the anvil block.
The washer is constructed with a rib as wide as the slot to prevent it from turning with the nut. Forms of differen forms and sizes are employed according to the differen forms and sizes of bars and the bends to be made in them When the nut is removed, a keeper prevents the bolt from dropping out. In the outside slot is fitted a pivot bolt for the fulcrum of the main bending lever, the bolt being adjustable along the slot for locating the lever as desired relatively to the anvil, and having a sleeve on the part whereon the lever turns for the nut to jam on in secur ing the lever, and also for sustaining the wear. At a short distance from the pivot bolt the lever is recessed in the lower side to receive the forming block (Fig. 2), and a sec ond lever between it and the bed plate, and it is formed with a longitudinal slot for in serting the bolts of the block and of the second lever. The forming block is to be set close to the end of the second lever when the latter is set at a distance from the reces shoulder and is used for bending a bar around the former. This former is more particularly employed when a reverse angle is to be made, as indicated in Fig. 4. When the bar is to be bent in the form of a clip (Fig. 1), or into an obtuse angle (Fig. 3), the former is not used.

When the machine is arranged as shown in Fig. 1, the first lever bends the bar around to the end of the former, and then the second lever bends it around to the side of the former for making clips.

Manganese in Animals and Plants.
Recent researches by M. Maumene have shown that the metal manganese exists in wheat, rice, and a great variety of vegetables. Wheat contains from one five-thousandth to one fifteen-thousandth of 1 ts weight of the metal, which exists chiefly as a salt of an or ganic acid. It is also found in potatoes, beetroot, carrots, beans, peas, asparagus apples, grapes, and so on. The leaves of the young vine are very rich in it; so are the stones of apricots. The proportion in cacao is very great, as it is in coffee, tobacco, and especially tea. In the 50 grammes of ashes left by a kilogramme of tea, there was found 5 grains of metallic manganese. There are vegetables, however, in which no manganes can be found, as, for example, oranges, lem ons, onions, etc. Many medicinal plants con tain it, as for example cinchona, white mus tard, and the lichen (Rocella tinctoria). Ani mal blond does not always contain it, but it is found in milk, bones, and even hair M. Maumene regards its presence in the |us of a 16-year old inventor, Master Edgar B. Badlam, who human body as an accident, and not of vital importance has patented an "improved steam boiler," and is perfecting He also suggests that doctors should cease to employ man other inventions which promise to be of importance. He ganese as a succedaneum for iron, for while the latter is has a model shop, costing $\$ 2,000$, where he has turned useful to the blood, the former is an intruder which is only out many models, his father thinking that " this is the kind tolerated in small traces, and rejected in larger quantities. of encouragement the young men of our day should have, Tea, coffee, and other vegetables require abundance of man-
canese in the soil for their les require abundance of man sence of it may account for the lailure of many plantations.

The Oil, Paint and Drug Reporter recommends the fc'lowing as the best process known to it for bleaching tallow. About 50 lb . of caustic soda lye are placed into a clean boiler and the steam is turned on. Salt is then added to the lye until it shows $25-28$ deg. B. The fat- 300 lb .-is now placed in the boiler, and the steam is turned on until the mass is brought to a boil, when the steam is shut off to prevent overflowing. It is allowed to boil up 1-2 inches at the most, and then left toitself for $3-5$ hours, so that the fat will clarify. At the end of this time, the upper saponified layer is ladled off; the pure tallow is removed and passed through a hair sieve or linen into a clean vessel, until the lower saponified layer is reached. The residue in the boiler, consisting of sponified fat and lye, is removed and used in the preparation of curd soap, together with the upper layer.
The kettle is thoroughly cleansed, and about $30-35$ pounds of water with $3 / 4-1$ pound of alum are heated to boiling. To this solution the fat is added, and the mass is allowed to boil for about 15 minutes, until all the filth has disappeared from the fat. The mass is then transferred to another vessel, and left by itself for 3-5 bours.
The pure fat is then again placed into the boiler and heated to boiling, until it shows a temperature of $170-200 \mathrm{deg}$. C In this last operation the fat becomes snow-white. The steam must be turned off as soon as the slightest trace of vapor of a disagreeable odor is thrown off. The fat may then be directly used or left to cool.
As has already been stated, the steam must be turned off or the fire removed as soon as a trace of disagreeable vapors becomes visible, whether the temperature be 150 deg . C. or 170 deg . C., for if this is not done the fat will again turn dark.
Freshly rendered, sweet fat (not acid or rancid) is most readily bleached, and may be heated quite high. Still the fat used should not be ton fresh, or one will take the risk of saponifying the 300 lb . without leaving any to bleach.
Tallow which bas been treated in this way, when used in toilet soaps, gives them a white color and agreeable odor. It is also well adapted for candle making, as it becomes exceedingly hard.

## Banana Peel as a Lubricator.

A long yellow ice cart, heavily laden, slid the other day into a gutter in Chambers Street, near West Broadway. The rear wheel stuck firmly against the curb. The driver lashed his horses and swung them around, but to no purpose. Ingenious philanthropists offered all kinds of sug. gestions, patted the trembling, sweating horses, and some put their sboulders to the side of the truck, but without avail. The off rear wheel would not turn. A barefooted little colored boy bad watched the proceedings with a childlike look of sympathy for the overstrained animals. He suddenly ran down Chambers Street and returned panting, carrying in his arms a lot of banana peels.
" Say, boss," he called to the driver, "I'll make yer wheel turn with these 'ere, if yer'll let me put 'em down."
"All right, sonny," said the driver.
The little darky sprang under the wheels, and carefully laid down the skins. He pressed some close to the curb, where the wheel was jammed. Then he sprang back and shouted, "Now, boss; pull away."
The crowd laughed; the driver pulled taut his lines and gave his horses a lash. The animals sprang forward, the wheel glided along the layer of banana peels, and the heavy wagon rolled out of the gutter. The onlookers cheered as it drove away.
'Oh," said the little darky, "I've seen pop move barrels and big boxes with oil, and pop tole me a little oil makes hebby dings go round. I seen hebby men fall on banana peel, and I guessed dey'd move dat wheel. My name, boss, am Abraham Lincoln George Brown."-N. Y. Sun.

## Consumption.

Dr. Edgar Holden, Medical Director of Mutual Benefit Life Insurance Company, Newark, N. J., says: For many years, even among the best informed, the impression has prevailed that consumption exhibits a preference as regards development, for certain ages. Thus, it bas been the conviction that those who escape the marasmus and tubercular meningitis of infancy come again into danger at puberty, and that again between thirty-two and thirty-eight a cli macteric is reached at which the mortality acquires its maxi mum of intensity, theu diminishing, to declare a wholesale sweep between sixty and sixty-five.
These views have grown out of an experience apparently well founded, since the mortality in every physician's personal field of observation has seemed to be greatest at those periods, but the conclusion is nevertheless a fallacy, and it has been made broader and deeper by statistics of mortality in which the ratio of deaths from consumption to the total number of deaths bas been relied upon.
Rare facilities for prosecuting an investigation to obtain a correct result have led me with considerable labor to a conclusion as startling as I trust it will be found conclusive, namely, that death from consumption, instead of being, as is almost universally supposed, most prevalent in early adult life in this country, is in reality not so, but grows relatively more frequent as life advances. This is true in the com munity at large, and among selected lives is actually less a the ages hitherto deemed most susceptible.

## SCREW TAP

The stock, A, is formed with a head, B, provided in its The stock, A, is formed with a head, B, provided in its rim with a series of longitudinal grooves, C , ithat receive the end of the head. The grooves, $C$, are formed with side grooves, E , and the corresponding surfaces of the cutters are similarly grooved. The cutters are prevented from being lifted out of the grooves by locking wires which are passed into the aperture formed by the two small grooves. A disk, F, held on the end of the head by a screw, partly overlaps the outer ends of the cutters and prevents them sliding out of the grooves. Mounted on the screw threaded portion of the stock is a nut, H , formed with an annular ridge, I , on which the inner ends of the cutters rest. The cutting teeth at the front ends of the cutters wear off more rapidly than the rear parts, and if they become too dull to cut, the disk


## EDDY'S SCREW TAP

is removed, and the cutters are moved forward to project from the head by turning the nut; the ends of the cutters are then ground off flush with the end of the head.
This inventiou has been patented by Mr. H. W. Eddy, whose address is corner Euclyd and Waite Avenues, Toledo, Obio.

## WELL BUCKET.

An invention recently patented by Mr. R. H. Foat, of Weatherford, Texas, is illustrated in the accompanying engraving. The top ring of the bucket has a cross bar having a central aperture, through which the valve rod passes. The lower edge of the ring is formed with an annular rabbet for receiving the upper edge of the cylindrical casing, A, that is made of sheet iron. The lower edge of this casing rests in a rabbet made at the upper edge of a cup, $C$, forming the bottom of the bucket. In the bottom of the cup is an aperture, in the edge of which is formed a rabbet for receiving the edge of the valve, $D$, held by nuts on the lower end of the valve rod. At the top of the cup is an apertured bar through which the valve rod passes.


The upper ring, B, the cup, and the valve are made o malleable iron. The rope is attached to an eye formed at the upper end of the valve rod. By this means a simple, strong, and durable bucket is constructed.

## Destruction of Fish by Dynamite.

Thousands of dead fish have been floating down Niagara River of late; among them have been large sturgeon, bandsome muscalonge, black bass, and cat fish. On the beach, also, from Bay View to Dunkirk, the dead bodies of fish have been washed ashore. All appeared to have died with in a short time. This wanton destruction is believed to have been caused by a party of reckless young men who sailed about in a steam yacht and now and then lowered into the water dynamite cartridges, which were exploded by electricity.

Perhaps there is no place on this continent where rattle nakes do congregate in greater numbers than along the Tioga River, in Pennsylvania. The mountains through which that crooked stream finds a passage are the home of the rattle snake, and in the warm summer months they leave their deus by thousands for the narrow valley, where they bask in the sun for a few weeks, and those that do not get their heads bruised by the heel of man, or get cut in pieces by lying nights on the warm rails of the Corning and Blossburg railroad, as thousands of them are, crawl back to their dens in the rocky ledges. In midsummer it is an almost daily occurrence for some one to be bitten by these reptiles in the Tioga Valley, and domestic anımals are frequently bitten. But the residents of this region do not look upon the bite of these reptiles as anything serious. When a person is bitten, a handful of mud or wet clay is applied to the wound, and fresh applications are made every ten or fifteen minutes until the poison is all drawn out. The first thing a native of that locality does after being bitten is to seek a place where hogs wallow, where soft mud or wet clay is always found. He binds on a quantity, and is wet clay is always found. He binds on a quantity, and is
soon cured. The same is applied to domestic animals when soon cured. The same is applied to domestic animals when
they exhibit symptoms of snake bite, and this treatment is they exhibit symptoms of snake bite, and this treatment is
always successful if the application is made before the poison has gone too far. It is well known that hogs are not harmed by snake bites, and this is accounted for by the porkers' habit of cooling off by lying in a mud hole.
A farmer on the line of the Corning and Blossburg railroad had a small cur dog that made it his business to kill rattle snakes. In his encounters with large ones he would be bitten several times, but as soon as the fight was over he would basten to the farm yard and lay bimself in a "hog would hasten to the farm yard and lay bimself in a "hog
wallow " for several hours, when he would come nut enwallow "for several ho
tirely free from poison.
It is well to fortif $y$ the system with stimulants, then apply the clay mud, and a cure is certain. The clay must be moist, or of the consistency of dough.

Wm. S. Huntington.
We are inclined to think that the snakes referred to by our correspondent were of a different breed, or age, or con dition from some of those whose bite is fatal. On the 13th inst., in this city, James Reilly, a snake charmer, who was exhibiting rattle snakes, and had taken one of them out of its box, according to custom, was bitten in the right band by the reptile. The man returned the snake to the box, and began at once to suck the poison from the wound with his mouth, then swallowed a quart of whisky and went to the hospital. Here he was treated with hypodermic injections of whisky and sedatives; other remedies were also tried, but it was of no avail. After lingering for over twenty-four hours in agony, the unfortunate man died. Reilly himself declared his belief that the bite of that particular kind of rattle snake -diamond back-was always fatal.
A few bours before Reilly died a Westchester County farmer named Purdy appeared, bringing what he claimed to be a sure cure, as it had saved the lives of at least fifty persons. He was allowed to try the remedy upon the sick man. It consisted of a decoction of berbs. The only effect was to produce a short sleep.

