A WEEKLY JOURNAL 0F PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

## WIRE ROPE TRACTION STREET RAILWAY

This system of street railroad, the invention of Mr. A.S. Hallidie, has been adopted by the Clay Street Hill Railroad Company, in the city of San Francisco, Cal., and is said to be adapted to all kinds of metropolitan railroading, especially where the surface of the streets has to be kept free from obstructions, where locomotive steam engines are not permitted, or where the streets are so steep as to preclude the use of horses, locomotives, or steam traction engines.
The system consists of an endless wire rope placed in a The system consists of an endless wire rope placed in a
tube below the surface of the ground, between the tracks of
of this slide is a wedge-shaped block, which actuates two jaws, B, horizontally, which open and close according to the direction in which the slide is moved, closing when the slide is moved upwards. These jaws have pieces of soft cast iron placed in them, which are easily removed when worn out, and which are of proper shape and size inside to grip the rope when they are closed over it.
On both sides of the jaws, and attached to them, are two small sheaves, C, which are held by means of rubber cushions
sufficiently in advance of the jaws to keep the rope off from
trip when attached to the car, which has already been turned on the turntable.
The road has a gage of 3 feet 6 inches. An ordinary 20 pound T rail is used, which is set flush with the street and and presents a neat, smooth appearance. The rope runs at the rate of about four miles per hour, and the ascent is made including stoppages, in about 11 minutes, the distance being 3,300 feet. The motive power is supplied by a steam engine of 30 horse power.
The road has run regularly since its completion in SepThe road has run regularly since its completion in Sep-
tember, 1873, and during the period of one year and four

a railroad, and kept in position by means of sheaves, upon and leneath which the rope is kept in constant motion during the hours the cars are running, by a stationary engine. The power is transmitted from the motor to the rope by means of grip pulleys, and from the rope to the cars on the street by means of a gripping attachment attached to the car, which passes through a narrow slot in the upper side of the tube.


From the illustration, Fig. 1, which is prepared from a photograph of a portion of the route in San Francisco, it will be seen that the ground is exceedingly irregular. The average grade is 580 feet, and the steepest 850 feet, to the mile. The entire length of the endless rope operated, which is of ste $\epsilon$ wire, three inches in circumference, is 6,800 feet, and the line is supported in the iron tubes, every 39 feet, on 11 inch sheaves. Other sheaves hold up the rope in turning angles, etc. By referring to Fig. 2, which shows a cross section of the tube, will be seen the opening or slot, seven eighths of an inch wide, in the upper side of the tube, which enables the foot of the gripping attachment to pass by and under the upper sheaves and over the lower sheaves. This attachment is shown in Figs. 3 and 4.

- Fig. 3 shows a perspective view of the attachment from above, and Fig. 4 represents the wheel by which it is operated. A vertical slide, A, works in a standard, and is moved up and down by a screw and hand wheel. This screw is shown on the dummy, Fig. 1. The small upper screw, going down through the large screw, operates it. At the lower end
allowing it to travel freely between without touching them.
When it is required to grip the rope, the slide is drawn up by means of the small screw before described, and the wedge at the lower end closes the jaws over the rope, at the same time forcing back the small guide sheaves on to the rubber cushions.
The standard containing the slide, etc., is inclosed in a cast iron bracket, and raised and lowered bodily through an opening in the tube from above the surface of the street to the rope in the tube by means of a worm and nut or rack and pinion. The dummy is coupled to the passenger cars, and pinion. The dummy is coupled to the passenger cars,
at the bottom of the incline, and uncoupled at the top, and at the bottom of the incline, and uncoupled at the top, and
vice vers $\hat{d}$, horses then being coupled to the car for the level rice versa, horses then being coupled to the car for the leve]
road. In order to stop the car, the jaws of the gripping attachment are opened slightly; when they release the rope, the guide sheaves take it, and the car stops. All the essential working and wearing parts of the gripping attachment are made of steel.
The turntable at the foot of the incline is double. The available space at this point was very limited; and in view of this, some ingenuity had to be employed. When the traction car reaches the foot of the incline, it is uncoupled from the car, and run on a turntable, the slot in the turntable allowing the shank of the grip to pass down freely. The table is then turned around one quarter of its circumference, and the track and slots are then brought in the same line: The traction car is then run on a second table, which is turned back, and the traction caris run on the up track. The car is then transferred in the same manner and coupled to the traction car, ready for the ascent. This course is necessary, as there are double tracks; ard the traveling wire rope runs down beneath one pair and up under the other. As the gripping attachment passes down under the street through the slot, it is necessary to have a slot in each turntable, to allow the traction car to be turned.
The method adopted at the upper end of the road is more simple. A turnout is made for the car, and it runs down to a common single turntable. The dummy is turned as follows: A circular table connects both tracks, with a slot described around a center. A small iron triangle connects the By pushing on the with the center of the slotang held in position by appropriate means, the dummy turns held in position by appropriate means, the dummy turns
around in a very small circle, and is ready for the return
months its actual running expenses per day, including wear and tear, and interest on cost at 15 per cent per annum, are estimated at $\$ 123$.


Companies or persons desiring to negotiate for the use of the foregoing system, or construction of similar lines, can communicate with the patentee, A S. Hallidie. President of the Mechanics' Institute, 113 Pine street, San Francisco, | of th. |
| :--- |

New Process of Engraving on Copper.
The hydrographic office at Paris has begun a process of engraving on copper which promises, by its rapidity and the moderation of its price, to be very widely useful. It consists in substance, first, in covering a plate of copper with a thin shell of adhering silver, upon which is spread a thin layer of colored varnish; second, in drawing thereon, with a dry point, the lines of topography, and lettering, precisely as one engraves with a diamond upon stone; third, in corroding the traced parts by means of the perchloride of iron.

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## TRADE MARKS.

The law presents to every one inducements and facilities for honest effort. The inventor of a new manufacture is, by way of compensation, secured in the exclusive right to make use, and sell the same for a limited number of years.
But withouthaving created a new entity, he may wish to engage in manufacturing some special commodity, and by
his skill and honesty may seek to establish a reputation that his skill and honesty may seek to establish a reputation that shall secure a preference for his goods over those of any of his also aims to protect him. He may, in any way he pleases, inform the public how his own productions are to be distinguished from those of other manufacturers, and any attempt at fraudulent deception on their part, in that respect, will be the subject matter of an action at law against them, and all thi without any statutory regulation on the subject.

Any mark or device attached to his goods is sufficient for this purpose. A word or a symbol is generally selected for thus designating them, and this constitutes what is known as a "trade mark." When by long custom it has become
known to the public in its signification, its use by another known to the public in its signification, its use by another
person embodies a falsehood, and can be dealt with as such, so far as that can be done in a civil suit. It is morally the same as a theft, a forgery, or a counterfeit, but cannot be punished as a crime without a special statutory provision to that effect.
The statute in relation to trade marks operates in aid of the common law on this subject-modifying it to some extent, fixing specifically the penalties attached to transgression, facili tating the giving of the requisite testimony in any remedia proceedings, and providing for a registration which fixes at once the rights of the proprietor, of which every one is bound to take notice at his own peril. In other respects the rules flxing the rights and liabilities of the respective parties seem to remain substantially unohanged by the statute. Some of
these rules will now be briefly considered.
The Commissioner of Patents is prohibited from receiving
become such. This condition refers to the rules and principles on this subject which are dictated by reason, and especially those which have been adopted by the courts.
One of these rules prescribes that the name sought to be used as a trade mark should not be descriptive. If one should seek to appropriate the word "inexplosive" as a trade mark on his preparation of an illuminating fluid, or the word "indelible" on a new marking ink, such tained by the courts as legitimate. Any other person who had contrived preparations for such purposes would have a had contrived preparations for such purposes would have a
just right to commend them to public favor by like designajust right to commend them to public favor by like designa-
tions respectively. Any law or regulation that should protions respectively. Any law or regulation that should pro-
hibit him from the exercise of such a right would be hibit him from the exercise
wholly tyrannical and unjust.
Again it has been held that the name of any particular lo cality could not, as a general rule, be selected as a legal trade mark. A party who had sought to appropriate the name "Lackawanna" as a trade mark for his anthracite coal, was not sustained in that attempt by the highest of our courts (see Canal Company vs. Clark,1 Official Gazette, p. 279.) The ground on which this decision chiefly rested was that no other person who should be engaged in mining coal in the Lackawanna district could legally be prevented from desig nating it by that name.
For a similar reason, the statute prohibits the registratio of a c trade mark which is merely the name of a person, firm, or corporation, unless such name is accompanied by a mark sufficient to distinguish it from the same name when used by other persons. And also, as a matter of manifest justice, no one is permitted to select as a trade mark a word or symbol which so nearly resembles one, previously appropriated by another person, that it will be likely to deceive the public.
But it must not be supposed that any one can with impu nity attach a name to his productions, although such name could not have been appropriated by any other person as a trade mark. The great underlying rule that fraud will not be allowed to achieve success, wherever it can be detected will interpose to prevent the consummation of an effort to compass its ends by falsehood or deception. If, therefore, salt manufacturer at Onondaga should adopt the word
"Onondaga" as his trade mark-although that trade mark "Onondaga" as his trade mark-although that trade mark
would be wholly invalid as such, unless at all events he had monopolized all the manufacture of salt at that localitystill,if another manufacturer at Saginaw or Kanawha should label his commodity "Onondaga salt," he would be liable to an action by the Onondaga manufacturer. This would not
be on account of the trade mark adopted by the latter. He be on account of the trade mark adopted by the latter. He might maintain such an action irrespective of his trade mark, by the fraud.
A trade mark then should be novel, that is to say, so fa differing from any one previously attached to a like commo dity that there will be no danger of causing deception; it should notibe descriptive of the quality of the goods to which it is attached; it should not consist merely of the name o any person, firm, corporation, or locality; and finally it shoul not be attempted to be used for an immoral or illegal pur-
pose. Subject to these conditions, it may consist of any de vice, symbol, or word-no matter how arbitrary or unmean ing in itself-that the proprietor sees proper to select.
These rules are believed to be sufficient to serve as guides
in most of the cases which shall present themselves to the in most of the cases which shall present themselves to th mind of the honest inquirer.

## HOME NEWS BY WAY OF THE SUN.

" Go abroad to learn the news" is a very old saying. Just now the study of the sun's constitution furnishes a remarka ble verification of the correctness of the proverb: that far way orb affording a better and closer view of the early stages of the earth's development than could possibly be gained at home, and furnishing at the same time an altogether unexpected means of estimating the relative character of the earth's chemical structure as compared with the other members of the solar system.
It is well known that the elements which compose the earth and its atmosphere are very unequally distributed. Of the part which we are acquainted with, oxygen constitutes by weight fully one half. Silicon makes up a quarter. Alumi num, calcium, magnesium, potassium, sodium, iron, and arbon, in decreasing proportions, constitute nine tenths of the remaining quarter. There is left only one tenth of a
quarter to be made up of the other fifty-five non-metallic and metallic elements. Nor are these various elements uniforml mixed in the parts of the earth open to our investigation The outer pgrtions, being mainly sedimentary strata, derived rom an original nucleus of primary rock, are of no assist ance in determining the primal distribution of the elements. For this we must interrogate the basic rocks. These are na turally divided into two great divisions, holding on the whol a definite relation to each other. The upper mass consists of ranite and other plutonic rocks rich in silica, moderately rich in alumina, and poor in lime, iron, and magnesia. Below are basaltic and volcanic rocks poorer in silica, equal in alu mina to the upper series. and much richer in iron, lime, and magnesia, and containing also a great variety of other ele ments as occasional constituents: the proportion of the dense metals increasing downward. These relatively precious con stituents of our earth, as we all know, reach the surface only hrough veins which traverse the outer layers.
How did it happen that a few of the elements are provided soplentifully for us, while there is such a scanty provision of the rest? And why are the useful metals chiefly hidden in he depths?
The Pope, the Turk, and-not the devil, as the old litanies
ran, but his chief opponents-the clergymen, (some of then at least) reply: "It is the will of God," and that ends the in quiry with them. But Science rests with no such thought repressing dogma. Present conditions are, because some other conditions were: what were those conditions? In pur suit of the answer to this question scientific men stop a nothing short of "interviewing" the Universe. Naturally the ruler of our planetary system is the most instructive wit ness in regard to the genesis of his family, the earth included
It appears to be pretty conclusively shown, by spectroscopic analysis of the sun's light, that the following twenty terres trial elements (with indications of perhaps two otherwise un known elements which need not be taken into this account) exist in the sun's atmosphere:

| Aluminum | Chromium | Lead | Sodium |
| :--- | :--- | :--- | :--- |
| Barium | Cobalt | Magnesium | Strontium |
| Cadmium | Copper | Manganese | Titanium |
| Calcium | Hydrogen | Nickel | Cranium |
| Cerium | Iron | Potassium | Yinc |

These various substances are not indiscriminately mixed in the vapors which surround the sum. Thanks to the inter posing face of the moon in total eclipses, it is possible to study the sun's atmosphere in sections,so to speak: by which study it appears that, by virtue of the high temperature which prevails there, and the varying specific gravity of the which prevails there, and the varying specitic gravity of the
different elements, the latter are enabled to arrange themdifferent elements, the latter are enabled to arrange them-
selves in layers, in spite of the storms and gaseous outbursts which would tend to disturb their positions. It is observed too that, in the main, the number of elements increases down wards. The outer "coronal" atmosphere contains cooled hydrogen. The "chromosphere" shows incandescent hydro gen, magnesium, and calcium. The "reversing layer," which lies next the photosphere, exhibits sodium, chromium manganese, iron, nickel, and the rest, with the probable ex ception of aluminum, the place of which has not been deter mined by observation, but which most likely lies between magnesium and calcium.
Theoretically the metalloids should lie, as a group,outside the metallic atmosphere: and Mr. Lockyer has submitted some evidence to show that they probably do, explaining why, under the conditions which prevail,their record among the Fraunhofer lines should be a feeble one, and insisting that, in the lack of such lines, we have no argument against the presence of some quantity of the metalloids in the sun, although that quantity may be small. As collateral evidence it is proper to add in this connection that, in the spectra of granite, greenstone, and lava, no trace of metalloids is seen, notwithstanding the (chiefly) non-metallic character of those rocks.
Assuming, in accordance with the nebular hypothesis, that the earth was once in the condition which the sun now pre sents, we can readily understand why its chemical constitu tion should be what it is. From the known behavior of the elements, it is inferable that, as the external metalloidal va pors cooled, they would condense and fall upon the underly ing layer forming these binary compounds capable of exist ing at a high temperature, such as the vapors of water and hydrochloric acid, silica, carbonic acid, and others.
As the cooling went on, the precipitation of these binar compounds would give rise to numerous reactions, forming silicates, chlorides,sulphates, etc. With still further cooling he condensation of water and the formation of mineral would ensue, and the consolidation of the outer shell would begin. The condensation of the metals would come much later and nearer the center.
The same line of facts and reasonings give a clue to the probable constitution of the planets. Assuming the solar nebula to have once existed as a nebulous star at a tempera ture of complete dissociation, and to have contracted with oss of heat, throwing off the planets successively, we may infer that the outermost would be chiefly if notentirely metal oidal; the inuer ones would be increasingly metallic as thei orbits approached the central portion of the nebula. Mr Lockyer considers that the low density and the gigantic and ighly absorbing atmospheres of the outer planets accor with their being more metalloidal than the earth: on th ther hand the high density and comparatively small and feebly absorbing atmospheres of the inner planets point to a more intimate relation with the inner layers of the original ebulous mass, and consequently a more metallic constitu ion. For the same reason we should expect to find the me talloids scarcer in the sun than in the earth. The otherwis mysterious fact that the moon is of lower density than the earth, and the moons of Jupiter similarly less dense than their primary, is easily explained by this hypothesis.
The news which we have brielly summarized awaits con firmation, though (as the newspapers say) it comes direct and from a trustworthy source. It is certainly good enough to be true, commending itself, as Professor Prestwich ob serves in his review of the present aspects of geology, no only by the simplicity and grandeur of the views presented but for their high suggestiveness for future inquiry and re search.