## New Apparatus for the Relief of Deafness.

Professor Politzer describes iv the Wiener Medizinische Wochenschrift a little instrument invented by bimself to aid those whose power of hearing is impaired. The principle is to transmit the vibrations from the pinna to the membrana tympani. Politzer opposes Voltolini's opinion that the cartilage of the ear is a poor conductor of sound, and on the contrary believes that the pinna, by means of its vibrations, is of great importance in the mechanism of hearing. His apparatus cousists of a small elastic drainage tube, one end of which is beveled off so as to rest evenly against the drum membrane, while the other end is curved slightly, and by membrane, while the other end is curved slighty, and by
its elasticity presses gently against the anti-helix. Near its outer extremity the tube is attached to a small concavo-convex rubber plate. This plate is fitted so that its concave side lies in apposition with the concavity of the concha. The idea of this attachment is to increase the conducting power of the instrument and to transmit with greater facility the vibrations of the pinna. In a large number of experiments made to test the value of this instrument, the inventor found that in most cases the hearing distance for the voice was considerably increased, in some instances from two feet without to fifteen or twenty feet with the apparatus. In many cases the hearing distance for the watch was also increased, though in no such striking degree as that for the voice. In cases in which the drum membrane was partially or entirely destroyed, it was found necessary to attach an artificial drum to the inner extremity of the tube. In deafness due to anchylosis of the ossicles or to disease of the labyrinth, little or no improvement was obtained by the employment of the tube.

## Crushed Ice for Burns.

The value of crusbed ice as a dressing for burns and scalds, first pointed out by Sir James Earle, is confirmed by Dr. Ricbardson (Asclepiad, 164). The ice, after being re duced by crushing or scraping to a fine state of division as dry as possible, is mixed with fresh lard into a paste, which is placed in a thin cambric bag and laid upon the burn. This is said to banish all pain until the mixture has so far melted that a fresh dressing is necessary.

## Correspandeutr．

## A Steam or Compressed Air Sky Rocket．

To the Editor of the Scientific American：
After reading the account of the singular boiler explosion at Orleans，given，with an engraving，in your number for July 19，it occurs to me there is an excellent opportunity or some ingenious person to invent a steam rocket．If large steam boiler，standing on wheels in the street，like a steam fire engine boiler，can be made to lift itself ove housetops，as shown in your engraving，it would seem not o be a difficult task to construct a steam or compressed air rocket applicable to useful purposes．Let inventor
try．
O．B．Server．

## Contraction of Steel．

To the Editor of the Scientific American：
In your issue of July 12 you give some peculiarities with which mechanics bave to contend in the working of steel， that have not received the attention that ought to be given to so important a matter．Some years ago I had occasion to temper many cutters，dies，punches，and other tools，and experienced all the difficulties alluded to in your article From Edes＇＂Management of Steel，＂and another little English book，I obtained many points，and by careful working．paying strict attention to beating and the bath， was ahle to increase or decrease the tool to be tempered at pleasure．
The idea that steel is steel，and must have similar treatment for all kinds of tools，ought no longer to find advocates． Steel suited for one kind of tool may be totally unfit for another，or require totally different treatment．If maker of tool steel would mark their different brands，and publish a circular giving information of a reliable nature concern－ ing it，a uniformity would soon be reached and recognized mong mecbanics，and tools would pass for their actua worth according to a known standard of excellence．

Levi K．Fuller．
Brattleboro，Vt．，July 11， 1884.

## Happiness and Health．

I＇o the Editor of the Scientific American：
In your paper of April 26，quoting from the Lancet，you say：＂One－balf of the＇dyspeptics＇we see would be well if they were only happy．＂＂Be bappy，and your sympa thetic ganglia will have the blood coursing through them with the bound of health．＂＂With those who live by rule and tremble as they live，laboring to eat aud drink precisely what＇is good for them＇and nothing else，the cause of failure is that such persons are overcareful．＂
Now，this is so totally a one－sided view that I cannot al low it to stand without a word of protest．While admitting fully that the influence of the mind upon the healthy action of the body is absolutely immeasurable，and while practic ing upon this belief daily，I at the same time cannot but also admit and assert that the influence of the body on the mind is a factor equally demanding consideration．The first sentence quoted above reads quite as correctly，＂They would be happy if they were only woll．＂I find very many cases in which，speaking in all moderation，it is so nearly impossible for the person to be happy，that we can hope for a return to cheerfulness，and to even a reasonable view of the affairs of life，only by a restoration of comparative soundness in bodily fuuctions．
The perfect blackness of despair，a depth of despondency which nothing can fathom，I have often seen，whose origin was purely and simply an exhaustion of nerve force，showing itself chiefly in that very solar plexus to which your article referred，and thence affecting the two organs with which it is so closely associated，and with such myriad ramifications， the stomach and the liver．The remark often quoted that ＂it is impossible for any one to be a good Christian whose liver is out of order＂has in it a world of practical truth and wisdom．A cheerful Christian he may well be excused from being．It is not only useless，but it is a cruel folly，to tell such a one that he must arouse himself to cheerfulness and shake off his gloom．It is true he may try，and I may urge him to make every effort in that direction，but I none the less bend all my energies to restoring the physical force which he bas lost．When a patient comes under my charge with a fractured femur，is it right for me to tell him to stand up and walk？I prefer to apply splints，and wait for the fracture to be healed．He will be ready enough to valk as soon as be has strength to do it．
It is in fact utterly out of the question to take any fair view of this matter without taking cognizance of the two sides，both physical and mental，and in almost equal degree； and it must never be forgotten that even where the sole cause of the exbaustion of nerve force may have been mental，there have supervened physical deraugements which then become of themselves reacting causes of increase d difficulty；and those derangements we can scarcely expect the mind to remove without physical aid and the lapse of time．The blood will not go coursing through the sympa－ thetic ganglia with the bound of health（when those ganglia have lost their proper tone）simply because the patient is happy；and the man who wrote as above that＂the cause of failure＂in persons who were forced，as the price of even decent comfort，to watch carefully their diet，＂is that me，have had the responsibility of attempting to restore such a weakened power of digestion to a healthy state．Of
course the power of the mind can greatly assist，and the course the power of the mind can greatly assist，and the
patient can and ought to be taught that he can aid his patient can and ought to be taught that he can aid his
restoration in a remarkable degree；but that weakened stomach has become as much a positive fact as the fractured femur；one needs splints as surely as the other．
And in this connection we are brought face to face with he fact that we continually encounter a condition of nerv ous exhaustion which is entirely distinct from simple fatigue，and which cannot be removed by rest alone．It is of itself a disease，as distinctly and truly so as is typhoid ever．No organic changes of nerve tissue are manifest， and we call it functional in its nature．Perbaps this is true and then，again，perhaps there are changes too mivute fo recognition．At any rate，this condition of nerve forc affects so powerfully all the functions of the body，but above all others the digestion，that it is responsible for a chief part of the depression to which we have referred； and thorough experience has clearly shown that mind and body must both be regarded and thoroughly studied befor any hope of its removal can be entertained．Man＇s dual bature is not a matter pertaining to the theologian or the psychologist only；it much more closely affects the daily work of every physician in active practice．Man is an an mal，but he is something more．

W．O．A．

## Microscopic Items．

For a good swab for cleaning small vials，test tubes，etc．， use a piece of the round leather belting sold by dealers in sewing machine supplies．
Disinfectants．－What is the best disinfectant？Answer－ A high degree of cleanliness．There is no disinfectant be sides this that is perfect in its action．If not thorough，it is almost useless．Many disinfectants only narcotize disease germs，but do not destroy them．
Method for Double Injections．－The veins are first injected brough the arteries with colored gelatine，and then a differ ently colored plaster of Paris is injected in the same way， forcing the gelatine before it，but as this stops at the capi aries，the arteries and veins can readily be distinguished．
The Beautiful Snow．－From the pure and beautiful snow just fallen，Floegel has obtained living infusoria and algæ， bacilli，and micrococci，mites，diatoms，and great numbers f fungi spores，also fibers of wood，mouse hairs，pieces of butterfly wings，skin of larvæ of insects，cotton fibers，piece of grass，epidermis，pollen grains，rye and potato flour，
grains of quartz，minute pieces of roofing tiles，and bits of grains of quartz，minute pieces of roofing tiles，and bits of ron and coal．
A Pretty Slide．－A very pretty slide，and one very easily made，is the raphides in the sap of the daffodil．It is only necessary to squeeze out a drop of sap from the flowering stem or to a slide，and on its drying，which may occur spon－ aneously，or be done over a spirit lamp，we find hundred of crystals strewn over the field of view．With the polari－ scope they are exceedingly interesting and brilliant．If w rop over the warmed glass a little Canada balsam，we can press on a cover glass．
Simulation of the Tubercular Bacillus．－The memoirs of A． Celli and C．Guarnieri give the results of a large number of bservations on the bacillus described by Koch in the odules of tuberculosis and in the sputa of consumptive patients，aud further call attention to certain crystals found not uncommonly iu these sputa，which，both by their ap pearance and by their behavior toward aniline colors，imitate the tubercular bacilli．The microscopic differences betwee the two classes of objects are minutely described．
Eramining Alive the Heads of Insects，Spiders，etc．－Mr．E T．Draper recommends a cone of pasted paper to be mad rather larger than the specimen，with the apex cut off．A igorous spider will soon project its head through the aper－ ture．When in this position it should be blocked behind with cotton wool slightly wetted．The cone can then be gummed to a slip，apex upward．
Many iusects can be arranged in the same way for the ob－ ervation of facial movements，and such front views admi of interesting and extended study，the action of the antennæ， palpı，and various organs of the mouth may be watched and curious effects produced by the excitation of saccharin or nitrogenous juices，administered from the top of a sable encil．
Bacteria Experiment．－During a recent lecture in the Philadelphia Academy of Pharmacy，glass jars were passed round containing samples of cultivated disease germs Potatoes cut in halves had been lightly smeared with a coat ing of substances containing germs．The bacteria wer nourished on the moist surface of the potato，and presented very interesting appearances．Different results were ob ained from different bacteria．Some of the half potatoes were covered with an ordinary deposit of mould．On others the disease germs had developed into thin，peculiarly shaped patches of fungous growth of bright blue，red，yellow，and reenish colors．Others had grown into an intricate and ex－ ensive network of fuzzy fibers，the growth on the surface f two or three potatoes reaching over and covering a space ving a diameter of eight or nine inches．
Tenacity of Tubercle Bacilli．－It has been doubted whethe he sputa of tubercular patients，which are thrown on the treets and later mix with all kinds of dust，would ever ause the disease．To determine this question，Dr．Vignal Deutsche Mediz．Zeitung，1884，No．1）has collected sputa，as hey had been expectorated by phthisical persons in the treets．He mixed then with the common street dirt moistened them，put them on a porcelain plate，suffered them to dry，again moistened them，again let them dry，and
continued these experiments for a very long period of time． Then be made inoculation from these sputa in two Guinea pigs；one died a few days later from a different，accidental complaint，the other first became fat－a proof of the experi－ menter＇s good feeding－then slowly emaciated，and finally， three months later，died．The post mortem showed a large number of tubercles，many in the state of caseous degenera－ ion，and a great number of bacilli．
This experiment proves that the sputa collecting in the streets and on the floors of dwellings are by no means in－ nocuous，but serve as pathogenic elements in persons pre－ disposed to this disease．－The Microscope．

The Vitiation of Air by Different Illuminants．
The following table，prepared for the Engineering and Mining Journal，shows the oxygen consumed，the carbonic acid produced，and the air vitiated by the combustion of certain bodies burnt so as to give the light of twelve stand－ ard sperm candles，each candle burning at the rate of 120 graias an hour：

## Burnt to give light of 12 candies．equal to 120


> gas....
git．．．．．．．
an

|  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| 3.30 | 16.50 | $2 \cdot 01$ | 217.50 | 195.0 |
| 5．45 | ${ }_{2}^{17} \cdot 25$ | －3．21 | 388.25 | ${ }^{278 \cdot 6}$ |
| 4.45 | $22 \cdot 30$ | ${ }_{3}{ }_{34}{ }^{3}$ | ${ }_{376} 36$ | ${ }_{23.6}^{33.5}$ |
| 6.81 | 34.05 | $4 \cdot 50$ | 484.05 | $361 \cdot 9$ |
| ${ }^{6} 65$ | ${ }^{33} \cdot 25$ | ${ }^{4} \cdot 77$ | 510.25 | ${ }^{325} \cdot 1$ |
| ${ }_{8}^{7}{ }_{8}{ }^{57}$ | 37.85 42.05 | 5．77 5 | 614.85 632.25 |  |
| 8.82 | 44－10 | $6 \cdot 25$ | 669 • 10 | 374 |
| 12：00 | 60．00 | $8 \cdot 73$ | 933．00 | ${ }^{305} \cdot 4$ |
| none． | none． | none． | none． | $13 \cdot 8$ |

New Source of Electricity．
As well known，hydrogen is an element of great import－ ance．Possessing little stability，it decomposes in the pres－ ence of a large number of bodies，and recombines accord ng to the circumstances under which it is caused to act ing to the circumstances under which it is caused to act．
One of its best known reactions has led Mr．Bremond，of Paris，to think that its presence in privy vaults might be put to profit in the production of an electric current．In the presence of iron，hydrosulphuric acid decomposes，in fact， and gives rise to the following reaction ：

$$
2 \mathrm{Fe}+3 \mathrm{HS}=\mathrm{Fe}_{2} \mathrm{~S}_{3}+3 \mathrm{H} .
$$

Free hydrogen is disengaged；but，if it be brought into the presence of an oxidizing body，such as the sesquioxide f iron，for example，it will at once combine with the oxy－ gen of the oxide，according to this formula：
$3 \mathrm{H}+\mathrm{Fe}_{2} \mathrm{O}_{3}=2 \mathrm{Fe}+2 \mathrm{HO}$.
It results from this that if things be so arranged that these two reactions shall occur simultaneously，so to speak，an electric current ought to be engendered．
In order to collect this current，Mr．Bremond would ar－ ange his pile as follows：
In a porous vessel of any shape whatever，he would ar－ range a cylinder of carbon surrounded with an intimate mix ture of sesquioxide oi iron and powdered charcoal，the whole being placed in a sort of envelope of iron wire．The connections being made，on the one hand with the interior charcoal，and on the other with the external armature o ron，the element thus constituted would be immersed in the privy vault．It is evident that if the circuit were now closed a current would bo produced．This granted，a very large number of elements of this kind might be grouped for ten－ ion or quantity in such a way as to obtain a current capa－ ble of directly supplying lamps，or at least of charging ac umulators．
The idea，as may be seen，is very original and seductive， because of its very simplicity．The porous vessel，more－ ver，which might prove troublesome on account of its brittleness，is not necessary，since the central carbon might be directly covered with an agglomerate of sesquioxide that could be afterward surrounded with an iron envelope．The ron itself is not absolutely indispensable，for zinc would behave in the same way，and might，if need be，be substi－ tuted for it；care being taken，however，to increase the num－ ber of elements for the same current，since the reaction would not be so lively with zinc．Finally，the sesquinxide of iron might likewise be replaced by any oxidant whatever， but as it is one of the cheapest of such itself，we scarcely ee，what could be practically employed in its stead except peroxide of manganese．
Such is Mr．Bremond＇s ingenious and original idea．－La Lumiere Electrique．

## Launch of a Great Ship．

The Cunard Line steamer Umbria，the largest vessel afloat xcepting the Great Eastern and City of Rome，was launched June 25 from the yard of Messrs．John Elder \＆Co．，Fair－ field，Govan，for the Cunard Company．She measures 8,000 ons gross，her length is 520 feet，her breadth 57 feet，and her depth 40 feet．Her engines are designed to indicate 12.500 horse power，the most powerful marine engines yet constructed．She was named the Umbria by the Hon． Mrs．Hope．She is built entirely of steel，is divided into ten water tight compartments，and has five decks．The promenade deck extends for 300 feet over the whole breadth of the vessel，and the saloons will all be proportionately large．It was matter of remark among the company pre－ sent at the launch that it is less than ten months since the keel of the vessel was laid．The new ship will run between New York and Liverpool．

CONICAL PRESS FOR TREATING BEET PULP.
Exhausted beet pulp makes an excellent food for cattle provided that it is neither too moist nor too dry; and, in order to bring it to the proper state for this purpose, Messrs. Selto bring it to the proper state for this purpose, Messrs. Sel-
wig \& Lange have invented a very ingenious conical press, which is illustrated in the accompanying cuts.
The apparatus is specially designed for expressing th juice contained in beet pulp that has been ex hausted through the dif ferent processes of extraction. Figs. 1 and 2 rep tion. Figs. 1 and 2 rep resent it in longitudina and transverse section,
and Fig. 3 gives a perspecand Fig. 3 give
tive view of it.

The pulp, which is sup plied continuously by a chain and buckets or an endless screw, enters the hopper, E , and falls at $a$, between two openwork disks, whose sides are in clined and covered with perforated iron plate. These disks are surround ed by the cheeks of the frame, $\mathrm{B} \mathrm{B}^{\prime}$, and the latter is securely bolted to wooden blocks fixed to the flooring. The disks revolve very slowly, and at an equal rate of speed around stationary drums C C', that are connected by tie rods, $b$, and they form with each other an obtuse angle such as to make them further apart at their upper part, $\boldsymbol{a}^{\prime}$, than at $a$. The pulp thus fills a chamber whose sides taper downward in the form of a wedge, and moves constantly over inclined axes. Owing to this arrangement it is carried along by the friction of the revolving disks, and is brought progressively into the narrowest interval of the pressure chamber. During this motion it undergoes a strong pressure, which reaches its maximum at $a$, and all the juice tbat it contains traverses the strainer and the disks, A A'. The liquid afterward escapes through wide orifices in the lower part of the frame, and falls into a funnel, H , which connects with a drain.
As the rotary motion is continuous, the expressed pulp, on making its exit from the space, $a$, passes into a wider cavity, and afterward meets with a partition, $F$, which forces it to make its exit from the apparatus through the aperture, $M$, in a state of considerable cohesion
In order to permit of regulating the pres sure, which depends upon the distance apart of the disks, $A$ and $A$, the builders bave arranged, externally to each of these parts, a sleeve, whose position is determined by screws connected with the frame. Each sleeve is capable of moving upon its axis, $C$ or $C^{\prime}$, in such a way as to increase or diminisb the interval that exists between the strainers. As shown in the figures, rotary motion is transmitted to the apparatus by a belt that passes over a pulley keyed to the shaft, L. Two gearings then drive the shaft, K , and this sets in rotation two pinions that gear with a system of toothing upon the circumference of the pressure disks, $A$ and $A^{\prime}$.
In order that the motion of these latte may be properly guided, each of them is put in contact with three conical rollers that pivot on the frame and run in bearings that permit of the position of their axes being regulated. All the running parts have to be carefully looked after and kept lubricated with tallow and black lead.
The use of this press in sugar works ha demonstrated the fact that it is unuecessary to take out the strainers in order to clean them during one season's running.
This operation, although very easy, may be avoided by forcing in, from time to time, a powerful stream of water against the ex ternal surfaces of the disks, which will then preserve all their efficiency.-Revue Industrielle.

Mackerel and Ale. - Notices have been posted outside the various metropolitan hospitals in London, warning the public against the excessive use of mackerel and mild ale at this season of the year, as the larger fish are liable to contain a small worm, which would be injurious and likely to cause cholera and other diseases. The caution with regard to the drinking of large quantities of mild ale is given especially to the working classes. The beverage produces profuse perspiration, and renders the body liable to a chill, which would be likely to lead to serious consequences.


Fig. 3.-PRESS FOR TREATING BEET PULP.
aw on the beaches of Long Island as early as 1758, and in been carried on since 1780. In the south of France the first step toward arresting the progress of the sand is to erect a barrier to the drift, the usual form being composed of pal ings or boards about 4 feet high, and the sharpened end driven into the sand. Each board is from 5 to 6 inches wide aud $11 / 2$ inch thick. An inch space is left between the boards, so that as the sand drifts it is piled up in front of the boards, and passing also through the spaces is deposited bebind. The boards soon become buried in the heap of sand which is collected around them, when they are raised with out disturbing the heap. When the paling is tirst erected, a
space on the windward side eight times wider than its height is planted with sand binding plants, those used in France being chiefly Arundo arenaria, a Triticum, Cakile maritima, and a Salsola. The dune thus secured rises higher and higher, and the plants as they are buried struggle upward and bind the drifted heap with a network of roots. The dunes in France increase in height at the rate of about a foot a year, and the top is sometimes covered with Tamarisk.
Dr. Bidie says: "The chief local plants instrumental in she was known as the orphan's friend. The statue repre sents Margaret sitting in a chair clasping an orphan to her side, while her hand rests upon the child, who is bending forward, looking up into her face. The pedestal surmount ing the base is of Italian marble. The group is also of Italian marble. The entire cost of the decorations for the grand pedestal and statue will be $\$ 6,500$.

The value of the fish caught by Canadian fishermen during 1883 is placed at $\$ 17,000,000$.

A PRACTICAL METHOD OF ESTIMATING DISTANCES.

D PRACICAL HETHOD OF ESIKAIIG DIS men upon a card-the standing ones 25 mm . in height and the kneeling ones 16 mm . If you are an artist and have the means at disposal, instead of simply blackening the figures you may paint both surfaces with the colors that are pecu liar to the different uniforms of the enemy, but care must be taken not to lay the colors on too thin. Now cut the figures out with care, leaving sufficient paper attached to their bases to allow the instrument to be held between the thumb and first finger.

The apparatus being constructed, it only remains to use it: At 200 meters distance station one or more men, and, where you are standing, allow an assistant to hold the instru ment at the height you direct him to. Now proceed to a dis tance of exactly four paces, of 0.75 m . each, from your figures, and ascertain whether their general aspect, as regards height and width, corresponds to that of the men stationed 200 meters off. If the resemblance is periect, you are in posses sion of one of the simplest and most portable of telemeters if it is not, you will have to begin all over again. You may renew the operation by placing your men at 300 meters, and taking six paces instead of four (Fig. 1).

Supposing that the apparatus has been constructed satis factorily, the manner of using it for estimating distances will be readily understood. Let an assistant bold the instrument in the direction of the troop that serves as an objective, while you move backward in keeping your eye upon the silhouettes and the objective, and stopping when the figures and men exhibit the same aspect and seem to form part of one and the same group. Then returning to your assistant, you count the number of paces that separated your eye from his hand. Upon multiplying this number by 50 , you will obtain a product that will give you in meters the distance sougbt
Notwithstanding the wonderful simplicity of the instrument, it is easy to control the accuracy of the principle upon which it is hased, first, by reasoning, and then by experiment.

In the similar triangles, A B C and D EC (Fig. 3), we have the ratio:
(a) $\quad x=l \frac{\mathrm{H}}{h}$

H and $h$ being constants, $l$ will have to vary with $x$, that is to say, with the distance.
The arrangement adopted permits, on holding the instrument away from the eye, of diminishing the difficulty that the latter has of seeing the objective and image simultaneously. Besides, it lessens the trembling of the hand that holds the apparatus, and which would render observation impossible in an ordinary stadium placed at 0.6 m . from the eye

What is the value of $\frac{\mathrm{H}}{h}$ ? In the majority of proportional base telemeters the distance sought is 50 times greater than the base. Such a ratio is very convenient, since it necessitates a base of only 20 meters for a distance of 1 kilometer. However, as the observer can scarcely measure the base otherwise than by pacing it off, it has seemed preferable, in order to expedite the operation and avoid a conversion of pace measurements into meter ones, to take a mean pace of 0.75 m . as unity, and to modify the formula so as to at once obtain the distance in meters.
In formula $a$, on substi tuting $n \times 0.75$ for $l$, and making $\frac{\mathrm{H}}{h} \times 0.75=50(\mathrm{H}$ being equal to 1,665 ), we shall have 0.249 m . as the value of $h$.

If, however, greater pre cision were required in the results, the meter might be preserved as the unity of measurement of the base, the silbouettes be given a height of 33 millimeters, and a cor about 30 meters, with knots 1 meter apart, be employed But it will be readily under stood that this process, although more accurate, is much less practical.
Let us now examine the causes of error as well as their limits.
The height of a soldier, taken as a base, varies between 1.45 m . and 1.8 m . As the mean height generally admitted is 1.665 m ., we should, upon taking this as a basis and operating upon extreme heights, commit an error of about one-thirteenth, more or less, of the distance sought. But if, besides the height, we consider (and it is the case here) the breadth of several men, we see that this dimension bas less variation, and that we could not assign to the error a value of more than one-fourteenth. This might, moreover be sensibly reduced by means of operations repeated upon different subjects.