## german pattint law.

At present the vari,us States, comprising the German Em pire, have each a separate patent law. At the time of the Vienna Exposition it was proposed to initiate a general pa tent law, and to abrogate the State laws. For this purpose the German Patent Protective Association was formed, and they have prepared the details of a new law, which has been presented to the Federal Council, with a petition for its enactment.
The proposed new law is substantially a codification of existing provisions, and embodies the current continental
as interlopers or trespassers, who must be watched, surround ed by restrictions, and compelled to surrender their property to whoever demands it.
In this country, the inventor is regarded as a public bene factor, enjoys entire freedom in the possession and working of his patent, is encouraged in his work, and honored by the people. It is chiefly when he goes before Patent Office officials that he meets with rebuffs and discouragements.
The proposed German law provides for a commission who shall decide as to the propriety of granting patents. Official fees small. Duration of the patent, 14 years. Annual payments to be made; neglect to pay forfeits the patent. Within six months after the application is made, but before the patent is granted, the applicant must show that the invention has been actually worked within the Empire. The Patent Office may extend the term for working to a year in special cases, and will then decide whether or not to grant the patent. Patentees are compelled to grant the right of use to any persons who desire; and if the parties cannot agree as to terms, the Patent Tribunal shall name the price which the inventor must accept. The government may use any invention, without negotiating with the patentee; the Tribunal will name a sum, which the patentee must accept, or get nothing.

A STREET RAILWAY IMPROVEMENT WANTED. We publish in another column a note from the president of the Third Avenue Railway of this city, inviting the attention of inventors to a needed improvement in the joints of the rails of street railways. The Third Avenue Railway is one of the most extensively patronized roads in the world. Its length is eight miles, and it carries about thirty millions of passengers per annum. Its rails are spiked down upon longitudinal wooden beams, with an iron plate under the ends of the rails. In addition to the enormous traffic of the company, the rails are subjected to much wear and tear from pany, the rat vehicles. The improvement called for must be of such a nature as to be readily applied to existing rails.

## A NEW DODGE.

We have frequently had occasion to warn patentees against he persistent efforts of designing persons in all parts of the country to abstract money from their pockets under various pretexts. The most numerous class of these impostors have hitherto been those who send circulars and letters to patentees, announcing their extraordinary facilities for selling patents, insinuating that they have a customer for the invention, etc., and all they require to consummate the sale is a power of attorney and a small fee in advance.
Our exposure has very nearly effected an extermination of their operations in this line, but now they turn up in a new rûle.
Instead of sellers of patents, they now appear as solicitors. They look through the list of patents each week, and write to the patentees, stating that their claims do not appear to cover the whole of their inventions, and advise reissues in each case, and set forth special facilities for obtaining these reissues. We have before us a letter from one of these reissue solicitors which a gentleman has sent us, with the usual enquiry as to what we know of the writer. The solicitor's letter goes on to state that his only means of judging of the strength of the patentee's claims was from the published report. The writer had not even read or seen the gentleman's patent, but he has written advising him to apply for a reissue, stating that for $\$ 70$, including all fees, payable when the order is given, he will do his best to get broader claims; but, he adds, the inventor must take all risk of failure. The writer is evidently a novice at this new dodge, and is either very stupid or has a streak of inherent honesty left; for he admits, as be fore stated, that he has never seen the patent, and he also
frankly states in another portion of his letter that he does not know whether the patent can be strengthened, adding truthfully that the result would depend altogether on what had been done in this line before the patentee made his application. But he winds up by stating that he believes that better claims can be "engineered through." What is meant by "engineering through" is not explained; but the expression would seem to be a part of the means used for impressing the patentee as to the magnitude of the solicitor's influence in getting allowed such claims as he may ask for.
It is not a large number that will be deceived by such specious communications; but some will be made nervous, and wonder to themselves if they have a valid patent. We would advise such persons to consult their own agents for information, but under no circumstances to place their business and money in the hands of these letter-writing solicitors, with whom they have no acquaintance.
It is not often that unsolicited advice from a stranger is worth very much, and the motive that prompts it may usually be looked upon with suspicion. We do not assert that advice thus tendered is necessarily given from pernicious motives; but we believe that it is not wise to follow the advice of strangers whose opinion is volunteered; and that those who place their business in the hands of such persons will be likely to find the experiment an expensive one.

## HOW TO BUILD A WINDMILL.

The principal data connected with windmills were dis covered by experimenters early in the present century, the best proportions for sails being ascertained, and most of the important details of construction being worked out. We do not mean to say that manufacturers have made no improvements since that time, only that nothing of any great novel ty has been produced. We must refer the reader to som
standard treatise on mills and millwork, and to the circular
of manufacturers, for information in regard to the various de tails and patents, and will content ourselves with a descrip tion of a standard mode of construction and proportion. Windmills can be either horizontal or vertical, but the latter are almost exclusively employed. In the vertical windmill, the shaft is inclined to the horizon at an angle of from $5^{\circ}$ to $15^{\circ}$, when the wheel is placed at the top of a tower; so that the wheel will clear the sides of the building, and allow space for the action of the wind. If the wheel is supported by a post, the shaft may be horizontal. The connection of he shaft with the pump or other mechanism may be made ither with cearing, or by means of a crank and connecting Th. The shaft must be free swing around in dire od. The shat why dire ion, so that the wheel can always face the wind. It moved, in the case of small windmins, by the use of a weather vane on he end of the shaft opposite to the wheel. With large wind mills supported on towers, the top of the tower is generally arranged so that it can be rotated, and a small auxiliary wind wheel, connected by gearing, moves it into the proper posi tion as the direction of the wind changes. The wheel of a windmill may be covered with cloth, or with slats of wood or metal, the cover in either case being technically known as the sail. It is frequently necessary to reef the sails, when the force of the wind increases; and windmills are often arranged so that this reefing is performed automatically. A common method of effecting this is to make the sail of a series of jointed slats, that present a close surface to wind of the ordinary velocity, and open, thereby decreasing the surface, as the velocity of the wind increases. A good number of the windmills in use, however, are covered with cloth, and reefed by hand as occasion requires. The best velocity for a windmill is such that its periphery moves about $2 \frac{3}{5}$ times as fast as the wind. Thus, if the wind is moving at the rate of 20 feet a second, the tips of the sails should move at the rate of 52 feet a second, so that, if the wheel were 12 feet in diameter, it should make about 83 revolutions a minute. Of course, if the velocity of the wind varies greatly, it will be impossible to keep the speed constant, so that windmills are not ordinarily well suited for work requiring steady motion; although they answer very well for moving pumps. if an intermittent supply of power is not a serious obstacle. In some sections, however, the prevailing winds are quite steady, and in such cases windmills can be applied with advantage to grist mills and other useful work. The force and velocity of the wind can only be determined by experiment, but the results of previous experimenters may be useful to our readers, and we give below a summary of the most recent and reliable


## 



of a windmill, it having been found that four sails of proper proportion produce the
best effect. The piece, P B, best effect. The piece, P B,
is called the whip of the is called the whip of the sail ; C D, E F, G H, etc., the bars of the sail. The bars are inclined to the plane of revolution, at difmade by any part of the sail with this plane being called the weather of the sail. Making the distances A O, N L, L I, etc., each equal to N $L$, L I, etc., each equal the $\frac{1}{1}+$ of the diameter of the
wheel, the best values for the angle of weather are as follows

For N O-18
For L M-19
For J K- $18^{\circ}$
For $\mathrm{J} \mathrm{K}-18^{\circ}$
For $\mathrm{G} \mathrm{H}-16^{\circ}$
For E F-12 $\frac{1}{2}^{\circ}$
For C D- $7^{\circ}$
For E F- $12 \frac{1}{2}^{\circ}$
The sail stretched over these bars will be a warped sur The part B D O, called the leading sail, is triangular, and $\mathrm{B} D$ is $\frac{1}{15}$ of the diameter of the wheel, $\mathrm{B} C$ being $\frac{1}{10}$, and $\mathrm{C} N, \frac{5}{12}$, of the diameter. The main body of the sail, B C N 0 , is commonly rectangular. A windmill of the best propor tions, running under the most favorable circumstances, utilizes about $\frac{{ }^{2} 9}{100}$ of the energy of the wind that acts on an
area equal to a circle having the same diameter as the wheel. area equal to a circle having the same diameter as the wheel.
It would not be advisable to count on realizing more than It would not be advisable to count on realizing more than
half this power in general practice; and on this assumption we have the following empirical rule, for determining the diameter of a wheel, to give a certain amount of power, with an assumed velocity of the wind:
Divide the required horse power by the cube of the velocity
of the wind in feet per second, take the square root of the quotient, and multiply it by the number 2024.8. The pro duct will be the required diameter in feet. An example illus trative of the preceding principles is appended. A wind mill is to be erected in a locality where the general velocit; of the wind is about 20 feet per second. It is to be attached to a pump, the work required of it being to raise 1,000 gallons of water per hour through a hight of 20 feet: 1,000 United States gallons of water weigh about 8,320 pounds, and, taking into effect the resistance of the pump, the power required will be about 1 of a horse power, or 0.167 horse power. Dividing this by 8,000 , the cube of the velocity of the wind, extracting the square root, and multiplying by $2024 \cdot 8$, we obtain $9 \frac{1}{4}$ feet as the required diameter of the wheel. Re ferring to the figure, we find that, in this case, $\mathbf{C} \mathbf{N}$ is 3 feet 104 inches, B D, $7 \frac{8}{8}$ inches, and B C, $11 \frac{3}{32}$ inches. The velocity of the tips of the sails should be 52 feet per second, or the the wheel should make about 108 revolutions a minute. These explanations will probably be sufficient to enable any of our readers who desire it to construct a wheel, and we shall be glad to hear of the success of their efforts.

## SCIENTIFIC AND PRACTICAL INFORMATION.

## nitro-glycerin

Professor Mowbray, in a recent lecture before the Stevens Institute of Technology, on the subject of explosives, stated that nitro-glycerin is now largely made from the fatty waste of stearin and soap factories. Its density, which is $1 \cdot 6$, water being 1, enables it to exercise its tremendous force; for in : given bulk, there is 60 per cent more gaseous matter than would be contained in it were it only of the density of water. new imitation silver ornaments.
In several stores in Munich various objects of art have lately been displayed, which are remarkable for their brilliant silver hue. It appears that they are mere plaster mod els covered with a thin coat of mica powder, which perfectly replaces the ordinary metallic substances. The mica plates are first cleaned and bleached by fire, boiled in hydrochloric acid, and washed and dried. The material is then finely powdered, sifted, and mingled with collodion, which serves as a vehicle for applying the compound with a paint brush The objects thus prepared can be washed in water, and are not liable to be injured by sulphuretted gases or dust. The collodion adheres perfectly to glass, porcelain, wood, metal, or papier maché. The mica can be easily tinted in different colors, thus adding to the beauty of the ornamentation.

## new process of gilding on glass.

Professor Schwarzenbach, of Berne, has recently devised the following new method of gilding on glass: Pure chloride of gold is dissolved in water. The solution is filtered and diluted until, in twenty quarts of water, but fifteen grains of gold is contained. It is then rendered alkaline by the addi tion of soda. In order to reduce the gold chloride, alcoho saturated with marsh gas and diluted with its own volume of water is used. The reaction which ensues results in the deposition of metallic gold and the neutralization of the hydrochloric acid by the soda.
In practice, to gild a plate of glass, the object is first cleaned and placed above a second plate slightly larger, a space of about one tenth of an inch separating the two. Into this space the alkaline solution is poured, the reducing agent being added immediately before use. After two or three hour repose the gilding is solidly fixed, when the plate may be re moved and washed

The Clark Revolving shutter.
It is announced in the advertising columns of this issue that Messrs. Clark \& Company, of London, Eng., patentees and manufacturers of self-coiling shutters made of steel, iron, or wood, have an agency at 218 West 26 th street in this city. Messrs. Clark \& Company's shutters are to be found in all parts of the world, and are known for their ease in working, security against burglars, and finished and orna mental appearance. The firm have other branches at Bos ton, Mass., Dublin, Edinburgh, Manchester, Liverpool, Mel bourne (Australia), Paris, Berlin, and Vienna, their head quarters in London being a very large and complete manufacturing establishment. In New York city, the Clark shut ters are to be seen on the new building for the Lenox library, 100 of them having been put into the structure; and the Delaware and Hudson Canal Company's new building and the Tribune offices are also being supplied with them. They are to be seen in many other of our principal cities, and ther cannot be two opinions as to their convenience and efficacy in use and light and ornamental appearance.
New subscribers to the Scientific American will here after receive the papers from the time of our receiving the order, unless they specify some other date for commencing All the back numbers from the commencement of the volum (January 1) may be had if requested at the time of sending the order, or on request, after receipt of first number.
Preparing Soil for Potting.-We find the following under the heading of "House Plants" in a popular and ex cellent family magazine: "Ladies who find their efforts to raise house plants frustrated by worms may be able to win success by boiling the earth before setting the plants. Use little water, and allow it to simmer away after a few minutes of hard boil."

The New York city authorities, who once peremptorily refused to allow the American Telegraph Company to lay it wires underground, are now seeking to compel all the com panies to bury their wires.

NEW MODE OF SLAUGHTERING CATTLE.
The present mode of killing cattle, by striking the animal with a hatchet or ax, is a cruel operation, as in most cases repeated blows are required to produce the death of the animal. Different methods have been recommended and tested for the purpose of executing the operation with the greatest possible dispatch, so that the animal be not unnecessarily exposed to protracted suffering.
The device represented in the illustration is a French invention, and promises to meet all requirements, being so simple in construction that it may be readily employed anywhere. The head of the animal is covered by a mask of suitable material, which closes the eyes entirely, and is at the center provided with a circular plate of sheet iron, rivet.

ed thereto, which guides in a central perforation a strong steel bolt or pin, in a direction vertical to the plate. The inner end of the sliding bolt faces the head of the animal, and is made hollow, while the outer projecting part is provided with a large knob. The masked or blindfolded animal has no idea of his fate, a single blow of the hammer or club on the knob being sufficient to drive the bolt into the brain, and produce the instant dropping of the animal as if struck by lightning. The theory is that the small quantity of air in the hollow end of the bolt is forced with the same into the brain, and, being heated by the compression, exerts a pressure on the brain, and causes thereby almost instantaneous death. The whole operation is completed within lralf a minute. Several cities of Germany and France have provided by special ordinances for the introduction of this device, which recommends itself to the attention of all humane persons.-Science Record for 1875.

## IMPROVED BOTTLE STOPPER

We publish herewith an illustration of a stopper now in use in Europe for corking bottles containing mineral waters, use in Europe for corking bottles containing mineral waters, which was exhibited at the recent Vienna Exposition. It is
the invention of M. J. de Becker, of Paris, France. It consists of a metallic ring, $a$, two semicircular parts, $d d$, and a sists of a metallic ring, $a$, two semicircular parts, $d d$, and a
cap piece, $b$, which last is provided at the underside with one or more cork disks, $c$. A disk of parchment paper is placed below the cap, $\dot{b}$, over the mouth of the bottle, the cap and paper being then forced in by suitable pressure, for which purpose the small corlsing machine, shown in Fig. 2, can be employed. The forcing-in of the cork admits the application of the semicircular sleeve parts, which bind, by their upper flanges, on the cap piece, and by bottom collars

on the rin at the mouth of the bottle. The ring, $u$, is then placed over the sleeve parts and carried down by the lever, $g$, of the corking machine, producing thereby a strong and perfectly airtight closure of the bottle. The machine enables three or four bottles per minute to be corked, the stopper being able to resist, according to trials made at the Conservatoire des Arts et Métiers, an interior pressure of thirty atmospheres ( 450 lbs . to the inch), which makes it applicable to the bottling of aerated waters.
The opening of the bottle is accomplished by simply placing the thumb on the cap piece, and pulling the binding ring, in an upward direction, with the forefingers. The sleeve parts and cap piece are then taken off, and the bottle is open. For sparkling wines and other carbonic acid beve-
rages, the cork is driven in far enough to produce a report on opening.
The advantages of this stopper are that it requires no corkscrew, and allows the utilization of smaller pieces of cork, as only one tenth part of a common cork is necessary for the cap piece. The bottle is closed in about one third of the time required for corking, wiring, and tin foiling, as in the present style; and the device gives a neat and ornamen used apearavce win by appling to the expense. It may be used over again by applying it to the bottle by hand, the taste of metal or cork, which is of importance in the bottlin of liquid beverages.