Another cause of error is due to the manner of doing the


Fig. 1.-METHOD OF ESTIMATING DISTANCES.
acing, which may vary from 0.7 m . to 0.8 m . at the mos when some little attention is paid to it, or 0.05 m ., more or less, than the normal pace. But the error committed in this case will represent only one thirty-fifth, more or less, of the distance sought, and this may be thrown entirely out of consideration where regulating firing is concerned. The two errors, upon being added, will, at the worst, never give a deviation of more than one-tenth in the real distance, and we shall admit that such an approximation is sufficiently exact if we reflect upon the gross errors that we should com


Fig. 2.-APPARATUS FOR ESTIMATING DISTANCES.
mit in estimating by eye, and upon the great variations in range that occur in the best regulated firing.
Let us add, that with this instrument it is not necessary to ee the entire object, if the
seen, it will be sufficient. of 1,000 meters and beyond; but if there is a field glass at one's disposal, it will be preferable to use it for very long distances. In all cases it is well to light the image as much as possible in the same manner as the men observed. If, for


Fig. 3.-APPARATUS FOR ESTIMATING DISTANCES.
example, these latter were in shadow and the instrument were too brightly lighted, it would be necessary to cut off with the hand or cap the solar rays that were falling thereupon.
It r
It resulted from experiments made at Fort Caguelot, on the Langre plateau, that, out of thirty measurements, one only could be considered as insufficient, this having given an error of at least one-eighth of the distance. All the rest fixed on as a limit; and, if a mean of such deviations be
sought, it will be found that it was only one twenty-second. The little iustrument that we have just described has in nowise the pretension to replace those excellent telemeters that all infantry corps are provided witb; but it offers a sure and convenieut means of estimating distances, and we believe that a frequent use of it will quickly familiarize the observer with making such estimates by the unaided eye, and this, it should not be forgotten, will always be the most really practical method on the field of battle.La Nature.

## yex

 ellow through those belonging to the colors red, orange, duced by green, blue, indigo, and violet. White light is prois prod the combination of all these waves, just as noise tones. Ned by the combination of multitudinous sound meeting them when we cross a series of undulations in water, given time than when we are at rest, while if we move the same way so that they overtake us, fewer pass us in a given time. Judging by the number so passing and their known rate of motion, the inference would be (were we uncon-scious of our own movement) that they were narrower in the former case and broader in the latter than they really are. Apply this reasoning to sound waves, and it will be seen that if we are approaching a source of sound the' sound wave should seem narrower, that is, the tone higher, while if we are receding from the source of sound the sound wave should seem broader or the tone deeper.
Experiment has shown this to be so, the chango of tone being found to correspond precisely with that shown by cal culation to be due to the measured rate of motion toward or from the source of sound. A rough observation of the change of tone can often be made during railway traveling, especially in America, where, besides steam whistles, bells areused. For it will be found that the tone of the whistle or bell of a passing engine lowers markedly at the momen when in passing the whistle or bell ceases to approach and begins to recede.
Now as light travels in a series of waves, it is manifest that the same law must apply to light as to sound. If we are approaching a source of light of one definite tint, the light waves will be shortened and therefore the tint changed in the direction from red toward violet in the spectrum. If we are receding from such a source of light, there would be a similar change, but in the opposite direction, that is, from whatever the tint might be to a tint somewhat nearer the red end of the spectrum. All that would be necessary in such a case would be that the velocity of approach or reces sion should be comparable with the velocity of light, or 186,000 miles per second.
Doppler's idea was that movements of recession or approach among the stars might be indicated in this way, the stars of ruddier tints being those which were receding from us, and those of bluer tints being those which were approaching. He overlooked the circumstance that the stars do not sbine with definite tints, but with white light, that is, with all the colors of the rainbow combined. It would be impossible to judge by the sound wave test of the approach or recession of something moving with noisy clatter, as to determine by the color test whether a star is approaching or receding. But if among the sounds producing a noisy clatter were only one whose tone was distinct and known we might, despite the noise, determine the question of approach or re cessiou. So if we can select even among the multitudinous tints forming the light of a star a single tint which we know, that tint will tell us of the star's approach or recession, it only the rate of such motion is great enough to cause measurable displacement of the known tint toward either the red or the violet end of the spectrum

Now in the spectrum of Sirius, as already mentioned, the lines of hydrogen are very strong; they are quite unmistakable also as the lines of bydrogen, so that the astronomer can compare any given line of hydrogen-say the one in the red part of the spectrum-with the corresponding line of bydrogen as given by the glowing gas in one of his tubes.
The comparison so made by Dr. W. Huggins, the most skillful of our English spectroscopists, showed that Sirius was receding from the earth at the rate of more than twenty miles an hour. Later observations at our chief national observatory confirmed his results.
So far only what was originally likely enough had been recognized. The observation, like others applied to the stars, showed a more rapid rate of motion among the stars than many astronomers had supposed to exist. In particular the theory of M. Otto Struve that stellar motions average between three and four miles per second was roughly shaken. But I had already shown from other considerations that Otto Struve was probably mistaken.
But of late years the evidence obtained at Greenwich has tended to show that the motion of Sirius is diminishing. And now it is found that the motion of recession has become so slow that we may expect it presently to change into a motion of approach-which may probably increase, reach its maximum, then diminish, change into a motion of recession, and so forth, as though Sirius were traveling in a mighty orbit with movements alternately carrying him toward and from our sun.
Now Peters and Auwers long since showed that the thwart motion of Sirius (that is, the star's apparent motion on the vault of heaven) is affected by a peculiarity indicating orbital motion. Mr. Alvan Clark, the celebrated optician of Cambridge, Mass., discovered a companion of Sirius which has been regarded as probably the cause of the motion of Sirius-not the ceater round which Sirius is traveling, but the cause of the motion of Sirius around the point which is their common center of gravity. The orbit estimated from either star as a center has a diameter not less than 100 times greater than the orbit of the earth round the sun, yet (so great is the combined mass of the two stars) the period of circuit is less than balf a century.
Supposing the mass of Sirius to be ten times greater than the mass of the faint companion, the orbit of Sirius around the common center of gravity would have a diameter certainly not less than nine times that of the earth's orbit, and the average velocity of Sirius in that orbit would be not less than a fifth of the earth's velocity in ber orbit, while when vearing peribelion a much greater velocity than this might be attained. Supposing that a portion of the velocity which is in the direction toward and from us to be about ten miles per second, and the system to be traveling at about the same rate from the sun, the apparent velocities in the direction of the line of sight would range from rest to a rate of recession of about twenty miles per second.

Whatever be the actual movements of Sirius, orbital or
otherwise, it is clear that the new method of measuring mo tion is capable of giving us such information about these movements as cannot but help us notably in the determination of their true character. The same method applied to Procyon and other leading stars will probably do more to nable science to interpret the constilution of the stellar heavens than any method devised since astronomy becam science.-Knoroledge.

## AUTOMATIC WAVE LUBRICATING LIFE BUOY.

The life buoy herewith illustrated consists of a seamles brass reservoir running entirely around the inside. The oil is filled in through a hole in the top, which is then covered by a cap which screws on. On each side of the upper par of the oil tube is placed a rose-similar to those placed upon prinkling cans-so that when the life buoy is hung upon the vessel's stern no oil call escape; but the moment it placed horizontally the lıquid begins to escape and cover placed sea with a thin film of oil, spreading out rapidly on every ide until a large circle is formed, within which the person who has fallen overboard may rest until rescued by the oats.
This buoy is the invention of Mr. G. Foster Howell, and


HOWELL'S AUTOMATIC WAVE LUBRICATING LIFE BUOY
is manufactured by Mr. D. Kahnweiler, of 146 W orth Street New York city, of whom further particulars may be ob tained.

## Harnesses for Fire Engine Horses.

A trial lately took place in the U. S. Circuit Court, North ern District of New York, in which the presiding judg gives in his decision several very interesting particulars. It was the action of Worswick Manufacturing Company et al. $v$. City of Buffalo et al. Judge Coxe's decision is as fol ows:
The complainants are the owners of Letters Patent No. 171:190, granted December 14, 1875, to Edward O. Sullivan, for improvements in harness for fire engines. The patent relates not only to the construction of the harness, but also to the manner of suspending it above the horse. The object of the invention is to enable the horses to be kept unbarnessed until the moment of the alarm, and then to attach them to the engine with great expedition. One man is thus enabled to do the work of three under the old system. The harness is made in sections, is permanently fastened to the neap or thills, and suspended from the ceiling by means of straps and spring catches, so that it may be dropped upon the horses and quickly secured.
Before the use of this apparatus, horses were kept contiuually in barness night and day. The result was that they were irritated and galled, aud the harness was injured and soon destroyed by the constant rubbing which this irritation occasioned.
There can be no doubt regarding the utility of the inven tion. Its advantages may be summarized as follows: relief to the horses, expedition in reaching the fire, durability and reliability of the harness, economy in the employment of firemen and harness makers. And when it is remembered that promptness in arriving at a fire has often prevented a great confiagration, the indirect benefits can bardly be esti mated.

The claim in controversy is the third. It is in these words
3. The combination, with a harness for a fire engine or like apparatus, of a device for suspending said harness above the place occupied by the horse when attached to the apparatus, substantially as and for the purpose set forth.
The defenses interposed are, first, the claim is void for the reason that there is an attempt to patent a mere abstrac-tion-the idea of suspending a harness from the ceiling in a particular place; second, the defendants do not infringe if the claim is confined to the particular mechanism described in the specification; third the patentee was not the origina inventor
So far as thearecords of the Patent Office show, Sullivan
was the first to enter this field of invention. No other pat ent, American or foreign, is introduced to auticipate or imit the claim referred to. It should, therefore, be con strued, broadly, to cover any similar apparatus which sus pends a harness in substantially the same manner. The de ails of construction both in the harness and the suspending apparatus are non-essentials, inferior, and subordinate to the principle embodied in the patent, which is the para mount and superior consideration. The man who first con ceived the idea of suspending the harness above the horse and put it into successful and practical operation is the one wo conferred the benefit, and is entitled to the reward. It ould be an exceedingly illiberal and nariow construcrion to hold that he should be deprived of the fruits of his inge nuity by one who simply changed the form of the harnes or of the de vice by which it is suspended. No principle is better settled than that a mere abstract idea is not the subject of a patent, but that principle has little application her for the reason that the iuventor has put his idea into tangi ble shape and given it form and substance. For years the problem was how to get the engine $t$, the scene of the fire in the shortest possible time. By a combination of old de ices Sullivan has reduced time to the minimum, and ac complished a confessedly beneficial result. It is not an ab straction he seeks to secure, but the apparatus by which the idea is carried out. With the claim thus construed, and i view of the state of the art, very little need be said upon the question of infringement.
The defendants have adopted an analogous combination The harness and hoisting apparatus used by them are sub stantially the same as those described in the patent. They bave quite likely introduced some improvements; they hav employed the well known mechanical equivalent of a pulley and weight for a coiled spring; they suspend the whole har ness and attach no part of it to the pole, and there are mino ponts of difference between the two mechanisms; but in al essential partizulars they are alike.
The main effort on the part of the defendants has been to show that Sullivan was not the original inventor. Here the burden is upon them to satisfy the court beyond a reasona ble doubt. A mere preponderance of evidence is not enough. The proof must be of such a convincing charac ter that the court can say without hesitaucy that the allega tions of the answer in that behalf are true. Has such proof been offered? It is thought not.
A fair conclusion to draw from the evidence is that the defendants have succeeded only in casting doubt upon the title of the patentee. Instead of capturing the citadel they have simply made a breach. True it is that before the patent vague conceptions of the invention had entered other minds; true it is that others bad approximated more or less closely to the successful realization. No one had quit reached the goal. The evidence shows that in one instance while the horse was standing harnessed in the stall, the col lar was, by means of a cord, pulley, and weight, raised on his neck to prevent chafing, heat, and irritation. In an other case a single harness, without collar and hames, wa attached to the thills of a light fire wagon. The harness and thills were elevated to the ceiling by a rope, pulley, and weight. A similar metiod was at another time applied to the harness of hose carts, excepting that the coilar and hames were left on the korse
There was also evidence tending to show that in 1872, a Louisville, the harness of a hose cart was suspended by a rope and pulley from the ceiling, and that the collar was hinged and was fastened by a snap or spring lock at the bottom. No witness was called who recollected seeing harness for fire engines suspended prior to the date of the patent. But, it not discredited, the evidence relating to the Louisville apparatus would certainly have the effect of re stricting the claim within exceedingly narrow limits. The complainants have, however, succeeded in showing tha there may well be a mistake both as to the time when aud the manner in which the harness was suspended at Louis ville. The chief and assistant chief of the fire department of that city during the year 1872 never saw or heard of the apparatus described by the defendant's witnesses. The chie next in succession, who previous to his elevation to tha office had been iu and about the evgine houses for twenty years, gave like evidence. A member of the Cleveland fire department, who came to Louisville in 1879 for the purpose of explaining and introducing the Sullivan apparatus, testi fied that he visited the different engine houses, but saw nothing at all resembling a swinging barness. The Louis ville firemen were surprised and pleased with the invention and it was immediately adopted by them. It, must, there fore, be said within the rule heretofore adverted to that the defendants have not succeeded in establisbing their defense Decree given for an injunction and an account, with costs.

## Protecting Steel and Iron from Rust

Professor Calvert has recently made the interesting discovery by practical tests, that the carbonates of potash and soda possess the same property of protecting iron and stee from rust as do those alkalies in a caustic state. Thus it i found that, if an iron blade be immersed in a solution o either of the above carbonates, it exercises so protective an action that that portion of the iron which is exposed to the influence of the damp atmospheric air does not oxidize, even after so extended a period as two years. Similar results, it appears, have also been obtained with sea water, on adding to the same the carbonates of potash and soda in suitable proportion.

Engineering inventions.
A steam boiler has been patented by Mr Samuel P. Hedeges, of Greenport, N. Y. It has vertical and horizontal cylinders with inlet and blow-ö pipes, and with projecting uipes having interior cir
culation pipes, whereby steam will be generated quick IV, and all the parts are easily accessible.
An axle box lid bas been patented by Mr. John C. Albrecht, of Columbus, Ga. The asie bos has beveled end and vertical side grooves, and the inclined lid has side flanges, the object being to provide
a lid which will always be oil tight when closed, and which can be easily opened and locked in the open
osition
hoisting machine has been patented by Mr. Cormele G . Ross, of Rutland, Vt. This invention covers contrivances for unwinding or overhauling the
rove of the drum more rapidy than it can ordinarily be ope of the drum more rapidy than it can ordinarily be
done, to economize time when working in deep mines quarries, etc., where considerable length of rope is
A clamp plate for railroad rails has been patented by Mr. Thomas J. Bush, of Lexington, Ky, Chis invention covers improvements on former patent ed aped to be placed upon the cross tie and flange of a
adap railroad rail, combined with interlocking bolts;
in the plate and cross tie parallel with the rail.
A dredger has been patented by Mr. Colle tion covers improved contrivances for workiug a scoop or dredping out canals and rivers by a derrick an
boom erected on the bsnk, and floats from which uaide and control the scoop, with improvements in it construction for regulating its dip.
A car wheel bas been patented by Mr William H. Herbertson, of Brownsville, Pa. The in-
vention coversmore especially an improved device for iiling axles of coal cars, there being a central oil cavi ty in the wheel, and inclined bars adapted to rest ime and labor, and all waste of lubricating materia being obviated.
A base burning steam boiler has been pa lented by Mr. Micheal E. Herbert, of St. Joseph, Mo It is an upright boiler, with a downwardly projecting annular chamber at its outer periphery, and a similar magazine, with other novel features, giving a greate ent of heating surface without the complication of reat number of fues
An automatic hydraulic signaling appara tus for railways has been patented by Mr. Frederic
W. Malcolm, of Cincinnati, $O$. The apparatus is co atructed with a hinged bar, a signaling post, and lotted semaphore arm, the bar heing connected to the arm by a piston and piston chamber, an air chambe with a perforated valve. pipes connecting the air cham.
ber with a piston chamber, etc., so the eemaphore arm ber with a piston chamber, etc.,., so the semaphore arm
will be displayed by the expansion of air compressed by the weight of the advancing train.

## mechanical inventions.

A lathe dog bas been patented by Mr. Samnel N. Silver, of Au burn, Me. Combined with the face ceiving a set screw from the face plate, an apertured plate being held between the jaws, while the set screw
serves as a pivot for the apertured plate, with various ther novel features
Watchmakers' pliers are the subject of a patent issued to Mr. Calvin W. Little, of Denver, Col The invention covers a novel construction, one of the Jaws ofing fatenened to a chisel edge and sitted, and the lower jaw a bearing for the watch face, the whol
eing designed to facilitate the re moval of the hand from a watch without straining or twisting the hand or the shaft to which they are applied.

## AGRICULTORAL INVENTIONS.

A peanut planter has been patented by Mr Christopher C. Boykin, of Ivor, Va. The invention justable plates a from the same, to regulate the capacity of the cups with various other novel features to improve wheele
planters for planting peanuts, peas, or other seeds. A cultivatiug harrow has been patented b Mr. Joyeux Collins, of Tyro, Ark. This inventio covers a novel construction, so the harrow can he
drawn along a row of plants to cullivate both sides a the same time, or the space between two rows. so the side parts of the harrow, in either case, adjustin themselves to the inclination of the sides of the ridges.

## miscellaneous inventions.

A fire kindler has been patented by Mr. George C. Kiesewetter. of Hoboken, N. J. The inven tion covers a composition of matter iu specified pro-
portions, made into cakes, consisining of resin benzine water, caustic soda, raw oil, nitrate of lead, sulphate of
${ }_{\mathrm{A}}$ wire fence has been patented by Mr Richard B. Combs, of Cincinnati, Ohio. The invention covers a combination of improved wire straining and fastening devices, improved post brace for wire
fences, with novel support for the wires, and other spe cial features in design and constfuction
A cabbage slicer has been patented by Mr. Theodore A. Cook, of Brooklyn, N. Y. The knives have a double action, making the device do its work
very rapidyl, and an eccentric lever is so arranged that it is very easy to operate, making a machine that is A hand loop for driving reins has been patented by Messrs. Charles E. Rand and Francis H.
Audley, of New York city. The invention covers 2. Audley, of New York city. The invention covers 2
series of hand loops, wilh an end loop, slides. and keep.
ers for securing the hand loops to a
readily adjusting them upon the rein.
Scenery for theatrical plays is the subject of a patent issued to Mr. Frank L. Rees, of Bridgeport,
Conn. This invention covers ench an arrangenent Conn. This invention covers ench an arrangement of
arritions as to enable the actors to appear in fuve dif parititions as to enable the actors to appear in five dif-
ferent apartments, each of which is exposed to the erent apanmens, each or wil
A hay elevator aud carrier has been patent ed by Mr. Abner J. Burbank, of Harvard, III. The in vention combines with a weighted lever and stop to enable the carrier to be run in either direction, th locking and tripping gear being simple and efficient. An oil cup faucet has been patented by Mr. ohn S. McGuire, of Centerville, N. J. In combination with a screw neck is a spout, an apertured plate with
a washer, and a screw cap with a valve plate, thus pro. iding a can for closing the spouts of oil cans, and on hich aloo
A vebicle spring has been patented by Mr George B. Malette, of Watkins, N. Y. It is a device of corrualed or serpentive anti-friction spring, with novel
devices for so connecting with the vehicle that the body $f$ the latter will always be depressed equally wilhout cality of the load.
A bill or letter file has been patented by Mr. Yichael B. Hurly, of Quebec, Canada. This inventio tobil lies formed with a wire stringer having binted ends, on which bills or letters are strung after novel construction is provided.
A method of securing heels to rubber boots has been patented by Mr. Alfred V. B. Carisise, of Ne Brunswick, N.J. The emetiod consists in applying tid sole into the beel and then connecting the outsole heet to the body of the boot and vulcanizing the so that the screws will be wholly embedded in rubbe A buck for beer coolers has been patented b Mr. Frank T. Cladek, of Rahway N. J. The in vention covers an improved swing beer buck for re rigerators nsed for holding beer on tap, the buck be ing adapted to be swung out of the refrigerator for acilitating the labor of placing the keg of beer in an A thill loop for by Mr. Alexander C. Davison, of Jefferson City, Mo
It consists of a metallic core, with an anti-friction porting roller at its lower end, with various novel de ices for ing the hold back strap, besides being cheap and

A protector for harness saddle skirts has , ord, Nass. The protecor is made win a cushion hav ing a nut in ise back, and a sciew for securing the
cushion to the back strap, to keep the latter out of coutact with the saddle skirt, and thus prevent the being chafed and marred.
A paper or letter box bas been patented by Mr. Harry Stccks, of Lowell, Mass. The invention ottom, the edges of the slot being turned inward to orm flanges, the hox being held to the door or cas ing in such manner that the side opening is close wen the door is closed.
An improved perpetual calendar has bee patented by Mr. Thomas A. Bereman, of Mount Plea sant, Iowa. The object of this invention is 10 show day of the week occurs, the device to be easily chang of any past or future year.
Au inner sole for boots and shoes bas been It is flexible, and has a flexible flling in is cute whereby the "brace" is taken out of the inner so against the outer sole without damaging the wear,
heavier outer sole may be used, and a more flexible bol or shoe is obtained.
A hot bed sash bas been patented by Mr Charles J. Aeimus, of Guttenberg, N. J. The inventio dividing the contiguous glasses of the frame, and th neans for supporting and holding them, so in cose he rotting or breaking of the mullions or strips they an be readily removed and replaced without disturb ing the frame.
A twine holder bas been patented by Mr Reuben Melvin, of Cincinnati, o. In combination with he recepracie for the ball of twine is a band or cor with a weight at one end and a ring or eye at the oppo-
site end, through which the free end of the twine is inssed. mat on a device by which the end or the twin

A wheel for roller skates bas been patented by Mr. Edward F. John 8on, of Jersey City, N. J. The wheel is a combination of saucer-shaped side plates, sfelly and tire to the wheel, although instead leather rubber or other flexible material may ne nsed

## urable.

A mould and mould hoisting apparatus for building concrete walls has been patented by Mr. vention consiets in a moula in which a course of the wall can be formed, and in devices for raising the
mould for the formation of another course, the con struction being novel, and such as will facilitate build ing operations.
A tobacco mould has been natented by Mr James M. Guston, of Louisille, Ky. The invention
covers improvements in the construction of for more readily adjusting them to plings of differen sizes, and also a contrivance for arrancing severa series of moulds and followers in frames, theseries be ing readily lifted apart after pressing, to facilitate re moving the plugs and refiling.
A draught equalizer has been patented by
Mr. Benjamin W. Sutherlen, of Fillmore, Minn. The
invention covers a novel constraction and combination of parts, wheroby the draught upon a biree horse team is perfectly equalized, the horses are allowed to travel
close up to both sides of the pole, side dranght is vented, and the evener is supported from the ground
with other advantages. Juan Arnold, of Brownvile, Neb. There is a specia combination of cord, drum, high speed brake wheel and other devices and attachments, whereby eithe goods or persons may be lowered from a burniing building , the machine being attached near a window, and made ready for use by simply throwing out a rope. A fire kindler has been patented by Mr. Eugene J. Dunbar, of Romulus, Mich. The invention conisist of a coal or carbon kinaingmade winan erior film of hard, smooth, resinous matter that ceadily inflammable; this improved kindling has bee used for the fring of locomotives, and is obtainin nuch favor for domestic use
A device for truing grindstones has been patented hy Mr. Chester A. Weller, of New York city. A rigid bed carries a nut plate and screw, a frame ding in ways and carrying housings, a shaft journa dastic elastic spaces, with other devices of novel design and
combinaion, for dressing stones by traversing rotary utters across their faces
A trunk lock has been patented by Mr. Mortimer C. Ogden, of Brooklyn, N. Y. The lock ca ng has a cibhi the raised part, and not projecting ond the inner surface of the rim or fanges, the object being to provide a lock which can be secured on the outer surface of the trunk, without the necessity of nortising or cutting the surface of the trunk
A steam generator has been patented by $\mathrm{Mr}_{\mathrm{r}}$. James W. Bailey. or Monmouth, II. This invention is designed more particularly for steam heating parposes,
and covers a novel sectional arrauyement whereby th nd covers a novel sectional arrangement whereby th circlation thed near the fire more effectively than it would other wise be.
A fishing machine has been patented by Mr. Thornton F. Williams, of Cascade Locks, Ore. A wheel with revolving dip nets is mounted on a scow
he supports being arranged on an extension at tern, and the nets having double inclined chntes discharging the fish out of each end of the wheel and .onveying them into the hold of the scow
A. coffee roaster has beeu patented by Mr Napoleon B. Powell, of Versailles, IIl. This inventio same inventor the feet that inder being so connected by an extensible barand clamping screw that the roaster will be held from longitudinal movement in the stove oven, and the cylin er can be readily detached from its supports.
A combined fifteen ball pool rack and spot ter has been patented by Mr. Wiliam A. Tea, ydde, obio. Mis inverion reates to improvenent on a former patented invention of the same invento the partsof the rack and of the trough or conduit at tached to it, and in the attachment of the triangle for spotting, whereby the balls may be accurately aud auomatically spotted.
A paddle wheel has been patented by Mr Andrew S. Morrison, of Portand, Ore. This invention provides a wheel which automatically adjusts itself
according to the current, the paddles being on two according to the current, the paddees being on wio mounted on the ehaft and the outer one is mounte oosely, so that when the pressure is greater on the
outer ends of the paddles they will be inclived accord ingly.
A heel for rubber boots or shoes has been patented by Mr. Walter Southwick, of New York city. uter plate of rates to that class of heels where an netal is used toprotect the heel, and prevent the wear er from slipping on ice; the heel is made very frm an strong, is or novel construction, and cannot by any of the boot or shoe.
A curve for portable railroads has been $p$ Place, Mr. Heorge W. Thomas, of Fuselier Ho ormer patented invention of the same inventor. and consists of two curved rails united by ties, on each end of which curved rail a tongue is hinged; the curve thu formed being placed on a cros sing, the tongues are in clined from the ends of the cu
of the regular track.