EXTERMINATION OF THE PHYLLOXERA.
The best results thus far gained, in the repeated efforts made in France to rid the vineyards of the phylloxera, have been obtained by the use of alkaline sulphurets, and more especially the sulpho-carbonate of potassium. The latter substance decomposes slowly, giving off hydro-sulphuric acid and sulphide of carbon.

Fig. 2.


It has been proved that the earth, in the vicinity of the infected roots, must be thoroughly poisoned. Solid poisons however, are of no avail, and liquids are apparently shed from the covering of the insect, which seems to be water


Root of vine, covered with phyl-
Swollen roots of vine, loxera, in an advanced stage.
caused by phy of vine,
Fig. \%. proof. The action of water and carbonic acid in the soil is sufficient to disengage gases, from the materials named above, whicb exterminate insects, while the potash acts as an excellent fertilizer for the injured vine.
The instruments used for introducing liquids, from which poisonous gas is to be developed, are represented in Figs. 1 and 2. Fig. 1 shows an auger, having a hollow shank and perforated just abo ve the cutting portion. This is provided with handles, above which is placed a small cylindrical vessel, shown separately, enlarged, which serves as a measure into which the liquid is poured in determined quantities. These last are measured by means of the vessel shown in Fig. 2. The insecticide is placed in the large receptacle, and thence, by tilting, the latter is allowed to fill the smaller can above. The ori-

Swellings of root fibers of vine-commence ment of the disease. fice between the two is then closed and the smaller can removed, and its contents turned into the hollow portion of the auger, as represented at $B$, dotted lines
the of the auger, as represented at $B$, dotted lines.
The effect of the ravages of the phylloxera upon the roots of the vine is represented in Figs. 3, 4, and 5. At the beginning of the attack, the radicles swell, as shown in Fig. 5, and also eniarged in Fig. 4. When the disease is far advanced, the roots appear as shown in Fig. 3.

Phylloxera Prize
It will be remembered that several months since we pub-
lished the text of the law passed by the French Assembly decreeing a prize of $\$ 60,000$ to any person who should invent a means of effectually exterminating the phylloxera. To his large sum, various vine growers, corporations, and mu nicipalities throughout France added other amounts, form ing a total, the aggregate of which, though not definitely known to us, might certainly be placed as a very handsome fortune for the lucky discoverer. The report of the commit tee, to whom the descriptions of the various plans have been sent for adjudication, has recently appeared; and although some six hundred schemes have been considered, no one is awarded the prize. The offer, however, remains open, and for this reason the advice of the committee is valuable to in tending future competitors. The report says that "the Commission is authorized to conclude that the communica ons which have been submitted to it have in no instance been accompanied with the record of sufficient experiment and application to the soil over a long enough period," and therefore the prize camnot be decreed. The document then calls particular attention to the following, from the observa tions made by M. Dumas, President of the Commission, when the offer of the award was first announced:
" Processes imagined but not tried are no longer of inte rest, since it would be very difficult to indicate, at the pre sent time, any method not already suggested. The fact of tobacco, sulphur, ammoniacal gas water, coal tar, petroleum, sea water, etc., being urged as sovereign remedics, twenty times or more, adds nothing to the confidence in such means Experience alone can teach us their value, and unhappily the occasion for inventors to try their processes is anything but wanting. In order to compete with a chance of success, it is necessary that the experiments be repeated, prolonged and authentic, and they must prove, beyond doubt, that the means tends either to cause the phylloxera to disappear fron the vines by an economical process, or to preserve health vines against the ravages of the pest, or to check its inroads while insuring the life and fructifying the attacked plant.
"'Ihe prize cannot be awarded until after an absolute demonstration, sufficiently prolonged, of the reality of the dis covery."

## About Spiders

Professor E. S. Morse says: Only the female spiders spin webs. They own all the real estate, and the males have to live a vagabond life under stones and in other obscure hiding places. If they comeabout the house so often as to bore the ruling sex, they are mercilessly killed and eaten. The spider skin is unyielding as the shells of lobsters and crabs, and is shed from time to time in the same way, to accommodate the animal's growth. If you poke over the rubbish in a female spider's back yard, among her cast-off corsets you will find the jackets of the males who have paid for their sociality with theirlives-trophies of her barbarism as truly as scalps show the savage nature of the red man.

## Water Ditches.

The ditches of California are the great arteries which bring life to the mines. Their even and constant flow secures a healthy and vigorous state of industry, while the dearth of water in the mines throws a pall over the business world of California, money becomes tight, and hard times are the consequence. The engineering skill displayed in the constru ction of ditches in this State is of the highest character, accomplishing the most daring feats, hanging flumes on steep, rocky bluffs, and crossing gorges of a thousand feet in depth and it must seem almost a presumption to inquire whether any improvements can be suggested.

## GIFFARD'S RAILWAY CAR.

M. Henri Giffard, inventor of the celebrated Giffard injec tor, has succeeded in constructing a railway car, the body of which is so supported on springs that all oscillation and jarring is entirely obviated, and the passengers within are enabled to read, write, and otherwise employ themselves with as much facility as if not in motion. Our engraving is pre

pared from a photograph of one of these vehicles, now in use on the railway between Paris and Lille, France. The platform is supported on heavy springs of its own, and carries at each extremity standards, which, in turn, are surmounted by ponderous leaf springs, to the ends of which the body of the car is suspended. It was found, on a first trial, that the peculiar horizontal oscillation which is so very fatiguing to the traveler was entirely suppressed, and that a light vertical elastic movement which remained was easily obviated by adjusting the suspending rods.
The weight of the car is somewhat more than that of those ordinarily employed on European railroads, and its cost is higher.-Science Record for 1875

A NOVEL DESIGN FOR A BRITISH CHANNEL TUNNEL. way, being 26 feet wide and 13 feet high; and he has car We illustrated, on page 306 of our volume XXXI., a ried out his design into detail, proposing to use perforating new method of building submarine structures, the invention of Jerome Wenmaekers, a Belgian engineer; and we refer our readers to the description there given, which fully shows the adaptability of the system to works of any extent, and machines (Fig. 4) capable of excavating a bore 9 feet 9 inches in diameter. The use of a compressed air chamber, of the full diameter of the tunnel, is shown in Fig. 5. He is, more

Compounding Marine Steam Engines.
A somewhat novel experiment in the way of applying the compound principle to existing oscillating paddle engines has been carried out in the case of the Royal Mail Company's steamship Eider, and the attempt, which it is believed has not previously been made, seems to have proved a great suc-

Fig. 1.-WENMAEKERS' BRITISH CHANNEL TUNNEL-LONGITUDINAL SECTION.
Lowever difficult of execution. The inventor of the plan timating its cost at $\% 4,000,000$, including the necessary junc- cess. The Eider is a paddle steamer of 1,564 tuns, builder's now publishes a detailed account of a tunnel under the Bri. tion railways on both shores. He anticipates a gross reve- measurement, and 310 horse power, built specially for the ish Channel, to be constructed on his pan, which shows nue of $\$ 6,000,000$, and believes that the working expenses intercolonial service of the Royal Mail Company in the West many new features which are worthy of onsideration.
He proposes to sink five caissons (as shown in our longitudinal section, Fig 1), the deepest of which, in the center, will require seventeen sections, the depth of water being about 40 meters (about 130 feet). The erection of these structures, if practicable at this depth, would enable the tunneling to be done in twelve headings at once, and would give an easy means of hauling away and dis posing of the debris, an important con sideration iu a Moreover, a very large means of length Moreotr, a very lage means of vent lating the tunnel would aforded, an thus the great difficulty anticipated in working such a submarine railway would be obviated. M. Wenmaeker's idea is to insure solidity to the tunnel by perforating the white chalk which underlies the sand of the ocean bed, and to construct the work in the hard gray chalk still lower down. The magnitude of the proposed works may be seen by nspection of the plan, Fig. 3, which shows the diameter of the caisson to $162 \cdot 5$ feet. This dimension would allow the work of hauling the loose eartl to the surface of the water to be done on a very large scale and with great rapidity
M. Wenmaekers prefers to construct the tumel at the depth indicated in the engravings, on account of the increase solidity of the substratum of gray chalk, although he claims that his system is equally useful for building the work at a depth of 6 or 8 feet only below the bed of the sea. $\Lambda$ tunnel made in the durable stratum, and lined, as he proposes, with masonry of béton aggloméré, or other well tried artificial stone, would doubtless be a work of great strength and permanent The distance be tween each two cais. sons would be about three miles and at half, mind and a half, and between those nearest the shores and the entrances to the tunnel, respectively, nels of such lengtlis Fig. 2.-SECTION OF THE PROPOSED CAISSONS FOR THE BRITISH CHANNEL TUNNEL. are trifling works
compared to those of Mont Cenis and St. Gothard. It is can be kept down to $\$ 1,000,000$, learing a profit of nearly $\geqslant 1$ of the Eider proposed to take a route leetween the nearest points, namely, per cent on the expended capital.

St. Margaret's, about three miles east of Dover, and a point. There is reason to beliere that the work of constructing a about the same distance west of Calais, half way between that city and Cape (irisnez.

M. Wenmaekers certainly deserves credit for the boldness of his scheme. His tunnel is to les for a double track rail-
ration tunnel will ie seriously taken in hand. The corpo Northern Railroad of France, a line which is largely owned by the Paris branch of the Rothschild family. A joint com by the Paris branch of the Rhole subject has been appoint mission to investigate the whole subject has been appointed
by the English and French governments and the capitalists ly the English and French governments and the capitalists
interested, and M. Wenmaekers' plans have already been interested, and M. Wenmaekers'
submitted for their consideration.

## Fluorescence of Bodies in Castor Oll.

Charles Horner states that certain natural organic coloring matters, which exhibited no fluorescence when in aqueous or alcoholic solution, were observed to fluoresce brightly when dissolved in castor oil; while other substances, possessing nat urally a faint fluorescence, were found to have this property considerably augmented.
In this solvent, cudbearexhibited a brilliant orange-colored light, and extracts of logwood and camwood a powerful ap-ple-green fluorescence. The well known fluorescent light of turmeric solutions was increased in brilliancy at least threecomparable only with the appearance presented by the best uranium glass under similar circumstances. It is suggested, therefore, that, in studying the phenomena of fluorescence, advantage should be taken, when possible, of the solyent property of castor oil,

Indies, and has been engaged in that capacity for several years. She was recently sent home to Southampton to be refitted and have her engines compounded; and this work having been completed, she will shortly sail again for her old station. The Eider's engines have oscillating cylinders, which were originally $66 \frac{1}{4}$ inches in diameter and 6 feet 6 inches stroke, working at 30 los. pressure, and consuming about 35 tuns of coal per day. In order to adapt the compound principle to these engines, and do so with as little alteration and expense as possible, Mr. J. Bowers (the company's superintending engineer at Southampton) decided to retain the whole of the existing engines, with the exception of the cylinders, pistons, and slide valves. As the new cylinders had to oscillate between the old columns supporting the entablature, it was found impossible to make the low pressure cylinder of a larger diameter than 72 inches, and the high pressure cylinder was therefore made 42 inches diameter, both, of course, having the old stroke of 6 feet 6 inches. The contract for the new compound cylinders, new high pressure boilers, steam pipes, etc., was given to Messrs. Day, Summers \& Co., of the Northern Ironried out their engagement to the entire satisfaction of the company's superin satisfaction of the company's superintendents. The Eidor was to Stokes Bay a day or two since, and the results of two runs on the measured mile were as follows: First run, 4 minutes 30 seconds, equal to $13 \cdot 333$ knots per hour; second run, 4 minutes 46 seconds, equal to 12.587 knots, giving a mean speed of 12.96 knots per hour revolutions of engines, $20 \pm$ per minute steam, 65 lbs. ; vacuum, $27 \nmid$ inches ; in dicated horse power, 1,251. The space saved in the Eider by the diminished size of the boilers and coal bunkers enables her to carry between 200 and 300 tuns more cargo than heretofore and the consumption of coal will be reduced from The improvement in the general ar rangements of the ship, in consequence of the decreased space required for the machinery, have added much to the
comfort, and improved the appearance

## Female Voters.

The Supreme Court of the Cnited States has lately decided in the case of Miner $c s$. Hoppersatt, that women, although they are citizens, are not therefore voters. W omen are citi The court unanimously held that the Constitution of the .


Fig. 4.-PERFORATING MaCHine.


FIg. 5.-CONSTRUCTION UNDER COMPRESSED AIR.
United States does not confer the right of suffrage upon any one. The right of suffrage is not made, in terms, one of the privileges of a citizen. The electiveofficers of the United States are chosen directly or indiregtly by the roters of tha

States. The United States has no voters. No one can vote States. .erae united states has no voters. No one can vote
for Fedeal officers without being competent to vote for State officers. It follows from thisdecision that women cannot become voters until they are authorized by the States in which they live.

## (1atrespomaicure.

## The Grasshopper. Scientific American:

## To the Editor of the Scientific American:

I have received the most valuable of all books, the Science Record, for 1875 . I notice an article on page 456 , on the habits of the grasshopper, by Professor Humiston. I differ from his description of their method of depositing their eggs. He says: " The tail of the female locust consists of a hard, bony, cone-shaped substance, capable of being thrust hard, bony, cone-shaped substance, capable of being thrust into ground from $\frac{1}{2}$ to 1 inch in depth. Just above this, on
the body of the insect and attached to it, is the egg cell; the the body of the insect and attached to it, is the egg cell; ; the
grasshopper is able to push its conical tail down into the grasshopper is able to push its conical tail down into the
ground and leave it there, with the cell containing the

## aggs.

I wish to state that the grasshopper does not push her tail into the ground, nor does she leave it there. The cone part, as he describes it, is a hard, forked,bony terminus,both above and below the anus. It is capable of being moved, and the female uses it as a drill. She does not leave the tail (as he calls it) with the eggs; but deposits the eggs, with draws the tail, and goes about her business. His view as the hatching in spring time are correct.
Leroy, Kan.
J. G. Shoemater.