## Common Sense Chairs.

Several years ago, a bout the time Mr. F. A. Sinclair commenced the manufacturs of his now world wide
known chairs, at Motville. N. Y.. he sent to the oftce of thispaper specimens of his several styles of manufacture. Those first sent have passed away, but othe have been ordered from time to time from Mr. Sinclair's manufactory, und the result is that we have had he Common Sense chairs in constant use for mand years, and for the piazza, hall, sitting room, o parlor of a country house we know of no kind of seal clair chair. From a small beginning Mr. Sinclair built upa very large busiress, and has adided to the pro duction of chairs the manufacture of settees and other seatsof double cane or ash splints all mounted in hard wood frames. For hotels and conntry boarding houses,
the Common Sense chairs and settees of Mr S Sinclai te nom mon Sense charrs and settees of Mr. Sinclar parties furnishing country houses and desiring inexpensive, comfortable, and durable forniture will do well to Mr. F. A. Sinclair, at Mottville, N. Y., for the various articles he manufactures, with a schedule of prices.

Rendering Paper Uninflammable Gaspard Meyer, of Paris, France, obtained a U. S. by the adding to the pulp while in process of manufa tare into paper, asbestos fiber, mica, tilint silicum pul verized, or any other silicate. Mr. Lara, Who reprent the patentee, has recently arrived in New York for the purpose of introaucing the fivenion in tuis coantre and a tew days ago he made some experiments at State.
Island before representatives of the fire department and number of gentlemen who had been invite to wit ness his extibition. A small, dry, pine wood brilding was constructed, the walls and raftere of which were covered with the incombustible paper. After the fre had been kindled the heat was intensifled by frequent injection of pertoleum and incandescent masses the gratification of those who witnessed the mach $\xrightarrow{\substack{\text { the gra } \\ \text { ment. }}}$

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ee regaled himself frequently with a smoke



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## NEW BOOKS AND PUBLICATIONS.

Modern High Explosives. By Manuel Eissler, Mining En
\& Sons, New York.
This book is one for the engineer, the contractor, and the manufacturer of explosives-full details of the methods of production being given as a part of the explosives. The production of glycerine is followed, from its flrst manufacture in a commercial way in 1850 own tothe most recent and greatly improved processes; making nitroglycerine are pointed out, and the various kinds of dynamite-from those made with infusorial earth and a large percentage of nitroglycerine down through those with lower explosives and chemically combining with the nitroglycerine-are described as to their manufacture, storage and transportation, and effectiveness for various uses. Gun cotton and the
fulminating compounds are likewise fully treated, also electricity as applied to blasting operations, many examples being given from well known engineering works and the author's practical experience in mining. The applications of these explosives for military purposes are only mentioned briefly, the design of the work being principally to promote industrial ends, and, by and use of these powerful destructive agents more

The Materials of Engineering. By R.
H. Thurston. John Wiley \& Sons, New York.
This is he third volume of Professor Thurston on this generalsubject, the present hook being devoted to
the non-ferrous metals and their alloys-copper, tin, the non-ferrous metals and their alloys-copper, tin,
zinc, brass, bronze, etc. It treats generally of the properties of the metals and their alloys, and their manufacture and working, but will be more especially useful for what it says relative to their strength-elastic limits, resistance to compression and transverse stress, etc.-
under varying conditions. The volume tabulates and under varying conditions. The volume tabulates and
analyzes a great number of tests of brasses, bronzes, analyzes a great number of tests of brasses, bronzes,
and like alloys, made by the United States Government. and by the author personally at the Mechanical
Modern Forest Economy. By J. Croumbie
Brown, LL.D. Oliver \& Dowd, Edin-
burgh.
This is the eleventh volume of the author on subjects
directly connected with that indicated in the title of directly connected with that indicated in the title of
the present book. He believes in forest culture and
preservation, and has especiry in Enyland and Scotland, and in the various countries some time Professor of Botany at the Cape of Good Hope. The present volume treats of the true elements of forest economy and forest administration, classing the latter as a science of no mean order, and advocat-
ing the organization of schools of forestry. It is well worth the reading of those who are now so earnestly urging that something be done to prevent the total destructi
on.

Wrought Iron and Steel in Constroc
tion. John Wiley \& Sons, New York
band book of rules and tables for the strength of A hand book of rules and tables for the strength
wrought iron shapes used as beams, struts, shafts, et manufactured by the Pencoyd Iron Works.
Metrological System of the Great Prra-
mid. By F. A. P. Baruard, LL.D. John
Mid. By F. A. P. Baruard, LL.D. John
Wiley \& Sons, New York.
This is a reprint of a paper read before the American Metrological Society, in which President Barnard summarizes the tenets of the pyramid faith, and investigates
the deductions made by those who thus believe, besides the deductions made by those who th
advancing a new theory of his own.
The Method of Least Squares. By Mans-
field Merriman. John Wiley \& Sons, New
York York.
The elimination of error in numerical observations, and the best method of reaching as nearly as poss ble
absolute accuracy in measurements and computations absolute accuracy in measurements and computation
more or less indirect, is here made the subject of more or less indirect, is here made the subject of a
carefully prepared text book by the Professor of Civil Engineering at the Lehigh Oniversity. It has been the endeavor of the author to present this by no means
simple subject in a manner so plain and direct, that civil engiveers who have not had extended mathematical training may be assisted thereby, and the numer ous practical examples given afford a comparatively
easy road to the acquirement of such knowledge of
easy road to the acquirement of such knowe enge
while the book is one in which the industrious student
will make rapid progress.

HINTS TO CORRESPONDENTS.

(1) O. K. L. asks: Can water $80-90^{\circ}$ Fah. be forced by means of a hydraulic force pump under pressure 70-80 pounds into the pores of wood which has been cut across the grain in blocks a quarter of an
inch thickness and put in an air tight copper or iron vessel? If so, how long a time would it take for the quarter of an inch thick? Would exhiusting the air from the vessel (and so in part from the wood beair before permitting the water to come in, facilitate the penetration of water subsequentiy forced under hydrauic pressure, as before described? A. Water should penetrate the blocks of wood, under the circumstances
mentioned, in a few minutes. The air in the wood mentioned, in a few minntes. The air in the wood
rould be compressed to about one-fifth its volume, and would be absorbed by the water, which might take several hours. If the compression is on y for a few ould drive possible that the air, Exhausting the air at first would insure the immedi te penetration of the water under pressure. Fill the
vessel with steam, and allow it to condense; this will vessel with steam, and allow it to c.
probably produce sufficient vacuum.
(2) T. P. Y. asks: What kind and size of pipe is best to lay from a spring of ordinary soft water rods distance and 25 feet fall, for family and barn traight line to sare a ${ }^{2}$ a or nots a the size of depends upon the quantity of water you may require and the capacity of the spring; 1 inch pipe will give a constant flow of 5 gallons per minute, $11 / 4$ inch pipe 9 gallons per minute, $1 \frac{1}{2}$ inch pipe 15 gallons. A galvanizediron pipe is best. It will make no difference about the sag, except as every bend from the straight ne increases the friction, and this wo
(3) F. W. F. says: I have a flat iron cast ing about three feet long and two wide, which reprea film of metallic copper or treat it with any solution film of metallic copper or treat it with any solution You will find a description of Process for Bronzing ron in No. 235, Scientific American Supplement. also Imitation Bronzing in Scientific American Sup(4)
(4) A. B. wants to know how best and tumps, and cheap and sample device or ime and oak pulling them? Or is simple device or implementfor ducing them to fragments so they can be handled and burned? A. A wooden lever with three clevises, chains
and hooks makes a simple and easily arranged device and hooks makes a simple and easily arranged device
for pulling stumps. For blasting them see Scientric merican, December, 1, 1883, page 341.
(5) R. M. H. says: 1. Providing the slide eithe on a locomotive has a certain lead, can lead be
eithed or decreased by any other means than by slipping eccentric? A. We understand that it canoot except by altering the construction of the valve. 2. Has the reversing lever any other control over the valve than its name implies, and to regulate the throw or travel of slide valve, independent of any influence
on lead? A. The reversing lever regnlates the amount on lead? A. The reversing lever regnlates the amount of the throw of the valye or cuts off the st
center, having no control over the lead.
(6) P. T. asks the best mode for pumping the kind containing about 250,000 cubic yards wate the kind of pump to be used, amount of horse powe A pump and boiler capable of pumping out your lake in 50 days of 20 hours each will cost about $\$ 1,00$ in New York. Boiler 12 horse, steam cylinder $8 \times 12$, water cyl inder 10x12. Much depends upon how high the wate has to be pumped and length of pipes required, which for such
force.
(7) J. E. T. says: I have been trying to do a little tinning,such as dipping table cutlery in a pot of nelted block tin, and have met with rather poor suc-
cess. My melted tin seems to be too thick, not run off smooth, but leaves the knife rough. How hall I make the melted tin thinner or run smooth on article tinned? A. You may have used your tin bath too long. The tin absorbs a little iron, or it may be too cold. A little powdered salammoriac sprinkled on the (8) J. F. L.-Water meters are read in the ame manner as gas meters. The 1st dial is cubic feet up to 100; 2 d dial is cubic feet by 100 for each figure; ddial 1,000 cubic feet for each flgure, and so on to the whole of the preceding dial Always read the figure whole of the preceding dial. Always read the figure
behind the index in the direction that it moves. The index hands alternate to the right and left in their motion to accommodate the plan offgearing.
(9) J. L. asks if water impregnated with sulphur will be injurious to steam boilers, and how to Yes. The sulphur combines with the iron, making
brittle. If you suspect sulphur in the water, you may
detect it by the smell of bad egrs. If there is to detect it by the smell of bad eggs. If there is too little
to detect in this way, boil a clean piece of silver quarter dollar) in some of the water; sulphur turns it (quarte
black.
(10)
(10) M. M. W. asks if there is any preparation of metal in liquid form of unlimited supply that is cheaper than quicksilver? A. There is none.
(11) J. P. says: I want to cast a number of small bells not exactly the usual shape, and cannot use What combination of metals of low fusing point can I nse, and is there any process of making the base metals sonorous? A. You cannot make any combina-
tion of metals properly sonorous at a low fusing point. (12) E. C. H. asks about mica and isinglass. Can they be bent, or moulded into any shape? Do they stand a high degree of heat when applied in the form of water or steam? Is there any work published which
treats of these articles? A. Mica is the proper name for isinglass, It is a silicate of alumina, with a little potassa. It is not plastic or capabie of being moulded. It will stand any heat below red. In steamand boiling water it is disposed to become opaque by dissolving of potassa from the surface. See Dana's Mineral.
(13) C. F. A. asks: What is nickel, and where does it come from? Please give a short account of it. A. Nickel is a metal first known more than a hundred years ago. Its ores are mined the same as
ion, conper, etc. It mostly comes from Germany, France, and England. There are mines in the highland range in the State of New York, and other places. It
has also been found in small quantities in the metehas also been found in small q
orites that fall upon the earth.
(14) C. B. R. asks the name and character of insects sent; they were found attached to a rope swing on a scrub oak tree. A. The specimens are the
larve and pupæ of the Twice-stabhed Ladybird (Chilocorus bivulnerus; family Coccinellidæ), a common and very useful little beetle, preying as larva and imago on
plant lice and scale insects. The larva is easily recog. plant lice and scale insects. The larva is easily recog-
nizable by its body being covered with very stout, long, nizable by its body being covered with very stout, long,
black, prickly spines, the perfect beetle being black with a red spot on each wing case. The specimens
wich evidently altached th
(15) I. K. asks: $1 . W$ bat is the surest way for a family to find out if there is any sewer gas in
their house? A. Sewer gas has a peculiar pungent, sickening odor; when once familiar with it angent, will readily recognize it in a house. The surest is to have a reliable plumber examine the premises. you cannot trust a plumber, obtain the services some of our sanitary engineers or experts. 2. What
the best way to clean or renovate old steel engravin
and the best way to clean or renovate old steel engravings?
A. See Scientific American Supplement, Nos. 44,115, A. See Scientific American Supplement, Nos. 44,115,
124, for directions for cleaning old steel plate prints.
(16) W. S. asks where one can be educated for civil engineering, and what primary learning is required. A. There are special courses of civil engi-
neering at.the School of Mines of Columbia College, neering at the School of Mines of Columbia College,
and also at the College of the City of New York. The reat school of civil engineering in the country. The Rensselaer Polytechnic at Troy, N. Y. The requirements vary with the institution, and can be ascertained
by consulting the catalogues. These can readily be by consulting the catalog
procured by application.
(17) S. E. C. asks a recipe for making suloap (recent) 1 ounce best fownd white curd or castile fluid ounce rectified spirit (strongly colored with al kanet), and sufficient attar of roses to strongly scent the mass. Beat the whole together, to a smooth paste,
in a marble or Wedgwood mortar. The spirit and coloring matter moy be omitted at will, and as a toilet found sufficient.
(18) A. B. J. asks for a solution or dip that will give luster to tinned articles. A. Tin may be cleansed by a rapid scouring with potash lye and
rubbing with a hard substance. Sometimes dippin nto hydrochloric acid is beneficfal, but the first operation is generally necessary. Answer to query 8 in the
Scientific American for May 10, 1884, gives some inScientific American for
formation on this subject.
(19) D. S. writes: The elm with us is in fested by some insect; a majority of the leaves are like the one Inclose herein. What are the cause and reme-
dies for it? A. It is impossible without better specimens to say precisely what the insect is, but we think likely that it is the canker worm, which injures the elm as well as the apple tree. The most approved remedies are as follows: To prevent the pests from going from
tree to tree, a band of canvas or paper is wrapped around the trunk and besmeared with tar or a mixture of tar and molasses, which must be frequently applied; or a bund of rope or closely twisted hay is put around he trunk and over this a tin band about 4 inches wide, wo, in such a manner that there will be a cavity be ow and a free edge above it. If these insects are prevented from ascending the tree, they will deposit their eggs below the obstruction and near it, and the eggs
can be destroyed by a single application of kerosene can be destroyed by a single application of kerosene
oil. This should be done about March in this latitude, nd earlierfurther south. If the worms have been per mitted to hatch, as soon as they are large enough to be
seen jar them from the trees and sweep away with a pole, as they hang by their threads, and burn or otherwise destroy them. If the worms have matured and gone into the ground for winter quarters, plow the ground late in the fall so as to expose the pupæ to frost and to their natural enemies. See also Professor A. S. Packard's article on the canker worm, pa

## (20) U. M. F Co as for

ill set A. Gutta perchadissolved in carbon disulphide to form mass of treacly consistence forms a very good cement thinned down, a small quantity of the cement is then
poured on each end, spread so as to thoroughly fill all
the pores of the leather; the parts are warmed over the pores of the leather; the parts are warmed over well together.
(21) J. E. N. writes: I make a "burnish ink" for shoes of extract logwood, potassa bichro-
mate, and copperas which does not strike in deep enough. Can you suggest the addition of anything, that is cheap, that will make it bite well, or can you furnish a good formula? A. The following are the pro-
portions of an ink similar to your own, but perhaps it portions of an ink similar to your own, but perhaps it
may give better results: Make a strong decoction of may give better results: Make a strong decoction of
logwood, preferably in soft water, by boiling; then add logwood, preferably in soft water, by boiling; then add
iron sulphate, at the rate of 2 ounces to the gallon, with half an ounce each potassium bichromate and gum arabic. Powder the last three ingredients and even the logwood if you like, as it will take the color out
quicker; or you can use the prepared extract of logwood at the rate of 1 ounce to a gallon of water. A solution of iron sulphate in 12 times its weight in water is used sometimes. See also Scientific American (22) K. S. N. L. Co. write: We are experimenting with paints, Japans, etc., in our nut locks, to prevent rust, and have been recommended to you for
the name of any paint or any combination of chem1the name of any paint or any combination of chemr-
cals, or receipt, which when applied to iron will prevent or in a large measure do away with rust. A. The following by M. Zein is worthy of trial: Mix 80 parts pounded brick, passed through a silk sieve, with 20 parts litharge; the whole is then rubbed up by the
muller with linseed oil, so as to form a thick paint, muller with linseed oil, so as to form a thick paint,
which may be diluted with spirits of turpentine. Bewhich may be diluted with spirits of turpentine. Before it is applied the iron should be well cleaned. From
an experience of two years a pon locks exposed to the an experience of two years u pon locks exposed to the
air and watered daily with salt water, after being covered with two coats of this mastic, the good effects of it have been thoroughly proved. See also article on CAN Supplement, No. 226
(23) J. N. says: An artesian well, one foot in diameter, throws 25 gallons per minute, and the
overflow will all run through an inch pipe. Now, if $I$ rive an inch and a half pipe down to the same depth, cose by, can I expect the same overflow, that is, will as much water run over the top of inch and a half pipe
as will run over the top of a foot pipe, the other conditions being alike? A. No. The friction in the $11 /$ inch pipe will slightly retard the flow; otherwise much depends upnn the freedom of the opening at the bottom. A 2 inch pipe will be better, and will yielda full
flow with a strainer and perforated section at the botflow with
tom.
(24) F. G. asks: What are the ingredients of what are called "aniline" colors or "French water colors," "Egyptian colors"-all of the same nature? A.
These colors are simply solutions of aniline dyes, These colors are simply solutions of aniline dyes, others are soluble in alcohol. A little gum water can added to give consistency if necessary.
(25) R. H. asks the receipt for making the The composition of the star metal for car bearings. A. The composition of the star metal as sold by dealers as near as possible to the composition, and suitable for heavy bearings:

## Copper Tin....

This can be varied to suit almost cvery requirement by adding tin
(26) S. \& T. say: Having a reservoir full of water and a certain size of pipe out of bottom run-
ning down a hill, will more water be discharged 200 feet below than will be at 100 feet, say a 1 inch pipe throughout? The question is whether the additional fall will cause the water to enter the 1 inch any faster
in the one case than the other. Should not the inlet be in rers? A flengths bet Should no the mlet be no more water will be discharged at 200 feet than at
100 feet. Make the upper section larger for more flow at the bottom.
(27) F. C. C. desires us to inform him the best and safest engine for light work, such as to run offee mill, sewing machine, pump up small amount of water, etc.; something creap but good and particularly
safe, and where to purchase it; something that would be safe in the hands of a lady or young girl. A. There are several forms of gas engine, which, as well as the
(28) J. H. writes: I have a lot of cotton stockings which when worn color the feet, the dye coming out; they have been washed and boiled to no
effect. Will you please tell me how to fix the color? A. We know of nothing to recommend you. The coming off of the coloring material is an evidence that an inferior quality of dye was used. Colored hosiery sould be put into a strong solution of salt and water, and dried in the shade or in a heated room before use. Wash on the wrong side in lukewarm water with pure
soap, perfeclly free from acid, rinse well in clean cold ter, and then dry as previously stated
(29) T. F. B. asks for some practical work giving instruction in the art of wood engraving for a lad who has an inclination in that direction. A. There
are no books of any real value to a beginner in this direction; it requires a pretty long apprenticeship, and is very tedious work, and then success or failure depends largely upon the natural capacity of the indi(30) J. F. K. asks the highest boiler presare the government allows to be carried. A. This is the build and strength of the boiler, and the use to it is put There are no specifled limitations
(31) J. H. P. asks if there is any known ethod of softening raw ox hide, so that it can be moulded into any shape, and then will recover or assume
its original strength, without becoming stiff and brittle like glue. A. There is cot, except by tanning, and that gives the substance a decidedly different na-
ture; all ox hides, when dry, are naturally stiff and
brittle, like glue. 2. In the burning of large sulphuric likely to volatilize? $\mathbf{A}$. The loss of lead would b about 25 per cent. By volatilization the amount driven off would be exceedingly small. 3. Will you mention any instances where acid chambers have been destroyed by fire? A. Works burned are the Marcellin, of Bridge port, Bowker, of Elizabethport, Crenshaw, of Rich
(32) A. L. B. says: Please tell me the chem ical composition of elderberry juice, before made into
wine, and if you think it practicable to buy the elderwine, and if you think it practicable to buy the elder
berries in large quantities cheaply without raising them on plantations? A. The chemical composition of the iderberry juice has probably never been determined It is a misture of various ingredients which would be
very difficult to isolate. 'The answer to the second question depends entirely upon the amount of capital required for thepurpose of raising the berries; if tha xceeds in amount the value of a civen quantity of ber ries at the market price,then of course it is best to bu Comparative values, and must be settled by obtainin the information relative to the possibilities of raising ad also of disposing of the elderberries
(33) S. S. S. asks: What pressure plates will stand with safety from an eighth to a quarter inch fair, and what is the best metal for strength with least weight? A. Large tubes such as are used for boilers are as light and strong as anything you can get. A 10 inch tube will bear apressure of 500 pounds with safety They hold a little over half a cubic length. Heads should be three-eighths wrought iron, raised a
calked.
(34) J. A. T. asks the cause of glass crack ing in store fronts, say a 4 lighted half, glass A double strength, about 36860 . with wrought iron mul-
lions and muntin. They were bedded in putty, and rowded to place with wooden stops. Some of them crack witbin au hour after putting in, and other twelve months. The buildings are veneered brick. I
have also had the same trouble using rubber tubing instead of putty. A. Glass of the size you mention seldom cracks in this climate when carefully set. Im perfect annealing may subject such glass to great
strain in a severe climate. We should judge that iron mullions may have much to do in caucing fracture in very cold weather. The large plates in New York windows are sometimes fractured in extreme weather from the strain caused by contraction. The crowding
to place by wooden stops may also cause a strain by bending that might start a crack at any time. We have nothing better to offer than the suggeation of greater care in setting
any direction.
(35) D. F. says: Inclosed I beg to band ou specimen of asbestos. Will you kindly infom $m$ used for, and what is the price per pound? A. The $\$ 30$ per ton. o $\$ 60$ perton, according to the length and strength of the fiber and its purity. It is used in making liquid and fireproof paints, roofing, piston packing, valve packing, flat packing,covering steam pipes and boilers, felt, etc. It is often used with hair felts and othe is the largest dealer of it in Maiden Lane, New York The specimen sent however appears to be chrysotile, variety of serpentine, found chiefly in Canada, and there employed, only to a limited extent, however, in
the preparation of a variety of textile material. The Canadian Geological Survey could probably give com
(36) W. T. M. asks how the liqueurs "Küm mel" and "Chartreuse " are made. A. The so-called ly, each in a little 95 per cent alcohol, half adrachm oil of anise, and five drops each of the oils of calamus, bitter
almonds, and coriander; also dissolve 1 to $11 / 2$ ounces oil of caraway in sufficient 95 per cent alcohol to make a clear solution. Incorporate the foregoing with 40 gallons French proof spirit, and add 10 pounds suga
dissolved in 5 gallons water. The green Chartreuse consists of:

| ied lemon balm. | . 500 grams. |  |
| :---: | :---: | :---: |
| Hyssop in flower. |  |  |
| Peppermint (dried) | 250 | " |
| Genepi......... | 250 | " |
| Balsamite. | 125 | " |
| Angelica seeds.. | . 125 | " |
| Angelica roots |  | " |
| Thyme. |  | " |
| Arnica flowers. | .. 15 |  |
| Buds of balsam pop |  |  |
| China cinnamon.. |  | " |
|  |  |  |