An Improvement Wanted in Street Railways. To the Editor of the Scientific American:
One of the greatest needs of street railroads is some simple and economical invention to keep the rails, where they meet, in a level condition; or in other words, to prevent the end of the forward rail from sinking below the end of the near rail. The device at present used is an iron plate placed under the junction of the two rails; but this does not entirely prevent the evil.
I invite the attention of inventive minds to this subject. Sam. L. Phillips, President. Office of the Third Avenue Railroad Company, New York city

Is Candy Injurious to the Teeth?
Most certainly it is. For outward proof of it $I$ will refer Most certainly it is. For outward proof of it I will refer
you to any candy-making village in our country, as the vilyou to any candy-making village in our country, as the vil-
lage of Neponset, Mass., where the shocking condition of the teeth, of the youth brought up in proximity to large candy manufactories, shows plainly the cause. But this is perhaps negative proof, and we should seek for proof positive, bccause other causes than those of the use of candy may be the reason, in this instance, of the disease.
But by far the most injurious consequence in the use of candy is in its indirect action through the system, first by its constituents, second by its disturbing action.
By long research I have discovered that the effect of the use of cane sugar, in small or in large quantity, is to produce a more or less constipated state of the alimentary canal, more particularly the refined sugar of the present day. al, more particularly the refined sugar of the present day.
If, then, the balance of intestinal action is normally correct, the presence of sugar always disturbs it.
There is a point that may be stated bere, and that is the action of sugar on an exposed nerve. We eat bread, meat, regetables, and our '" exposed nerve" makes no complaint; but the moment a little sugar is dissolved in the tooth, the tissue sets up a cry. What does it mean? Does it mean that it dislikes it-that it is discordant to the system? Does it mean that it is injurious to the fleshy or to the bony substances, or both? I have as yet not solved the problem. Who will do it? By an analogy we must conclude that cane sugar is injurious, and yet there may be other reasons and other causes for the pain produced in the tooth.
Besides the sugar contained in the candies of the present day and the coloring matters (mostly made of tincture of cochineal, which is harmless) are occasionally other material,su as pigments of green and yellow, which are poisonous
We have a large number of essential oils, or medicaments,
every one of which has a peculiar medical effect on the sysevery one of which has a peculiar medical effect on the sys-
tem, toning it up or down, binding up its parieties or loosentem, toning it up or down, binding up its parieties or loosen-
ing them, and to these medical effects much of the injury of the confectionery of the present time is due
A small catalogue of these essential oils and flavors may be interesting
Group No. 1.-Peppermint, checkerberry, sassafras,lemon, clove, anise, cassia or cinnamon, vanilla, rose, caraway, coriander, cayenne.
(troup No. 2.-Jargonelle pear, strawberry, pineapple, banena, peach, almond
Group No. 3.-Boneset, licorice, horehound, ginger, car damom, chocolate, butter, cocoanut, cordial, brandy, gum arabic, acids.
In purchasing a pound of mixed candies, you may perchance get all of these flavors in one lot.
Now I do not pretend to say that one is likely to be poisoned by such a compound, but I do say that, when a mother gives; a three year old child an ounce of peppermint drops to eat, she should know the effect of them when eaten-that she ought to know she is giving the child a medicament as well as effect of the oil of peppermint is definite, and that an ounce of peppermint drops will, if they are strong-and of course
hey are supposed to be good only as they are strong-co ducing in a young child sometimes a spasm and inflamma tion, shown by a thirst for water, and a general disturbance of healthy action.
Such is, I believe, the general action of the essential oils of confectionery in group No. 1. The oil of cassia or cinna-
mon is very irritating. The oil of cloves is considered by mon is very irritating. The oil of cloves is considered by
many as destructive or poisonous. As a rule, the essential many as destructive or poisonous. As a rule, the essential
oils retard digestive action in the same manner that they preserve from decay meats and fruits, by retarding fermenta tion, or making compounds with digestible or decaying sub stances.
The pear and similar flavors in group No. 2 are imitations they are chemical flavors, and are decidedly unhealthy. The composition of them I have found to be as follows:
The jargonelle pear flavor is made of the acetate of amyli ether, which is prepared by distilling a mixture of fusel oil, ether, which is prepared by distilling a mixture of
The pineapple is made from butyric ether dissolved in an ther portion of alcohol. Butyric acid is made from decay ing cheese, grape sugar and chalk, fermented together.
Various mixtures of the ethers, with addition of various
gents, such as acetic acid, camphor, orris, vanilla, the vol agents, such as acetic acid, camphor, orris, vanilla, the vol
atile oils, etc., result in imitations of strawberry, rasplerry, apricot, currant, etc.
The tonka bean is used very much in place of the vanilla pod, to imitate the vanilla flavor.
The common oil of almond (bitter) always contains a considerable amount of prussic acid ; this oil is said to be substituted sometimes by the oil of mirbane or nitro-benzole, eight or nine drops of which is said to have produced death
The peach and almond flavors are also imitations. mad rom prussic acid in some form, and are very poisonous.
The third group contains medicinal flavors: licorice, bone et, or horehound, ginger,cardamom, all of which have a dif ferent action from the first group, being relaxants and diuratives, and will have that effect in greater or less degree.
There are varieties of which we will not here speak; but we must condemn the spirituous drops sold at the street cor-
ners, as decidedly impolitic and demoralizing to the little ners, as decidedly impolitic and demoralizing to the little ones who may be tempted to buy them.
But the injurious effects of candies do not stop here. The pure essential oils are costly and are increasing in price yearly; substitutes must be found, adulterations are practised, and among the most common is the adulteration of the oil of peppermint with spirits of turpentine, a thing to be ut terly condemned, especially as its action is, with exceptional persons or in exceptional cases, that of a violent and dangerous poison, and in all cases it is an irritating oil, producing conges tion of the veins and coagulation of the blood (a useful styptic in cases of excessive bleeding, by the way); and yet I am informed it is used by the confectioner himself,and only
a rule to put in as much as he can disguise or cover up.
rule to put in as much as he can disguise or cover up.
The use of laudanum in licorice cough drops should
condemned. Many a child has been injured by them without the knowledge of what was going wrong.
The lemon drops are supposed to be made of citric acid,and flavored with oil of lemon; but why citric acid, when oil of vitriol is so much cheaper? I have reason to believe that tartaric acid is most generally used.
But why cry down candy, the pleasant pacifier, that which fills the sweet tooth of the rising generation? Almost every one likes candy-a little now and then-almonds, sugarplums, gum drops (now made to a great extent of glue). I do not cry it down, but must raise my voice against its exces sive use, and ask whence comes the tendency, the appetite, for so much sweet? It seems to me to be occasioned by the
and increasing use of sugar in the family at home.
That which in the past was a luxury is now supposed to be a necessity. We have toned up our appetites until our viands are tasteless unless they are sweet with cane sugar. We daily spoil the flavor that God has placed in our food, by adding our own product to it.
If we wish to eradicate from our youth the very strong tendency toward high seasoning or high sweetening, we must begin at home, and tone down instead of toning up, and teach ourselves and our children to love the inherent flavors of the grains, the fruits, and vegetables; and as we and our children cultivate a love for them, so will their tastes grow, until this excessive sweetness will bear disgust, and their appetites will turn away from what cloys and sickens, and dis-
turbs the normal condition of the human body. I should refer to an article used to adulterate sugar, called terra alba-a white earthy substance-quite harmless, being sulphate of gypsum (anhydrous calcic sulphate)-profitable to increase the weight without being suspected by the buyer It is said to be used in large quantities. It can be easily found by dissolving the candy in water; if any sedim, which mains, it is lik
is also used.

## Hollow Structures.

Nature teaches us one of the grandest lessons in her economization of structures and materials. The stems of water plants are hollow and of various sections, as cylindrical, an gular, or furrowed. Many of them, as all know from the revealings of the microscope, are of cellular or tubular con-
struction. Examining the stem of a young dicotyledon cut across, we find the inner portion full of radiating cells of fibro-vascular bundles, of wedge-shaped section, the pith occupying the center. If we minutely examine these vascular bundles we shall find a layer of cells traversing the bundles on the inside of this, toward the center of stem, the cells form the proper wood of the fibro-vascular bundle, and on the outer side, toward the circumference, the cells are closer and
more compact. The layer between these portions is called the cambium layer,and the stem of the oak and other exogens is strengthened by continual increase of woody fiber outside his layer, or the liber of the stem. We might go on illus trating, from a variety of plants, the remarkable adaptation of stems to their habitats and conditions of growing; some triangular in section, as in various water grasses, sedges,etc.
exposing only an angle to the flow of the stream; other exposing only an angle to the flow of the stream; other
square and round in section, of beautiful symmetry, and which man has imitated in the art of construction, and in casting his metal into cylinders and shafts.
Not only in stems of plants and grasses, but in the bone of animals, we find the same hollow structure developed. In the case of birds, wherelightness is most necessary, the sub the case of birds, wherelightness is most necessary, the sub-
stance of the hollow bones is remarkably thin. Take a stance of the hollow bones is remarkably thin. Take a
feather. What a wonderful union of strength and lightness is there in it! We find this hollowness particularly evident in that end of the feather at which the muscles act,or at the in that end of the feat
short end of the lever.
Leaves show a similar adaptation of matter. Some leave exhibit deep furrows or ribs which support the membrane o tissue, and give it a stiffness to withstand the pressure of the wind. Others have their surfaces indented or voluted, or formed of two or more conves lobes, thus giving rigidity to them. Again, shells and other organic forms possess cellu lar and corrugated parts in which the material is distributed to the best advantage. We have not been slow lately to avail ourselves of these lessons. Our tubular and cellular bridges, our iron vessels, our columns, and shafts of machinery, ou iron roofs and walls,are instances of the employment of hollow and corrugated forms, and the extent to which they are applicable and may yet be employed is almost co-equal with the whole field of inventive genius.
Butour primary object here is to call attention to some of the mechanical principles involved in these structures, and to indicate how the same principles may be applied to the uses of art. We have shown on what elements the strength of cast iron beams depends, namely, in putting all the metal into the shape of flanges on the extreme side of the neutral plane of the beam. 'Thus the inverted $T$ shape answers this best in cast iron, as we have seen. Now, keeping this form in view, let us first examine the strength of a hollow cylininder. Here we find the material thrown at a distance from the central or neutral axis, and thus fulfilling the great principle of making the moments of resistance of the fibers the greatest possible. Thus let us take a solid cylinder of a giv en diameter. If we cut away or hollow it we shall find, al though we are taking away a quantity of the material, we do not proportionately diminish its transverse strength; but if we place the material that we take out round its external surface, we greatly increase the strength.
The experiments of Mr. Hodgkinson upon columns of cast iron were conclusive in proving that the hollow cylinder was the strongest form of section under compressive force. These were conducted upon hollow tapering columns, upon cross sections, as used in the connecting rods of steam engines, and upon forms in which the metal was cast in the shape of the letter H . All these forms proved considerably weaker than the hollow cylinder of equal weight of metal. As the rela tive merits of these forms of casting metal are of constant use we append their proportionate strengths: Hollow cylindrical pillar, $100 ; \mathrm{H}$ shaped pillar, $75 ;+$ shaped pillar, 44. The examples were all of the same weight and length, with rounded ends.
General Morin's rule for the thickness of cast iron pillars may be relied upon, as it is based upon the founder's experience of the minimum thickness
Height, feet, 7 to 10, 10 to 13, 13 to 20, 20 to 27 ; minimum $\begin{array}{cccc}\text { thickness, inch, } 0.5 & 0.6 & 0.8 & 1.0\end{array}$
Another rule is to make the thickness in nc case less than 1-12 of the diameter. Cellular or tubular girders exemplify to a still greater degree the value of hollow construction. 'The Conway bridge, in North Wales, designed by Mr. Robert Stephenson, is an instance of the application. The two tubes of this bridge are each 25 feet high in center, and 14 feet wide externally, 420 feet long, and weigh 1,300 tuns. The material is chiefly disposed in the top and bottom parts or flanges, and these are also composed of small tubes or cells to give additional stiffness. The sides are of plate iron riveted together, and each tube is really an immense beam, of slight diminution toward the ends. An iron ship is really a tubular or cellular beam, approaching a rectangle in section, and undergoing various strains. The waves are the points of support, sometimes near, and often wide apart: while occasionally the whole vessel is lifted and supported by one wave like a pivot. Under these continually varying conditions, the deck and bottom of the vessel are subject to alternate compressive and tensile strains, and in very long vessels, like the Great Eastern, in a heavy sea, these strains are very formid able; and hence the value of adequate stringers under the decks, and diagonal braces, to stiffen the ship lengthwise and laterally, and bulkheads to prevent transverse or the rocking motion which a vessel often has when laboring in a heavy sea. Every deck and vertical division in a ship en ables the ship builder to make his structure cellular, and gives him admirable opportunities of tieing and bracing together the sides.-English Mechanic.

## Free Lunch Suspended.

In consequence of the increase of postage and the necessity of prepayment, we are obliged to decline seuding odd numbers or specimen copies of the Scientific American free, as has been our custom for a quarter of a century.
Hereafter persons desiring specimens or any special numbers of the paper will please to remit, for caci copy ordered, ten cents.

## $\overline{\text { Numbir } X \times I}$

by joshua rose.

## hand turning.

Turning work in the lathe with a tool held or guided by hand, or, as it is commonly termed, hand turning, is at once one of the most delicate and instructive branches of the machinist's art, imparting a knowledge of the nature and quan tity of the resistance of metals to being cut, oî the qualifications of various forms of cutting tools, and of the changes made in those qualifications consequent upon the relative position or angle of the cutting edge of the tool to the work; position or angle of the cutting edge of in this knowledge is to be obtained in other way than by the practice of hand turning.
It is the work of an instant only to vary the relative hight and angle of a hand tool to the work, converting it from roughing to a finishing tool or even to a scraper, which perations are difficult and sometimes impracticable, if not mpossible, of accomplishment with a tool held in a slid rest.
The experience gained from the use of slide rest tools is imparted mainly through the medium of the eyesight whereas in the case of a hand tool the sense of feeling be comes an active agent in imparting, at one and the same time, a knowledge of the nature of the work and the tool so much so, indeed, that an excess in any of the requisit ualifications of a hand tool may be readily perceived from qualice of feeling, in the he sense of feeling, ive of any assistance from the eye; and in this fact lies the chief
gained by learning to turn by hand.
For instance, there is no method known to practice where by to ascertain how much power it requires to force a slide est tool into its cut, or to prevent its ripping in; so that a wide variation, in the tendency of such a tool to perform its allotted duty easily and without an unnecessary expenditur of power, may exist without becoming manifest to any save the experienced workman; whereas the amount of power required to keep the cutting edge of a hard tool to its work, o hold it steadily, or to prevent it from ripping, is commu nicated instantly to the understanding through the medium of the sense of feeling. Nor is this all, for even the sense of smell becomes a valuable assistant to the hand turner Several metals, especially wrought iron, steel, and brass, emit (when cut at a high speed) a peculiar smell, which be comes stronger with the increase in the speed at which they are cut and the comparative dullness of the edge of the tool employed to cut them, more especially when the cutting edge of the tool is supplied with oil during the operation of cutting. The reason thatthis sense of smell becomes mor appreciable during the operation of hand than during that o slide rest turning is because the face of the operator is nearer to the work, and because hand turning is performed at a higher rate of cutting speed.
If a tool for use in a slide rest is too keen for its allotted duty, the only result under ordinary circumstances is that it will jar or chatter (that is, tremble, and cut numerous in dentations in the work), or that it will lose its cutting edge unnecessarily quickly. But a hand tool possessing this de fect will in many instances rip into the work, because the power, required to prevent the strain, placed by the cut upon the tool, from forcing the tool deeper into its cut than is in ended, is too great to be sustained by the hand; and the tool, getting beyond the manipulator's control, rips into the work, cutting a gap or groove in it, and perhaps forcing it from between the centers of the lathe. If, on the other hand tool is of such a form that it requires a pressure to keep i to itsduty, the amount of such pressure, when the tool is held at any relative hight and angle to the horizontal center line of the work, and the variation in that amount.due to the slightes alteration of the shape of the tool, are readily appreciated by sensitiveness of the hand; when they would be scarcely if a all perceived were the same tool, under like conditions, used in a slide rest.
These considerations, together with the great advantage in the relative rapidity with which the form and applied po sition of a hand tool may be varied, render hand turning far more instructive to a beginner than any other branch of the machinist's art. And since the subject is of equal importanc to apprentices, to amateur turners, and to those who have learned their trade without having the opportunity to study this important branch of it, the subject will be treated in detail so as to be available to the merest tyro
The first lesson will be to learn to turn a piece of plain iron, and the tools necessary for this operation are a bench vise, a file, a center punch, a hammer,a center drill,a graver, and of course a lathe, with the requisite hand rest and driver or dog. Having fastened the piece of iron to be turned in the vise, with the top face not more than an eighth of an inch higher than the jaws of the vise, so as to prevent the iron from jarring while it is being filed, file the end as nearly level and square with the body of the iron as possible. The next operation will be to centerpunch it by holding the pointed end of the centerpunch as near the center of the end face of the iron as the eye will direct; and while pressing the point of the punch sufficiently firm against the work to prevent the punch from slipping, strike the other end of the punch with a hammer, which will make a conical indentation in the end of the work, to receive the lathe center. This operation should be performed upon each end of the work so that it may be turned between the centers of the lathe. It is a common practice to center one end of the work only, and to fasten the other end in a chuck, thus making the chuck serve as a driver and obviating the necessity of center punching more than one end of the work. This method will,
it is true, save a little time, but is objectionable for the fol it istrue, save a little time, but is objectionable for the fol-
lowing reasons: Chucks will run quite true while they are lowing reasons: Chucks will run quite true while they are
new, and indeed for some little time, but they do in time new, and indeed for some little time, but they do in time
get out of true; and as a result, if the work requirts to be reget out of true; and as a result, if the work requirts to be re-
versed in the lathe so as to be turned from end to end, the versed in the lathe so as to be turned from end to end, the
part of the work turned during the second chucking will be eccentric to that part turned during the first chucking. If one end only of the work requires to be turned, and needs be true only of itself and irrespective of the part held in the chuck, the latter may be employed; this subject will, how ever, be treated hereafter
The most desirable shape for the centerpunch, and the manner of holding it, are shown in Fig. 58, A being the