Digest for twenty-four hours; distill and rectify to
obtain 60 liters; add 25 kilos of refined white sugar dissolved by heat in 24 liters of water; mix the whole
and make up with water to 100 liters; mellow and color yellow with a misture of blue coloring and infusion of
caramel or saffron. Size allow to repose, and filter.
(37) W. E. J. asks: Can you inform me where I can communicate with some one who has an water is from 100 to 150 feet deep, or put me in communication with some one who has the means of locat-
ing a wrecked vessel? A. We would refer you to the Edison Electric Light Company, 65 Fifth A venue. Mr Edison, we are informed, has experimented in this direction. Or you might write to Gen John Newton, Chief of Engineers, New York.
(38) J. Q. A. says: I have a summer coat made of mohair,dark gray in color, almost black. Per spiration has given it a very bad odor, though without
changing the color. What will clean it without injury? A. Perspiration stains are removable by washing the quent rinsing with water.
(39) W. P. C. says: I want to know if you an tell me of a good cheap chemical bath that I can o use over again as solder? I want to use hot water, and I know that chemicals will admit water to get hot enough to melt tin, and I want to know what chemical e saved to of your purpose is not practicable. Tin is frequen!ly emoved from refuse scraps by treatment with hydro in crystals. This process is given in Soientifi American Supplement, No. 112
(40) F. B. says: I bave a paper roller with gures embossed in it,working together with a roller of the metal roller being hot, the flgures on the paper roller get torn up, as the cloth sticks to it very badly What substance shall I take, to make the paper rolle hard, and smooth like glass and also watertight, so as
to resist the action of dampness or heat. A. Try thin hellac varnish 2 or 3 coats, drying each thoroughly ellac varnish 2 or 3 co
(41) A. M.-To whiten tarnished silver himbles, rub with a brush and oxalic acid and wash lean with warm soap and water; polish with rouge on
brush. - Answer the questions from the Young Men Cush.-Answer the questions from the Young Men
Christian Association conscientiously. If they think ar membership, they will receive you.
(42) F. W. C. asks (1) how can I re-ebonize maple rifle stock in the easiest way? A. Full infor on page 3301 of Scientifio American Supplement, No. 207. The general process of ebonizing wood con sists in the application of a solution of iron acetate ometimes with logwood and sometimes simply alone . What the preparation is which cartridge manufacurers grease their cartridges with? A. A mixture of
beeswax and tallow is used. 3. An economical method freasing small bullet breech caps of 022 inch calibe A. We would recommend that they be dipped or im
(43) B. J. K. asks (1) the name of a work chemistry that treats broadly on the subject of oxygen ject desired. A. There is no single book on the subChemistry, vol. i., is very full, but a work on Dynamical Geology would probably be more satisfactory; Dana's anual of Geology has a chapter in it devoted to this black or magnetic oxide of iron is the combination of ofric (per) oxide with for (proto) oxide ofron. the ferric oxide (peroxide). 4. About what pe cent of iron or oxide of iron does ocher contain? $86 \cdot 6$ per cent ferric oxide, $14 \cdot 4$ per cent of water 5. Are carbonate ores of iron as rich in metal as
hematite or magnetic ores? A. Magnetite contains heoretically $\% * 4$ per cent of iron, hematite
(44) J. A. C. asks for a receipt for making receipt for making sarsaparilla such as is sold in bot les. A. Several formulas for sarsaparilla sirup will be ound in Scientifio American Supplement, No. 77. prepared by moistening 16 troy ounces of the pow dered sarsaparilla with half a pint dilute alcohol; let it stand 30 minutes, then percolate until 3 pints have
passed through; evaporate at a moderate heat in water bath to 1 pint, add 10 ounces sugar, evaporate t pint, and strain while hot
(45) H. W. asks a formula for Gunther's mead, or oue that is as good. A. The ordinary mead is by spices and oils. The following modifying the favo files will probably be satisfactory: Take ten gallons of water, two gallons of strained honey with two or thre lemons cut in slices. Mix all together and boil for half an hour, carefully skimmingall the time. Five minutes after the boiling commences add two ounce of hops; when partially cold putit into a cask to w
off. In about three weeks it will be fit to bottle.
(46) M. J. B.-Your machine will run small arc light very well. One of Browning's small arc
lamps would probably be best su ted to it. You can purchase these lamps from any of our leading opti
(47) F. D.-Your machine will undoubtedly work very well. We only suggested thal the later form of Siemens armature might prove more satisfactory consult Supplement, Nos. 222, 224, and 225.
(48) J. B. L. says: I have seven pounds of No. 16, and five pounds of No. 20 cotton covered coping a dynamo electric machine, and what kind would be best to make to get the best results from the above
wire. A. You would probably be able to make a successful machine by following the ins ructions given in Supplement, No. 161
(49) C. G. Y.-You can pursue a course o eecrric engineering in Cornell University, Tthaca, $N$.
$Y$., but if yon can secure a situation with some estab ishment like Edison's or the United Slates Electric Light Company, it would probably be better for you unless you are able to take both.
(50) T. H. M. asks: 1. Where can I buy a electric supplies can furnish you with of our dealer in electric supplies can furnish yon with the outfit you
need. Consult our advertising columus.
2 . How can I tin steel and iron so as to cover it with a thicker coat than is generally done with the ordinary process using muriatic acid? A. The articles may be well cleaned and dipped in melted tin covered with wax or tallow.
3. Are there any books, or SUPPLEMENTS of your paper, treating on either subject? A. Supplement Nos. 810 and 436 give fullinformation on electro plating
(51) M. E. W. says: 1 . In making the
else can I use for the vessels, besides flower pots, as
the acid soaks through and breaks them? A. You can purchase porous cells. 2. Why do you have to use porous cell? A. The porous cell renders the battery more constant. 3. What will prev nt the zinc from
becoming so brittle wh n amalgamated? A. Use pure inc and less mercury.
(52) W. S. asks: 1. How many feet of wire and what number should I use to make an electro ma net that will hold a weight of one pound? A. About 150 feet of No. 24 wire for cores seven-sixteenths o one-half inch diameter and one and three-quarters to
two inches long. 2. Will one gravity battery $6 \times 8$ be sficient? A. It would require two or three cells of gravity battery. 3. Is it the number of the wire or the mount of feet that makes the power, the battery being the same in both cases? A. It depends up on the ind of oattery, its resistance, etc. For a battery o considerable resistance a fine wire is used, and for battery of low resistance yielding a quantity current oarse wire will be required. 4. What is the mean it, in the way of force or pressure? A. An ohm is nit of electrical resistance. It is about equivalent to 38 feet of No. 24 wire above referred to, or 330 feet of No. 9 iron telegraph wire ( $0 \cdot 155$ of an inch in diam
(53) J. H. S. asks: How many cubic feet of compressed air, at 200 pounds pressure per square nch, would it take to run a two horse power engine ours; how many compressed to 600 per inch; als t 800 pounds per inch? How many cubic feet will it sind of iron would it require to stand the above presor with safety? Can I compress air and keep it f ubic feet; for 600 pounds, 100 cubic feet; for 80 pounds pressure, 75 cubic feet. An ordinary boile hell $1 / 4$ inch thick, 3 feet diameter, double riveted, is ufficient for an air tank for 200 pounds pressure. Well iron heads is strong enough for the higher pressure.
(54) J. E. B. says: I wish to cut down
poplar tree 12 fret in diameter, in such a manuer a
not to injure the timber. Please let me know the best
way to do it. A. Ascertain which way it will naturally fall, make a soft bed for it to fall upon of brush, hay, or anything of that nature several feet thick. The guy the tree with ropes to direct its fall upon the be Saw from the side that the tree is to fall, following up he saw with thin wedges to keep the tree from set ling upon the saw. When the saw is nearly throug
(55) J. S. W, asks. What would be the best
ould be the best feet keel? The canoe is to be used in rapids and rassibly in surf. A. A canoe of 10 or 12 feet keel, fo 20 to 22 inch depth amidships, and 24 inch stern to be
${ }_{\text {(56) F. P. P. asks: What is the receipt for }}$
villing hair on a person's body, or in other words
what will remove the hair so ic will not return? A. Boudel's depilatory, a frequently used preparation, is wade by mixing 3 parts sodium sulphide (crystallized) starch. It should not be applied longer than 2 to minutes. It is said to be very effective and safe Hair is likewise removed by means of electricity, and description of the process is given in Duhring's "Dis (57) the Skin," 3d edition, page 425.
(57) E. M. C. asks: 1. What is the best by ginger ale manufacturers? A. The extract of ginger is made by packing 4 ounces powdered ginger in a ercolator, moistening it with a little alcohol; then hrough. Mix this with 8 ounces syrup. See ScIEN tific American Supplement, No. 270 , for a well recommended formula for ginger beer. 2. What is the best way to make lemon sirup from the fruit? A. Take 5 gallons lemon juice, 1 ounce best oil of lemons dis-
solved in half pintof alcohol; orthe rinds of 16 lemons olved in half pint of alcohol; orthe rinds of 16 lemon rubbed with sugar to extract the essential oil; dis-
solve 80 pounds sugar in the juice, and boil for 2 mi olves, Skim, then strain.
(58) R. asks: 1. What preparation is there, bat by writing on paper will eat or cut the letter the papyrograph made? A. A description of the papy rograph, including the ingredients of the ink, will be found in Scientific American Supplement, No. 225. 2. Give also a formula for making a composition for
fastening the edges of pads, tablets, etc.? A. The fastening the edges of pads, tablets, etc.? A. The and glue with coloring matter, such as fuchsine, simi and glue with coloring matter, such as fuchsine, simi-
lar to the composition of printers' rollers, with some-

(59) A. C. F. asks about a driven wel here the soil is sandy, water being found aboutt 6 feet below the surface; it appears to be in the quick-
sand, beneath which appears to be clay. In geting water, the sand being fine and mixed with the wate passes through the pipe, and is continually drawn up
with the water, thus making the water muddy and im pure. How can a well be diriven under sucb circum stances so as to make it work well? A. There is no
better way of keeping fine sand out of driven well pipes than to make the strainer longer than usual and cover with very fine brass wire cloth, about 60 mesh to the will pass through may be pumped up by working pump strongly. The larger particles of sand will be drawn agaiust the strainer, and in a short time form a illter stratum around the pipe, which will keep back the quicksand. In this way we have pumped out a hal that lasied tine quicksana, and obtained a ciear flow cloth will add much to the durablity of the strainer. (60) P. K. says: I made a whistle 12 inches in the opening diameter: the bell is 24 inches long he steam opening is one-sisteenth inch. The bel
pressure 100 pounds. I have moved the bell all the
way from one inch to six inches, but the whistle loses its tone after one-quarter the steam is turned on. Now, is the opening too large? Is the bell too thin iron, and
is it too long or too short? Is the steam pipe large enough? Ought the short? Is the steam pipe large opening A . We have never seen a bell made of sheet iron. Should judge that the riveted seams might inter. ere wilh the ring. The bell should be the eame size or
diameteras the sceam opening. We fear that the bell is not held firm enough over the steam opening, or may not be exactly round; so that the steam strikes the lip in the same relative position all around the rim, which is very necessary. There is always a best pressure to bring out the full tone of the whistle. There is little ase in trying to force it with a full pressure of 100 or gun motal best che bell hard brass or a piece of boiler flue brazed to a mrought iron disk or a head; anything to make the bella solid piece and set solid and central upon the steam opening, which hould also be a true annulus. ceived from the following correspondents, and examined, with the results stated:
W. W. W.-Probably tourmaline, but the specimen is so small and the crystals so indistinct that identiflcears to be a partially decompcsed variety of limestone or carbonate or lime.-H. H. W.-The specimen is crystallized ca!cite or carbonate of lime.

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