punch, and B, the work. The work being provisionally cen ered, we must make those centers true, so that the work wil rue up without requiring to have too much metal cut off in he operation; to this end, we place the work between the enters of the lathe, and adjust the back center so that th work will revolve easily if the hand is drawn lightly acros it, and yet it must not be so loose as to be able to shake a all. We then adjust the hand rest so that it will well clear he work; and using it to steady the right hand, we hold a piece of chalk near to the work, revolving the latter by rushing the fingers of the left hand quickly and lightly cross it; by then slowly advancing the chalk towards the work until the two touch, the chalk will mark the eccentric side of the work if it does not run true, and a ring around the same if it is true. If it be so much out of true as to require alteration, it must be placed in the vise again and the center drawn by striking the centerpunch while it is at an inclination, the point being in the direction of the chalk mark, as shown in Fig. 59, A being the chalk mark, and herefore the direction in which the center requires to go Having removed the center according to the judgment, the chalk mark should be effaced, and the work placed again in he lathe and tested as before, the whole operation being re pated until the work runs sufficiently true
Our next performance must be to drill a small hole up the enter of the work, using the centerpunch mark as the cen er wherein to insert the drill point. The object of this is to ase away the bottom of the center in the work, so that it will not press against and wear away the extreme point of he lathe centers, and to prevent the centers in the work rom moving their position in consequence of the wear due o the friction caused by their revolving between the lathe enters, as they would do in the absence of the center drill For this purpose the universal chuck and a twist drill b. For thi papo sirable tools, they being purchasable from any store keep ing machinists' supplies. The chuck must be screwed on to ing machinists' supplies, The chuck must be screwed on to
the running spindle of the lathe; and the drill being fasthe running spindle of the lathe; and the drill being fast ened in the chuck, the work is placed so that the point of
the drill is in one of the centers and the center of the back the drill is in one of the centers and the center of the back
head of the lathe is in the other center. Then, by starting the lathe and holding the work still by the left hand while he right hand is gently screwing out the back lathe center he work will be forced over the revolving drill,thus drilling he hole referred to. Whilethe drilling is being performed the drill should be freely supplied with oil to assist it in cutting and to prevent it from wearing away and becoming dull. It is very important, during this operation of cente rilling,to relax, every few seconds, the hold upon the work sufficiently to permit it to make about a third of a revolution, which may be done while the other hand is supplying oil to he drill. The object and effect of this is to cause the cen er drilling to be true, which otherwise it would not be, es pecially if the work is comparatively heavy, or heavier on side than on another.
In the absence of the possession of a drill chuck and twis rills, they may easily be made, the best forms being a

Fig. 60 represents the drill chuck with one end of the dril

in its place, while Fig. 61 represents the drill separate. The cone, from A to B in Fig. 60, is the part which fits into the socket or hole in the lathe spindle; from the end, C , to the
t down to half the diameter of the hole; and its bottom ace is left taper as shown, so that the taper, D, of the drill


Fig. 61) will, when forced into its place, serve to lock th drill and prevent it from turning in the chuck.
The drills may then be formed of steel wire (Stubs' is the best for the purpose) by simply filing the flat taper, D (Fig 61 ), on one end of the wire, and forging out the other end to drill of the required size, care being taken to forge the drill end (as shown in Fig. 61) smaller at A than at the drill ing end, $B$, from $\mathbf{B}$ to $\mathbf{A}$ being a gradual curve: which is called the clearance, and which serves, in consequence of the decreased diameter of $A$, to permit the cuttings of the drill to pass out of the hole while the drilling is being done If the drill is not given sufficient clearance, the cutting will become jammed in the hole, and, binding fast to the drill, will arrest its revolving motion, and cause it to twis and breat off leaving the cutting end of the drill fast in th hole; in which case, unless one end of the broken piec happens to protrude so that it can be extracted by a pair of pliers or a hand vise, and unless it can be jarred loose (as is sometimes the case) by striking it against a block of iron or sometimes the case) by striking it against a block of iron of wood, the work must be heated to a low red and permitted to
cool of itself, so as to soften the point of the drill to allow cool of itself, so as to soften the point of the drill to allow it to be, by another drill, cut or drilled out.

## Important Renearches on Explosive substances.

Roux and Sarrau have previously shown that two differ ent kinds of explosions can be produced by dynamite, accord ing as the substance is made simply to deflagrate (explosion of the second order), or to detonate by the percussion of ful minate of mercury (explosion of the first order), and that th force of the explosion produced by the same quantity is ver ifferent in the two cases. They now find that the majority of explosive substances, gunpowder included, possess the same emarkable property
The reciprocal of the weight (due corrections made) of each substance, which when exploded in ene and the other manne sufficed to rend similar cast iron shells, gave the relative ex plosive forces. Some results of the experiments are given in he following table, the explosive force of gunpowder ignited in the ordinary manner being taken for unity

| Name of substance | Explosive force |  |
| :---: | :---: | :---: |
|  | 2nd Ord | 1 st Order. |
| Mercury fulminate.. |  | 9.28 |
| Gunpowder | $1 \cdot 00$ | $4 \cdot 34$ |
| Nitroglycerin. . | $4 \cdot 80$ | $10 \cdot 13$ |
| Pyroxyl (gun cotton). | $3 \cdot 00$ | $6 \cdot 46$ |
| Picric acid. | . $2 \cdot 04$ | $5 \cdot 50$ |
| Potassium picrate. | $1 \cdot 82$ | $5 \cdot 31$ |
| Barium picrate. . | 171 | $5 \cdot 50$ |
| Strontium picrate.. | $1 \cdot 35$ | $4 \cdot 51$ |
| Lead picrate. | $1 \cdot 55$ | 5.94 |

Of the highest practicalimportance is the discovery of the detonative explosion of gunpowderinduced by the detonation f nitroglycerin (itself set off by the fulminate of mercury) or the force of the explosion is more than forefold greate than that obtained by igniting gunpowder in the ordinary manner. (The increased force of gunpowder and gun cotton, when exploded by the agency of detonation, was fully dem onstrated by Abel six years ago). The authors observe that he mass of the substance employed for exciting detonation must usually bear a certain proportion to that of the substanc o bexploded, but in some cases the action is propagated hroughout the latter when once up at any given point.Comptes Rendus, Journal of the Chemical Socieiy.

## Self-Watering Locomotives.

The self-supplying water apparatus for locomotives is oming into very extensive use in this country. It consists a water trough from 800 to 1,200 feet long, laid between he tracks of the railway. As the engine passes along at a velocity of, say, 20 miles an hour over the trough, the fire man, by means of a lever, lowers one end of a pipe into the rough, and the water is carried up into the tender. The ater is prevented from freezing in winter by means of steam pipes. The use of this device, by saving time in stoppages ermits a more moderate average of speed, and so result in economy.

Chromo-lithographic Process.
In place of using a special stone for each color, necessita ing as many separate impressions as there are colors, the entire subject is drawn upon a single stone, and a proof is aken on a thin sheet of copper. This sheet is then cut ou carefully according to the desired contour of the colors, and pon each of the portions is fixed a solid block of color,pre viously prepared. The whole is combined into one form, and is printed on an ordinary lithographic press, all the colors at once, the moisture of the sheet being sufficient to take of and hold the colors as the sheet goes through the press

Kangaroo Leatter.-In Australia kangaroo skins are becoming an important article of traffic, and experts declare that they make the toughest and most pliable leather in the world. Boot uppers of this material are said to be both com fortable and durable. It also makes the best of morocc whips, gloves, etc. Of these skinssome are exported in thei raw state, and others after being manufactured. The kan aroo is widely distributed throughout the colonies, and grea numbers are slaughtered, yearly, for their skins.

IMPROVED BOLT CUTTER.
The annexed illustrations represent two sizes (Nos. 5 and 6) of a new automatic bolt-cutting machine, recently invented by Mr. E. Schlenker, Superintendent of the Howard Iron Works, of Buffalo, N. Y. The dies revolve, and may be easily removed and others of different sizes substituted, with out taking out a screw. When inserted,they become instantly automatically locked. The dies open automatically to receive the bolt, upon which a perfect thread is cut by a single passage through the machine, when other automatic devices cause it to be discharged. The opening of the dies is effected by a gage rod which is set to cora gage rod which is set to cor-
respond with the length of thread respond wi
to be cut.
The smaller machine, illustra ted in Fig. 2, maybe operated by hand or belt power, and will cut from one quarter inch to one inch and a quarter inclusive. The next size, No. $5 \frac{1}{2}$, will cut from three eighths of an inch to two inches inclusive, and the No. 6 machine, which, in the larger engraving, is shown provided with a nut-tapping attachment, operates on from three eighths to three on from three eighths to three inches, also inclusive. Dies and master taps are furnished with tioned; with the thind, men tioned; with the third, the purchaser may order the nut-tap. ping attachment, and, in addition, as many. dies and master taps as he requires. The apparatus is constructed entirely of strong and durable materials, and offers throughout, besides its special features of advantage, a simplicity of construc tion which will doubtless commend it favorably to me chanics.


For further particulars, prices, etc., address ihe manufac turers, R. L. Howard \& Son, Buffalo, N. Y.

## IMPROVED DINNER PAIL

The construction of the dinner pails in daily use by the millions of working men throughout the country is, it is claimed, open to several objections, not the least of which is that the greater portion of the surface of the receptacle, into which the hot coffee is poured, is within the pail proper containing the meat and other edibles. The latter by this arrangement. lose their flavor, and a quire an insipid, sodden taste. To remedy this and other disadvantages, the pail represented in the accompanying engraving has been in vented by Mr. F. E. Heinig, of Louisville, Ky. who has obtained thereon two patents, one da ted in 1873, and the other since the commencement of the present year.
Fig. 1 shows the pail complete as carried in the hand. In Fig. 2, A is a pan (to be used for meat, vegetables, or soup), the upper wired edge of which fits tightly within the lowe wired edge of part B. The latter is in section a little over a half circle, and is intended for meat, bread, or pastry. C is the coffee bottle which also fits over the wired edge of part A, and has a wired bottom describing a little les than a half circle. It has, besides, a simple tin hook on the lower edge of its flat surface, which, catching on the standing edge of the flat surface of part B, holds the bottle firmly in its place. The cover with the cup fits over parts, B and C, and holds them fast together. The size and weight of the pail can.
Besides the evident lessening of the prebability of spoil

Among others of his bequests was the sum of $\$ 700,000$ for an observatory on the summit of the Sierra Nevada, which all lovers of Science hoped would be accomplished. Alas! how uncertain are both man and riches!

## TOMLINSON'S IMPROVED CHIMNEY COWL

The construction of the new chimney cowl herewith illustrated is such as to prevent currents of air descending the chimney cap in stormy weather, this being effected by suitable provision for imparting an upward impetus to the incoming currents. The flue which constitutes the cowl is secured to the himney by a lange, above a suitable cap or hood. In the sides are a series of air openings, from the top edges of which, and exterior to the flue, project shields, A, which are adapted to shed water or wind, should the latter tend downwardly. From the lower edges of the air openings extend inwardly projecting deflectors, B, the length of which, as well as of the openings, is less than the diameter of the tlue By this means a space is created . 1 ends of the deflectors, beside the ends of the deflectors, well ber edges, through which the products of combustion can pass and readily escape at the top of the flue. The air openings can be formed on all sides of the flue, or on but tivo, as in the present instance.
If a current of air strikes the cowl on either side, it will enter through the openings and

## SCHLENKER'S IMPROVED BOLT CUTTER.



HEINIG'S IMPROVED DINNER PAIL.
ments; simplicity of construction, and easy putting together; saving of material in construction, besides the permitting of uch greater utilization of scraps.
For further information address the patentee, F. E. Hei nig, 89 Floyd street, Louisville, Ky.

Temperature of the Earth.
At the recent annual meeting of the Geological Society of Glasgow, the president, Sir William Thomson, gave a lec ture on "The Conditions of Underground Temperature at Different Depths." The various classes of variations occur ing, and the mathematical investigations which had been made by various eminent observers of the phenomena re terred to, notably those of Fourier, who had done much on fhe subject of underground temperature, were considered Suchobservations were difficult to make with correctness on account of the changes of temperature caused by the opening of the ground for the placing of the thermome ters. The best form of thermometer was that having a long shaped bulb.
It was found that, generally speaking, the temperature of the earth increased by $1^{\circ}$ Fah. for every 50 feet of depth There were some considerable exceptions to this, the temperature increasing faster, which was apparently due to volcanic action.
By making use of the knowledge acquired by observations and supposing the earth at one time to have been in a molten state, this condition could not be placed further back than about $400,000,000$ years.

## The Lick Donations.

Some time ago Mr. James Lick, of San Francisco, deeded a large portion of his great estate, in trust for public purposes of an educational and philanthrupic character, reserving a modest income for himself. For this good deed he was highly commended all the world round. Now he revokes the trust; and concluding that he has not done justice to his relatives, and that he can carry out his own purposes more relatives, and hat confirms the steps hitherto taken by the
be turned upward by the deflectors. A suction is thu created within the flue, and the eduction of smoke accele

rated. If the current enters the flue from above, and tends downward, the deflectors will turn it sidewise and outward State and county rights for sale. Paten ted February 9, 18\%5, to Mr. Joseph Tomlinson, Mount Vernon, N. Y, who may be ad dressed for further information.

## Magnetization.

M. J. Jamin's researches point to an important modification in the construction of magnets. Suppose that a great number of plates, which, after being separately magnetized to saturation, are placed together. The magnetism of the combination will be seen to in crease up to a limit which cannot be passed, and which is reach when the polar surfaces and which in polar surfaces are filled. Suppose that ten plates are re quired. If now we re-commence the same experiment, applying the same plates against two iron armatures of a large surface, the intensities will increase much more slowly, because the sum of the magnetism is diffused over a more considerable extent, and the limit will not be reached till this extent is trustees, and resumes possession of his property. The world is full. For this it may be needful to superpose twenty, will be obliged to revoke much of the praise heretofore be- thirty, or forty plates, and, generally speaking, a numstowed on Mr. Lick, unless he shows that his change of mind ber so much the greater as the armatures are larger. The in this instance does not involve the abandonment of his total power of the magnet will, therefore, increase with its great scheme of good.

## The grayhound is one of the

 growing commonly to the hight of about the canine race, ometimes exonly to the hight of about thirty inches, but sometimes exceeds this by ten or twelve inches. The legs being long and muscular, the abdomen contracted, and the loins strong, the dor has advantages over any other kind for speed and endurance. His jaws are elongated so that he may seize his prey when at full speed; his neck is long so that he may lift his head high for sighting game, aud he is as remarkable for his keenness of vision as the bloodhound for his scent.Representations of the grayhound are to be found on the oldest Egyptian monuments, and the breed is supposed to have originated in Western is supposed to have originated in Western
Asia. The color and fur of the animal Asia. The color and fur of the animal
have been much varied by climatic influhave been much varied by climatic influ-
ences. The English grayhounds, kept for ences. The English grayhounds, kept for
centuries for the sport of coursing, are the centuries for the sport of coursing, are the
fastest of the species, and their hair is mofastest of the species, and their hair is mo
derately smooth, the colors being black, slaty gray, or fawn. The power of following game by scent is entirely absent in the English dog; while the Scotch grayhound (probably somewhat crossed with a deerhound) is remarkable for its keenness of nose. The Irish grayhound is very strong, muscular, and courageous, and will geverally come off best in a combat with a wolf. In coursing, it is usual to match two In coursing, it is usual to match two grayhounds against each other, and they are fastened by their collars to a leathern
thong, with a snap hook operated by a thong, with a snap hook operated by a
string. Boys go into the field, and beat the grass or other crop with long sticks; a hare gets up and runs. The starter, when the hare has attained some distance, pulls the string of the leash, and away go the dogs, side by side and close together, with the speed of the wind. The hare would soon be run down were it not for its remarkable facility for suddenly doubling on its pursuers; and it will execute this maneuver so rapidly as to run right past the dogs and away in the con- in the creation of a form of scientific industry which has so trary direction before they can turn to catch it. But the su- largely enriched the town of Birmingham, and increased its periority in endarance of the grayhounds in time wears out the hare, and the fleeter of the two dogs will surely catch it at last, killing it instantly by one squeeze on the ribs with its long and powerful jaws.

## THE KAGU.

## FNGLISH GRAYHOUNDS.

At the recent ceremony of laying the foundation stone of the science college which he is about to give to Birmingham, Eng., Sir Josiah Mason said: "The trade of steel pen making, I have now followed for more than forty-seven years until I have developed the works into the largest pen factory in the world. This business and that of the split ring making were my sole occupations until 1840, when accident brought me into close relations with my late valued friend and partner, Mr. G. R. Elkington, who was then applying the great discovery of electro deposition; and through my as sociation with him in this undertaking I may claim a share
 fame throughout the world. I mention these facts to show you how the means with which God has blessed me have been acquired, and to show, also, how natural it is that should wish to devote some portion of those mea ns to assist in promoting scientific teaching to advance the varied form of scientific industry with which, throughout my Birming New Caledonia, in common with other countries lying in ham life, I have been so closely connected." the South Pacific Ocean, contains a variety of ornithological species, peculiar to that region of the globe, and, besides, remarkable for the beauty of their colors and the singularity of their forms. A number of curious birds have, of late years, been transported from the colony above named, and confined in the various zöological gardens of Europe, where their habits have been carefully studied by naturalists. Among the specimens wbich quite recently have beeu added to the Jardin des Plantes, it Paris, is the kagu, or rhinochetu jubatus, a representa tion of which we have reproduced from the pages of La Nature The bird presents the characteris. tics of the herons in general appearance, but careful study of its osteology bas resulted in its pro ving to be a species of crane
The plumage, during life, is of a soft grayish blue, but after death changes rapidly to a dirty yellow. The beak is long and curved, and, with the claws, is of a bright red. The plumes of the neck and breast are rather short but as if to make up for this deficiency, thase on the posterio portion of the head are long enough to form a hump, which the bird can raise or lower at will. The tail is poorly developed and the wings are ill formed and short. The pin feathers are streaked with white and covered with bands of black and brown. The size of the body is about that of a chicken, and its conformation shows very plainly that the bird
The kagu is easily tamed, and even in its native state will follow the plow to pick up grubs and earth worms, as readily as the crow. In its habits it resembles the rails, especially in approaching prey, when its serpentine and brusque movements of the neck and body closely resemble those of that class of birds. The hen lays two eggs, but conceals them with great care.
Measures are to betaken to acclimatize the kagu in France, as a protection to farmers against insects; while its present rapid rate of disappearance in New Caledonia will probably result in the careful guarding of the species in that colony.

Battery carbons can be readily cut with a handsaw mois oned with water.


## THE AUSTRALIAN KAGU

pine will last that length of time. Roofs are so expensive to keep in repair that it behoves every man who has had expe rience with them to contribute what he can for the genera rood on this all important subject.
In the future I intend to lay low priced shingles-say from $\$ 2.75$ to $\$ 4$ per thousand-and paint them with a coat of tar and asphaltum-say one barrel coal tar, costing $\$ 3$; ten pounds asphaltum at 3 cents, 30 cents; ten pounds ground slate at 1 cent, 10 cents; two gallons dead oil at 25 cents, 50 cents, which should be added after the other has been wet ted and thoroughly mixed.
I consider the above mixture as good as anything that can be put on to shingles, as it will thoroughly keep the wate nails rust, and I know of no reason why they will not last as long as I shall want shingles. The mixture should be put
on hot, on a dry day, and upon a dry roof. Ground slate or asbestos is fireproof; so, also, is the tar, after it has dried thoroughly. The last shingles I had cost $\$ 2.75$ per thousand; laying, $\$ 1.75$ per thousand; nails, 25 cents per thousand paint, 12 cents per thousand, and I now consider it as good as any roof I ever had or saw."

## Street Pavements.

In a paper read before the Edinburgh and Leith Society, Mr. J. H. Cunningham describes very ably the relative mer its of the various kinds of street paving used in the cities of Great Britain, namely, the Macadam, Telford, granite block, asphalt, and wood. He says:
On the whole, we may conclude that maca dam and macadam concrete roadways, al though they may answer well in secondary streets, should not be laid in main thorough fares. We may also conclude that neithe this system of road-making, nor any develop ment of it, is likely to produce the street of the future.
Wood and asphalt pavements are in seve ral respects superior to granite. Much less mud and dust is formed on them, and they are comparatively free from noise. They are also safer, except when thoroughly wet. am not aware that granite is in any respec superior to either of them. Even if the cupuld turn out to be more costly, owing to their requiring repair more frequently and heir turng repair fore inintly and having to be ren sooned will more tha an compensate for the extra price. Only long and extensive experience can settle this poin satisfactorily, because many indirect benefits are secured by their use, which it is not easy to estimate in money; and there are many ex penses connected with all pavements which are not usually included under the head of maintenance. On the whole, it seems proba ble that either wood or asphalt is destined gradually to supersede granite as a paving material, at least in large and wealthy towns
It therefore only remains for us to find out which of them makes the best, or, to quote the Pall Mall Gazette, the " least objectionable" road surface. Mr. Haywood has fully re ported to the Commissioners of Sewers of the city of London as to the relative advantages, together with the probable ex pense and durability of these pavements. In 1873 he made a very extensive series of observations, in order to ascertain their relative safety. Allowing for all modifying influences, he found that wood is safer than asphalt, as not only fewe accidents occur on it, but those which do happen are of the kind least injurious to horses and obstructive to traffic.
Further, Mr. Haywood considers that wood is the mos quiet, but also the dearest; that they both can be kept equal ly clean, and will probably be found equally durable. That they can be laid and repaired with about equal facility, but that the best repairs can be made in asphalt.
The general impression left in reading the report is that, excep as regards safety, there is no much difference between them Wood is, however, about twice s safe as asphalt.
Let us see which of these two pavements is likely to endure best, judging from theoretica considerations alone. W ood pavement is constructed accord ing to Macadam's principles, as phalt according to Telford's. Wood is laid on a comparativel soft foundation, and the whol ort forms a kind of elastic roadway fors a kind of elastic arch, which party resists vertica pressure, by distributing the thrust horizontally through it ntire substance. In asphal roadways, on the other hand, th concrete foundation may be con sidered the real road, the asphal being merely a sort of protection which gives a smooth surface and can be easily renewed as it i worn away. But this combina tion is, I fear, devoid of elastici Elasticity is without doubt essential to the permanence of a roadway. This quality certainly appears to be secured in improved wood pavements, though not in asphalt But it may be contended that the asphalt covering has in tself ufficient elasticity, and that it acts like a sheet of vulcan zed india rubber. Possibly a concrete bed covered with heet of vulcanized.india rubber might form a good road. think a less yielding surface is desirable, and that elasticit of form is likely to give better results than mere elasticity o volume. For these reasons I venture to think that improved wood pavement will ultimately be found superior to Val de Travers asphalt, and that the introduction of the former has been a decided step in the right direction. I also think tha we may look for further improvements in modifications of this system, and that a roadway having the requisite surfac qualities, combined with elasticity of form, will always be
superior to one whose chief recommendation is mere so lidity.
The first cost of the improved wood pavement and the as phalte pavement in London is the same, nam 3 l , $\$ 4$ to $\$ 4.50$ per square yard. Cost of repairs per annum also about the same, namely, 50 cents per square yard.

## A PRIZE PLAN FOR A FIREPROOF HOUSE

On page 280 of our volume XXXI., we announced the offer, by the Merchants', Farmers', and Mechanics' Savings Bank, of Chicago, Ill., of a premium of $\$ 1,000$ for the bes set of plans and specifications for a fireproof dwelling house, of not less than five rooms, and a total capacity of at least 5,500 feet. Up to the end of last year, thirty applicants for the prize had put in an appearance, and a committee have since been occupied in investigating the merits of the designs. They recently awarded the prize to Mr. A. J. Smith, of Clark street, Chicago, whose plans were for a one story house, $20 \times 43$; a two story house, $18 \times 26 \frac{1}{2}$; and a two story store and dwelling, 22x57. The cost of these buildings, res pectively, is to be $\$ 1,200, \$ 1,700$, and $\$ 3,600$.


Fig. 1.-Front elevation.
The one story dwelling house is a 'building 43x20, of five rooms, consisting of parlor $13 \times 10 \frac{1}{2}$, and two bed rooms $10 \times 6 \frac{1}{2}$ each. The hight of each room will be 10 feet in the clear between floor and ceiling. An important feature in this plan is that, should a fire occur in the front part of the building, the rear portion may be preserved intact, and vice versí. The outside walls are hollow from foundation to roof. The floor, beams, and rafters are wood, protected from fire by concrete, one and one half inches thick on the ceilings and underneath the floors; and the roof is covered with tin on the


Fig. 2.-PRINCIPAL story
top of the concrete. Thorough ventilation is provided by flues adjoining the fire flues, and topped out in the chimney. There is a ventilated air space underneath the ground floor, preventing dampness from arising; and there is also a ventilated air space between the ceilings and roof, to prevent the


Fig. 3.-second story.
heat of summer from affecting the rooms. The fire tlues will be lined with flue pipes eight inches square. There will be a drain pipe, connected with sinks and closets and with main sewer, to carry off all surface water, slops, etc.

The two story dwelling, of which we present a front ele vation, Fig. 1, and the ground plans, Figs. 2 and 3, is a build ing $26 \frac{1}{2} \times 18$, with five rooms, two on the ground or principa floor, and three on the upper floor, the sizes of which are Parlor 12×10, and kitchen $12 \times 12$. The three upper rooms are for bed rooms, the sizes of which are, respectively, 11x9


Fig. 4.-section at a, b, c, d.
$8 \frac{3}{4} \times 7 \frac{4}{4}$, and $8 \frac{9}{4} \times 77$. This building has a cellar forcoal and wood, fitted up with water closet. The size of cellar, within walls, will be $12 \times 20$. The upper story and the principal story will be each 9 feet in hight, and the cellar 6 feet 6 inches.
The building with store and dwelling combined is $22 \times 5 \%$. 'The entire principal story is occupied with store room. The upper story is divided into seven rooms, consisting of two parlors, $11 \times 12$ each, bed room $11 \times 11 \frac{1}{2}$, bed room $13 \times 9 \frac{1}{2}$, bed room $10 \frac{1}{2} \times 9 \frac{1}{2}$, kitchen $13 \times 11$, dining room $13 \times 11$.
The three buildings are similar in construction. The cheapness of the structures is unquestionable, and we trust it will be long ere their fire-resisting qualities are put to the test.

## A Water Rat taking an Artificial Fiy.

A correspondent writes to Land and Water as follows: "In Mr. Buckland's chapter on 'The Rat,' he mentions the catching of a rat by one of the flies of a friend while fishing, hooked by chance; but I remember fishing with my father for trout in the May fly season, in one of the Derbyshire streams, when a water rat dashed out from his hole in the bank and took the fly in his mouth (the fly was the natural drake or May fly). After playing with him some time, he swam to the side, became entangled in some dead branches, and, breaking the hook away, escaped. Although I have been an ardent fisherman, this is the only instance I have known of the rat actually seizing the fly."

A shaft has been sunk at Lawton, England, for the purpose of pumping up brine, to be conveyed by pipes to the coke ovens in connection with a colliery, a distance of two or three miles, there to be converted into salt by means of the waste heat from the ovens. The cost of the undertaking will, it is said, exceed $\$ 200,000$.


The subsequent application 1 n such circumstances must be deemed tha
commencement of anew proceeding. and as thatalone upon which the pat
ent granted in pursuance of it depends.





vention. frequently prove the maklng of sone fixture whtch is destroyed;
of saties
ofome model which 1 slost; and some conver sation which has never been
and
 earitrer than we think it was invented by any one.
Farr ore satisfoctory and convincing is the eroof that the complainant, in
the latter part of 1867 and subsenuently, was making and vending. in large












$\qquad$
by somebody ese.
IIt Is not necesary to consider the many other factsin the case whith tend to
show that the defend ant in fact obtained his knowledge of the tevice front
the



 Was placed upon the crossheads in 1866 . arising from the anterior patent or
We thnnk the presumptlon of the law
the complinat is conona
from thetestimt ons consont with the inference of the fact to be drawn

 fact tait the compainant, ore many mont and the market.
There may be a decree for the complainant in the usual form.
[Reuben Syler, for complainants.

## NEW BOOKS AND PUBLICATIONS.

Transits of Venus, a Popular Account of the Past and Coming Transits, from the First, observed by Horrocks in A.D. 1639, to of "Other Worlds than Ours," etc. With Twenty Plates and Thirty-Seven Woodcuts. Price $\$ 3$. New York city: R. Worthington \& Co., 750 Broadway.
The subject of this volume and the renown of its author combine to ren-
der it most acceptable at the present time. The signal success of the recent der it most acceptable at the present time. The signal success of the recent
observations has given a universal impetus to the public interest in the question, and there is no doubt that the transit of 1882 , which will be visible in all parts of New England and the Middle and Southern States, will be watchecl by millions of our people, anxious to behold the strange spectacle on which the solution of so many mighty problems depencs. Mr. Proctor's work is complete as a history of the phenomenon, and as a luct and authortlon; and the maps and fllustrations, executed in a beautiful and very accurate manner, give additional value to a book which we unhesitatingly pronounce to be the best treatise which has yet appeared on the subject.
The Orbital System of the Universe. By Antony Welsch, Clinton, Iowa. Clinton: Allen \& Bowers.
We have been led, by a brief perusal of this volume, to wonder upon the facility with which books get into print. Here is a work full of chaotic
Ideas, written in gross violation of the English language, on a subject of deas, written in gross vilation of the English language, on a subject of
which the author gives us no reason to believe that he has the slightest comprehension himself, and on which he does not begin to attempt to enlighten his readers; yet 160 pages of it are printed in good style and well bound, and some hundreds of dollars must have been dishursca, $v$ : aich the author or his publisher will never see aga,
igence of the human race,
The inexpediency of an Irredeemable Paper Currency. By John Stuart Mill. New York city : Henry L. Hinton, ri4 Broadway:
1 timely reprint
petual indebtedness.
our Currency, What it is, and What it Should Be. By John G. Drew. New York city: Henry L. Hinton, 744 Broadway.

A Review of Senator Jones' Speech on the Banking and Currency Bill. By Henry S. Fitch.
$\&$ Co., Clay and Leidesdorff strcets.
These two pamphlets are earnest protests in iavor of the policy of paying an old debt with a new one, and are not above the average of their class of iterature.
nsactions of tee American Institute of Mining Engineers. Volume II. Easton, Pa.: Published by the Institute, T. M Drown, Sccretary, Lafayette Collegc.
The American Institution of Mining Engineers has a high reputation among our sclentific bodies, and certain of none is doing or can do more the development of her enormous and varied mineral wealth: and the profession which is to ploneer this progressive movement fortunately contains many of our most illustrious sclentists. We commend this volume to the perusal of all who are Interestcd
possibilities of the United States
Onthe allen Governor and Throttle Valve, a Paper read beF.W. Kitson, of Leeds, England

April 17, 1875.
Zecent Gegrecicay and foreigu zatents.
Improved Method of Softening Umbrella Ribs. John McAuliffe, New York city.-This improvement relates to the
softening of the ends of umbrella ribs, to facilitate the boring or softening of the ends of umbrella ribs, to facilitate the boring or
punching of the holes for the wire by which they are fastened to punching of the holes for the wire by which they are fastened to
the collars. It consists in standing the ribs in a bath of hot lead, and letting them stand while the bath is cooled down gradually to atmospheric temperature.

Improved Apple slicer and Corer
Henry H. Siler and Thos. A. Brooks, St. Lawrence, N. C.-The invention consists in arranging a series of cutters so as to be adjusta-
ble to and from the center, to cut out a core of greater or less dible to and from the center, to cut out a core of greater or less di-
ameter; in a cutter bed made up of sections that slide upon each ameter; in a cutter bed made up of sections that slide upon eac
other and upon base blocks; also in a ring plate provided with slot other and upon base blocks; also in a
Improved Device for Soldering and Capping Cans. Improved Device for Soldering and Capping Cans.
Richard Henry Smith, Baltimore, Md.-This invention relates to in a soldering iron holder having a rear recess, and adjustable both vertically and horizontally by a sliding support and binding screws. The invention also consists in the combination with a revolving
table of separate detachable and independently rotating plates, havtable of separate detachable and independently rotatin
ing clamping devices for holding different sized cans.

## Improved Gang Plow

Stephen S. Scheumack, Victoria, Tex.-The invention consists in combining a crossbar-placed above and having arms that straddle the axle-with another crossbar having a vertical adjustment, where
by the gangplow can be equally well employed for preparing, culby the gangplow can be eq
tivating, and seeding land.

## Improved Soldering Machine.

Wm. D. Brooks, Baltimore, Md.-This invention comprises a serie oyster, and other cans may be soldered in a rapid, thorough, and oyster, and other cans may be soldered in a rapid, thorough, and
economical manner, the cost of manufacture being thereby reduced
from twenty to forty per cent, while the joints are close and refrom $t$
liable.

Method of Securing Pins to Artificial Teeth. Orin S. Bixby, Syracuse, N. Y.-It is well known that in the manu-
facture of artiflial teeth platinum is employed as the material of the pins that fasten the teeth to the plate, because it is the only commercial metal that will not fuse or oxidize in the heat and ventilation to which the teeth must be subjected in baking them. By
this invention the pin cavities are made in the inner or back side of the teeth before the latter are baked, and the pins are not set in the cavities until after the teeth are baked, so that material other than platinum may be employed.

Improved Sugar Cane Cutting Machine. Julius Robert, Gross Seelowity, Austria, assignor to Dr. Otto
Kratz and R. Sieg, New Orleans, La.-This invention relates to a patent granted to same inventor October 30, 1866. It consists essentially of detachable cutter-holding plates for connecting the cutters to the cutter-carrying wheel, contrived for the ready removal of the
cutters for grinding, and the application of other plates with sharrened cutters, to be used while the dull cutters are ground and attached to their attaching plates, two sets of plates and cutters being used. These plate

## Improved Lever Press.

William O. Watson, Albany, Ga.-'This improvement in lever
presses consists of toggle levers to work the main lever, connected presses consists of toggle levers to work the main lever, connected
to the capstan by a rope passing over intermediate pulley blocks in to the capstan by a rope passing over intermediatithout the corres ponding diminution of the speed consequent to the ordinary me

## Improved Butter Worker.

Frank B. Aldrich, Chicago, Ill.-In this butter worker the rollers through the machine, and to prevent the butter from working out to the ends of the rollers, and there sticking. The rollers are grooved long1tudinally in such a way that the projections between said
grooves are concaved upon the forward side, and rounded upon the grooves are concaved and concaved or beveled upon their end parts.

Improved Dental Reflector.
Francis M. Osborn, Port Chester, N. Y.-This reflector may be applied to a dental clamp to show the cavity of the tooth distinctly,
so that the dentist can see just what is to be done, and also watch so that the dentist can see Just what is to be done, and also watch
the progress of the work. The invention consists in a disk provided with a reflecting surface upon its front side, and a ball stem upon
its rear side, and the arm provided with a spherical socket upon one its rear side, and the arm provided with a sp
end, and spring clamps upon its other end.

Improved Vegetable Slicer.
Aimé Vuillier, Newark, N. J.-This consists of an implement having a spiral cutting blade, with side-extending cutting rings at the upper end, ror entering the vegetable and slicing out of the same a
twist of two separated spiral pieces. The implement is very simple, twist of two separated spiral pieces. The implem.
and executes its work with remarkable celerity.

## Improved Hoof Trimmer.

Andrew Shirran and William J. Givens, Pacheco, Cal.-In operating the knife a disk is given a revolving motion, thereby winding more or less of a band on its surface in cutting, and in releasing the the machine the shoulder of a slotted head is placed against the outside of the hoof. The bearing surface of this shoulder is faced with a concave piece of brass, which receives the rim of the hoof.
This arrangement throws the knife toward the center of the hoof, This arrangement throws the knife toward the center of the hoor, work from the center to the outer edge of the hoof. The knife is work from the center to the outer edge of the ho
convex and attached to the lower end of the handle.

Improved Land Pulverizer.
Angeline Underwood, Carrollton, Ill.-Two strong wooden frames
are placed side by side, and to the middle parts of the side bars are are placed side by side, and to the middle parts of the side bars are
bolted bearings for shafts. Upon the shafts are placed a number of circular disks. The two frames incline freely in either direction to adjust themselves to any unevenness in the surface of the ground, and small friction rollers keep the frames from twisting when the
machine is in use. The frames turn freely, and at the same time the machine is in use. The frames turn freely, and at the same time the ends of the tongue crossbar are prevented from dropping down.
To the rear bar of the frame are attached scrapers of a width to scrape off any soil that may adhere to the cutters, and which might otherwise prevent the cutters from entering the ground to the re-
quired depth. The cutters are designed to enter the ground to the quired depth. The cutters are designed to enter the ground to the
same depth as the plows, so as to cut in pieces all sods, clods, and same depth as the plows, so as to cut in pieces all sods, clods, and
lumps that may have been turned under by said plows.

## Improved Washing Machine.

Gideon Huntington, Toronto, Canada.-In this washing machine a
clothes-holding open work drum is arranged to rotate in a tub set clothes-holding open work drum is arranged to rotate in a tub set over a furnace. The drum is reciprocated by a rocking standard, a horizontal bar pivoted thereto, and straps which are wound in reto said bar. By applying the foot to the rocker, the standard is to said bar. By applying the foot to the rocker, the standard is
vibrated and the desired motion imparted to the drum.

## 

John D. wilson, Round Grove, Kan.-The animal
John D. Wilson, Round Grove, Kan.-The animal is placed within
enclosure formed by a fence made of a single wire, supported at an enclosure formed by a fence made of a single wire, supported at
a short distance above the ground. To its leg is attached a hopple on which are devices which catch on the wire fence when the ani on which are devices which catch on the wire fence
mal attempts to pass over or crawl under the same.

Improved Flour and Middlings Purifier.
George Washington Brown, Metropolis, Ill.-A pressure chamber
is arranged at the head of the reel to receive the air from a blast fan. A perforated tube surrounds the shaft, and is considerably larger, to form an air conductor extending along the reel about three quarters of its length, with one end opening into the pressure
chamber to receive the air, conduct it along in the reel, and discharge it outward to the cloth, to aid in separating the bran and light matters from the middlings while falling about in the reel.
The partition between the pressure chamber and the reel is perfor The partition between the pressure chamber and the reel is perfor-
ated to allow the air to blow in the reel and along it. Below the reel is a long triangular air conductor over the conveyer, receiving air from the pressure chamber, and delivering into the space below
the bolt. Along the top of the case is a wide conductor, and along the bolt. Along the top of the case is a wide conductor, and along
each side is a narrow one; and under the wide conductors is anothe one, in triangular form, receiving and discharging air in the same manner, but discharging it more directly upon the cloth, mainly to keep it clear, while from the other conductors it is more particular-
ly designed to fill the space with air to counterbalance that blown ly designed to fill the space with air to counterbalance that blown
into the reel, and prevent the latter from unduly forcing the impurities through the reel. At the top of the fall boards there is conductor for taking up the impurities from the flour and mid
dlings as the air rises up through them while descending from the reel to the con veyer below.

Improved Saw Set.
Josiah f. Titus, New York city, assignor to himself and John
McLean, of same place.-This consists in a sliding McLean, of same place.-This consists in a sliding jaw piece in a
slotted frame or plate having a bridge which supports an adjusting screw. The screw turns freely in the bridge and moves the slide, so that the jaw can be adjusted to suit the thickness of the saw.

## Improved Candlestick.

Wells Kilburn, Napa City, Cal.-The invention consists of an improved candlestick, formed of spring jaws and a loose tube, provided with a cross wire in its lower part. In using the candlestick, the
candle is placed in the tube, the wire is placed between the jaws and the tube and candle are pressed down to the saucer. The in and the tube and candle are pressed down to the saucer. The in-
clined or rounded side edges of the jaws guide the wire, and enable the said wire to push back and pass said enlarged upper ends, both
in passing down and in passing up. When the candle is burned n passing down and in passing up. When the candle is burned down to the top of the tube, the tube is raised, which brings the wire against the lower end of the candle and raises it. When the candle
has been raised sufficiently, the: tube is again lowered, leaving the candle supported by the jaws

Improved Clothes Line Support.
John N. Fuller, Cleveland, O.-The top piece consists of two circular prongs which branch off, with suitable interval between
them, from the socket part of the head piece of a pole. The hooks are left open at opposite sides for admitting first the introduction of the rope or line into one hook, and then into the other, so as to be secured rigidly by the same. The pole or supporter is then raised with the clothes line and firmly planted into the ground by the pointed socket.

Improved Toy Arrow Shooter.
John H. Wales, Milford, Mass.-This invention consists of a toy formed of a tube, provided with an open ring upon one side of the
arrow and the rubber band. In using the toy the tube is held in arrow and the rubber band. In using the toy the tube is held in
one hand, the arrow is passed through the tube from its forward end, and the rubber band is passed over the rear end of the arrow.
The rear end of the arrow is then grasped with the thumb and finThe rear end of the arrow is then grasped with the thumb and fin-
ger of the other hand and drawn back to put the rubber band under ger of the other hand and drawn back to put the rubber band under
any desired tension. The arrow is then released, and the elasticity any desired tension. The arrow is then released, and the elasticity
of the rubber band will throw it from the tube with considerable of the
force.

## Improved Stove Grate

Willian Walsh, Albany, N. Y.-This consists in a grate made two parts, one of which parts is vibrated laterally similar to or movement to raise the fuel from the other part.

Improved Device for Holding Pipe Fittings.
Thomas P. Hardy, New York city.-This improved chuck for holding pipe fittings and other objects while being tapped is so constructed as to allow the fittings to center themselves upon the taps.
The device opens its jaws to receive and discharge the fitting and and The device opens its jaws to receive and discharge the fittings, and
will move said jaws out of line with the taps to allow the fittings to conveniently inserted.
Improved Top for Salt and Pepper Boxes.
Improved Top for Salt and Pepper Boxes.
George D. Paul, Brooklyn, E. D., N. Y., assignor to Paul Brothers George D. Paul, Brooklyn, E. D., N. Y., assignor to Paul Brother
$\&$ Co., New York city.-A gridiron-shaped stirring and crushing vided with a thumb piece projecting out through one side of the cup, and also with a spring, the thumb piece and spring acting to push the crushing frame along beneath the top of the cup forvard
and backward, to crush the lumps that may fall upon it and stir the and backward, to crush the lumps that may fall upon it and stir the
finer particles when packed against the cap, all so that the perforafiner particles when packed ag
tions will always be kept free.

Improved Butter Worker.
Jacob L. Englehart, New York city.-In using the device, the and worked by a flexibly pendent corrugated block, as it is moved and worked by a flexibly pendent corrugated block, as it is moved
up and down by the revolutions of a crank shaft. The excess of up and down by the revolutions of a crank shaft. The excess of
liquid flows down the grooves of the bench. When the butte has been sufficiently worked upon the cloth and bench, it is transferred to the finishing table.

## Impreved Chimney Top.

Henry Becker, Blauveltville, N. Y.-This is a conical chimney top, whose base plate is provided with outwardly curved lugs, that bind after passing through the corners of the flue opening on the sides of the chimney coping.

Improved Molding Machine.
Aaron Miller, Ringtown, Pa.-This improved foot power molding machine, for working regular or irregular moldings upon the edge
of lumber, may be adjusted to run the cutter head in either direction, as may be desired. Devices are provided which serve to drive the cutter head at a uniform velocity.

Improved Cotton Scraper and Chopper.
William H. McClaugherty, Seguin, Tex.-This is an improved machine for scraping cotton and chopping it to a stand, which is so constructed that it may be readily adjusted to leave the hills at any
desired distance apart, and to scrape the ridge to any desired desired
depth.

Nels E. Johnsen, Chelsea Naval Hospital, near Boston, Mass.This consists in the peculiar construction of a compressor or friction bar and compressing device for holding the carriage in posi-
tion, and for lessening the recoil of the same when the gun is fired; also in a novel device for locking the carriage to the compressor and out.

Improved Breech-Loading Ordnance.
Johnsen, Chelsea Naval Hospital,
Nels E. Johnsen, Chelsea Naval Hospital, near Boston, Mass.-
The breech block is raised and closed down by a screw, and is hinged to bre breech. The serew works through the extreme of breech as through a nut, and when it is turned back the breech block is raised by
virtue of a joint bar. The piece to which the joint bar is hinged, and through which the screw wore to which the joint bar is hinged, and carried back and forth with the screw. The breech piece is carried back and forth by the screw on guides. $A$ piece on the end of the screw to turn and move the breeeh piece byack and forth on its ways, and lip on the end of the breech block closes down into the groove in the screw piece. A spring plunger in the breech block is drawn
back by a lever when the breech block is closing, and prevents the block from being blown upward when the piece is discharged. This gun may be loaded at the muzzle, if preferred ; but ordinarily
the breech block will be elevated to a perpendicular position, and the charge inserted, the screw being drawn back.

Improved Animal Trap
Isaac V. Newsom, Eatonton, Ga.-The animal enters a dark bait the door of the trap behind him. At the same time, he opens an orifice into a light chamber, into which he escapes, and in so doing
moves mechanism which sets the trap back to its original condition, eady for another visitor

Improved Shoe Brusl
Israel Joseph and J. Albert Joseph, New York city.-This is a box made with rounded side edges, and open at the top and one cnd.
The cover is made with rounded sides and open at one end, and the whole is combined with the back of a shoe-blacking brush. Two small brushes have their backs and handles formed to fit upon each ther and the blacking box, and into the cavity of the box attached to the back of the blacking brush.

Improved Neck-Tie Shield.
Reginald R. Parker, Indianapolis, Ind.-This invention consists in providing the shield with a strap loop for receiving a neck-tie an and button loop.

Improved Screw Plate.
George R. Stetson, New Bedford, Mass.-The ways are each fixed n a pivot, at the side of the opening next to the adjustingscrew, so facilitate the changing of the dies. At the opposite side of said opening is a stud, which enters a socket in the back of the die to fasten the dies and the ways in working position.

Improved Watch Case Spring.
Constant W. Wadsworth, Peekskill, N. Y.-The spring is made in two parts, which may be readily adjusted upon each other to bring watch case, so that it may not be necessary to mar said case by orming a number of screw holes. With this construction, also, th ot beliable to break whe
Improved Peat Molding Machine.
Jean Francois Bocquet and Victor Alexis Bénard, of Paris, rance.-This invention relates to an improved machine for mold-
ng peat that has been crushed and mixed or reduced to a homorg cous condition in a grinding or other mill. The peat thus pre pared is received into a hopper or box, above a set of traveling
molds, formed chiefly of a series of suitably articulated plates, said molds being revolved by and around polygonal drums, and the peat eing thus formed into blocks, and deposited on the ground o rail, whereby the peat blocks are laid regularly and close together

Improved Smoke and Cinder Conductor.
Daniel Brancher, of Lincoln, and Jacob L. Ring, of Mount Putogether, having flanges and telescopic slides between the cars to allow the cars to move back and forth. Slots in the outside piece and pins limit the longitudinal motion of the parts. This joint sec ion and flange, made of rubber, gives additional fexibility to th conductor. Spring hooks, placed on the outer slotted pieces in re-
versed position, hook over the flanges and hold the parts together. This forms the coupling of the conductor, and enables the conductor to be
oot in use.
Improved Combined Clothes and Quilting Framc Melvin Churchill, Helvetia, Wis.-This is a quilting frame combined with a clothes rack, the two being connected so as to be used for either purpose when required, so that they may be folded
small space for storage, transportation, or when not in use.

## Improved Ice Former.

Stephan Krauss, Clifton, N. Y.-A small stream of water is allowed thow upon the apex of an upper tier of spouts. As the concav ties of the spouts of the upper tier fill with ice, the water will drip
from their edges upon the spouts of the tiers below. The water will also fall upon pins, and will thus be further subdivided. In this wa the water will be exposed to the air in films, drops, and very smal streams, and will be very rapidly frozen. When a sufficient quantity of ice has been formed, the apparatus may be covered with

## Improved Grain and Straw Lifte

Donald Crane, Knight's Landing, Cal.-This is composed of ropes teriaced, and forming a kind of net, made in two parts and attached been transported to the desired place for unloading, a derrick is on the hook of which rings attached to the ropes ar placed, and the entire load is lifted from the wagon and swung
round over the place where it is to be discharged. Suitable mech anism then allows the parts of the lifter to separate and discharge the load.

## lmproved stencil Cutter.

Patrick L. O'Brien, New York city.-This invention consists of
tencil-cutting device, which is guided longitudinally and laterally encil-cutting device, whin is guided longitudinally and laterall on suitable supporting and sliding frames, and adjustable to single and double, straight, circular, or curved lines, being readily operated by one hand, while the stencil plate or shect is fe to the cutting knife with the other hand.

Improved Bag Fastener
Charles W. Harvey, Waterloo, Iowa.-This bag fastener is formed
by the combination with each other of a rubber block, a scrers, and two metallic washers. The mouth of the bag is gathered in the usual way, the string is passed one or more timcs around it, and is between the said washer and the body of the bag, where the clasbetween the said washer and the body of the bag,
ticity of the rubber will hoid it securely in place.

Improved Watch Case Spring.
egay, Brooklyn, N. Y.-This consists of
Jules Menegay, Brooklyn, N. Y.-This consists of a watch case in a dovetail groove in the inner face of a section of the rim of the in a dovetail groove in the inner face of a section of the rim of the
case. The latter is split for a short distance from one end, and is provided with a clamp screw for pinching the split parts upon the
edges of the spring, so as to hold it at any point. The spring can thus be shifted to any needed extent for adjusting it to the case can thereby be adjust

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## 

S．A．T．will find a description of making
plaster molds on p． 58 ，vol．24．－E．L．will find dir ections for making colored paper for manifold writing on p．363，vol．31．－E．L．will find a correct
rule for ascertaining the curvature of the eart rule for ascertaining the currature of the earth
on p．39．j，vol． 31 ． S ．H．M．will find directions fo on p．3．．5，vol．31－S．r．M．
preparing bones for manure on p． 75 ，vol．31．－
J．W．R．will find a recipe for a gold wash on p． 43 vol． 30 ．－C．R．B．will find a recipe for fine blacking on p．283，vol．31．－W．S．R．will find directions for making a pot for melting metals on p．235，vol． 32.
Plaster of Paris is the best material for making Plaster of Paris is the best material for makin
molds for small castings．－J．E．M．can repair the molds for small castings．－J．E．M．can repair tirec－
silvering on looking glasses by following the dull direc
tions on p．203，vol．31．－J．S．H．Will find full tions on p．203，vol．31．－J．S．H．will find full direc
tions for mounting chromos on p．91，vol．31．－C．E vill find a good recipe for axle grease for heav bearings on $p$ ． 90 ，vol． $31 .-\mathrm{W}$ ．H．T．will find a re－
cipe for waterproof cement for aquariums on p ． cipe，vol．38．－A．A．will find a recipe for bronze or use on brass on p．283，vol．31．－E．F．can mak his tent waterproof by using the varuish described
on p．34t，vol．31．－L．K．Y．will find a description of water glass on p．154，vol．32．Furniture polish is
described on p． 315 ，vol． 30 ．Muriate of ammonia can bebought for a small fraction of what it would ost an amateur to make it．－L．J．B．will find a de p． 150 ，vol．31．－J．P．A．will find a formula for the proportions of a safety valve on p．197，vol．31．－ W ． W ． H ．will tind a description of sailing faster Whan the wind on p．rive，vol．28．－E．W．will find di－ ections for waterproofing muslin on $p$ ．347，vol． 31 －C．M．B．will find that etching on glass is described
on p．409，vol．31．－J．R．M．will find directions for calculating the diameter of the driven pulley on pp． 20 ，$\% 3$ ，vol．25．．－C．D．will find directions for ma－ king colored lights on pp．58，154，vol． 30 ，and pp
$90, \geqslant 19$, vol． 31 ．- S．F．S．will find an answer to hi ueries as to lime light in our reply to J．H．S．，p 18，vol．32．－C．C．will find directions for casehard
ening plow mold boards on p．202，vol．31．－C．L and W．B．A．will find directions for imitating will find that iron can be softened by following the directions on p．123，vol．31，for steel．－C．L．D．will
find directions for laying out a sun dial on p．409， ol． $29,-H$ D．E．will find a recipe for waterproo lacking on p．155，vol． 26
（1）F．D．D．asks：Why is it that oscillating engines are not used on steamboats or by
facturers？A．They are，to some extent．
（2）H．C asks：What degree of angularity mooth and thoroughly lubricated，without it being forced back by the compression of wood in－ to which it is driven？A．It must not exceed
twice the angle of friction between the wedge and the surface．An average value of the angle o friction is $534^{\circ}$ ，so that，for such a case，the angle
of the wedge should not be greater than $111 \tilde{s}^{\circ}$ ． （3）T．J．A．\＆Co．ask：What is the process of cupellation？A．The principle depends upon oxygen at a high temperature，and of forming with it an easily fusible oxide，which imparts ox ygen with facility to all those metals which yield oxides which are not reducible by heat alone．
Most of the oxides thus formed unite with the ox－ Most of the oxides thus for med unite with the ox－
ide of lead，and produce a fusible glass，which is asily absorbed by a porous crucible made o the mixture contains is left behind in a brigh globule，which admits of being accurately weighed The cupels are prepared from bone ash（burnt to whiteness，and ground to a fine powder），by moist ening it with water；a suitable quantity of the
mixture is placed in a mold，and the required mallet or of a press：the cupels are allowed to dr thoroughly before they are used．The method of
cupellation you can tind described in any good book on chemistry．
（4）J．\＆D．N．say ：You mention a large times its weighng half a tun，that can raise twent net of that strength，being stationary，draw an other magnet of the same strength not stationary？
A．We can give you no general rule for determin ing magnetic attraction of this description．Much depends upon the
through the helices
（5）G．W．S．says：I am running an engine to cut out $5 / 8$ stroke，making，with throttle wide open，about 63 revolutions．If I shut my throttle to reduce the speed wabout 55 or 56 revolutions， with no load on， T have no back lash，neither hav comes off，I have back lash，and in consequence I must slow down my engine．Why have I back lash without load，and none with？A．It appears
probable，from your statement，that the governor does not control the engine properly；so that when the work is removed，the speed of the engine is to give a definite opinion without further knowl－ to give a dennite opith
edge of the situation．
（6）S．H．M．says：I have a small steam hest which is cracked near one of the bolt holes． What will make a perfect steam joint？The chest
is of cast iron．A．If it cannot be brazed，you is of cast iron．A．If it cannot be brazed，you rust joint or using a piece of sheet rubber fo a rust joint
packing．
（7）H．F．R．asks：1．What should be the thickness of shell for boiler of one horse power
to bear 135 lbs ．with perfect safety？A．We hare to bear 135 lbs．with perfect safety？A．We What power would each of two engines give，th
When of one $11 / 2 \times 4$ and the other $2 x 6$ inches，with 100 lbs． aner pressure？A．The power would depen but you will find numerous rules in back num bers by which you can make the necessary calcula tions．3．Whatare the addresses of the Cooper In－
stitute and Cornell University？$A$ ．Cooper Insti－ tute，New York city；Cornell University，Ithaca N．Y．The tuition is free at the Cooper In－
titute．By addressing the presidents of the insti－ tutions named，you can doubtless obtain full infor mation in regard to their relative advantages． 4.
Has there been any contrivance patented to light Has there been any contrivance patented to light
the gas in any part of a residence by electricity， the gas in any part of a residence by electricity，
each jet to light independently of all others，but all getting the spark from one battery？
think that something of this kind has been intro－ duced．5．Is there a portable forge made of boiler ron，arranged to use all the extra or lost heat to enerate steam to run a small blower，or the steam from several such forges to drive a light steam
hammer？A．We have never seen anything of the hamme
（8）B．asks：Will pine wood ignite by com－ steam is passing？A．Not unless the steam is
（9）M．E．C．says：1．I have a small boat or upright boiler two feet in diameter．I have irebox，connected to the crown sheet and side o rebox，and of course there is a good circulation friend says that these pipes will burn out very dickly if I use the boat in salt water．Is this so ．The pipes would soon burn out ir scale were cur by the use of salt water．2．If I wish to take his boat to Florida by inland navigation，would he boat have to be inspected？A．Yes．Apply the inspector in your district
（10）W．R．J．asks：Are there any Barker＇s entrifugal mills now in use？A．We believe there hat they are virtually Barker mills．They do no meet with much favor，however，since the Barke （11）A．H
（11）A．H．C．asks：1．At what power would os stroke，runging at 120 revolutions a minute and using steam at 80 lbs．？A．About 12 horse power 2．Do you think steam－riveted boilers are as good as hand－riveted？A．Yes，if a good machine is
used．3．Do you think double rivets along the Yes． （12）O＇B．\＆D．asks： 1 ．What size of wire
ope will be strong enough to draw, ，000 lbs．up an clined plane of one foot rise in the A．From ope work satisfactorily on a wooden drum 15 inches in diameter？A．No．It would be better
to make the diameter of the drum from 24 to 30 to make
inches．
（13）C．D．says：On p． 36 of your current volume，it is stated，that five minutes before a cer－
tain explosion occurred，the water stood at 3 inch－ es above the fiues．By a long experience with team boilers，I have become convinced that the ater at such times is converted into foam，ang
ntirely fills the boiler．Upon pressing the gage the water has the appearance of being flush，while
in reality the boiler was nearly dry．A．We would e glad to receive some facts in corroboration of
（14）W．S．S．asks ：How is burnishing done With the use of a burnishe
tool rapidly over the work．
What kind of briar roots are pipes made of？ hey are made of knotly roots of the commo The cone pulley this country．
The cone
The cone pulley on my lathe has 3 sizes fo change of speed， $21 / 2,414$ ，and $\pi 3 / 4$ inches．I wan o make a treadle wheel so that one band will suit ope soon to publish a simple explanation of the method．
I wish to make some stamps for marking clothing Ihave the printer＇s types，and I wish to make the un the old types in after being melted．What
（15）W．L．asks： 1 ．Which will stand th greater pressure．a pipe one inch in diameter or
pipe six inches in diameter，provided both pipe are of the same material and of the same thick－ up，is the pressure greater or less below the wate evel than above？A．Greater
（16）S．says：A train of cars is going round tance than the inside one，yet they are geared to gether．Please explain it．A．If the wheels are notconed，one must slide．If the wheels are coned， the one on the outer rail will be larger than the other，so that it is possible there may be no slip－ thing is rightly proportioned；and in general ther is some slip even with coned wheels，though it usually reduced by coning．
（17）G．G．C．says：I have a foot lathe on
which the belt does not run true，but runs 14 inch ff of hoth large wheel and pulley wheel，Is this
ecause the shaft and lathe bed are not parallel A．It is either on that account or because the pul You can make the adjustments，if required，by neasurements．
（18）C．asks：Who first invented the dial seam gage，Eastman，Bourdon，or a German en
ineer？A．We believe that the Magdeburg gage as the first．Perhaps some of our readers have efinite information on the subject．
（19）C．A．C．asks：1．What can I use to fill up blow holes in some small steam cylinders，sub－
jected to 100 lbs．pressure？A．Braze plugs in the ne for．a two a steel boiler be ．Than fron an be made lighter than an iron one of the sam trengtl．We do not know that it would have any
（20）D．E．B．asks：Can a common slide or ock valve be set to work expansively？A．Yes． The pyramids of Egypt，the tomb of Mausolus， the temple of Diana，the walls and hanging gar dens of Babylon，the Colossus of Rhodes，the
tatue of Jupiter，the watch tower built by Ptol－ （21）W．H．B．says：L，U，S says that the ame power will do the same work with a 60 inch as with a 30 inch saw．I do not see bow it is possi－ 0 inch saw．Of course the 60 inch has double the leverage from center to verge，consequently th twice the work of the smaller saw．But I cannot ee how he gets away with the short lever in favo of the small saw．Admitting the verge of each to tavel at same speed，of course there must be an increase of speed only at the expense of power．
A．In the case of the large saw，the pressure on the A．In the case of the large saw，the pressure on the
engine piston must be doubled，but the piston engine piston must be
only moves half as fast．
（22）L．C．W．says：My water pipe，leading om main in street to house，is frozen．Some two $x$ ．Some fow have dug up the street and side ix．Some few have dug up the street and side－
walk and thawed the pipes out，but this is very expensive and difficult，owing to the frozen condi－ tion of the earth．Is there any plan by which they
could be thawed out from the inside of the house？ could be thawed out from the inside of the house？
A．It can often be done by forcing steam into a ipe from a small boiler
（23）G．A．McL．asks：What is agate，used halcedony．It is supposed to have been formed a deposit of silica from solutions intermittent $y$ supplied，and deriving their concentric waving ourses from the irregularity in the rocky wall olors are due to traces of organic matter，or of xides of iron，manganese，or titanium．
（24）J．C．K．aska：What kind of a locomo－证 is the Fairlie narrow gage engine，with smoke tack at each end？Is the boiler solid through out？A．Yes；it is all one boiler，and the two they can swing．
（25）W．S．C．says：Can steam power be sed in place of horse power in threshing wheat If two boilers are supplying a third one with team，will the third one have double the amount of pressure of the other two，or will steam be o qual pressure in all？A．The pressure will be How in the three boilers．
How My notion is that the middle hitch should be made o as to give the single horse $2 / 3$ of the lever，and the 2 horses just $1 / 3$ of it．Am I right？A．Yes． Will pewter or lead do to make a cylinder head
or a small steam engine 1x2 inches？A．Yes，but for a small steam engine 1x2 inch
it will not be very serviceable．
（26）J．E．R．saye：I have an 18 inch circu lar saw for sawing stove wood．I have it set to when it is tave incies in the wood it blackensth ood on both sides，though I can see through all the time on either side．A．The bends in the teeth are probably too far from the point．Have the end in the teeth on a true curve to the extreme cutting point，so that no part of the tooth can ing point，and you will obviate the trouble．The eeth of your saw probably wedge and bind in the erf，about one third the lengtb of the tooth from he point．－J．E．E．，of Pa
（27）E．F．F．asks：1．What will be the ef fect of inserting teeth two gages thicker than the w．Wre not the teeth be likely to expand the thed，the thick teeth would have no more tend ency to expand the saw than those of the same tand to saw frozen beech，if the blode is propel y hammered，using such teeth on $3 / 1$ or $1 \frac{1}{4}$ feed A．Such a saw，if properly made and kept in order will stand to saw any kind of frozen timber．Bu
in a saw for ordinary use，there is no advantage in in a saw for ordinary use，there is no advantage in having the teeth thicker tha
at the rim．－J．E．E．，of Pa．
（28）S．A．H．asks：With a column of wa er of a given hight，and a tube leading out from
its base，turning up and optning at a level with the base，and all the proper conditions of free pas sage secured，to what hight，proportional to th
columns，will the jet of water spurt？A．From 50
（29）D．A．R．says：I want thmake a magis lantern．I have two lenses $21 / 2$ inches in diamete and of 8 inches focus．Will these do？A．Place are lector and a light in she focus of the of the con ective，the latter in a sliding tube，both with plan
(30) T. M. says: I have seen a small battery
onsisting of two cells, with zincs $2 \times 2$ inches and consisting of two cells, with zincs $2 \times 2$ inches an 2 inch try.
mercury. The cells were black. Are they mad of rubber or carbon? A.They are probably carbon.
Such cells and also positive plates are made of carSuch cells and also positive plates are made of carbon deposited in gas retorts by the splitting-up o too highly heated hydrocarbons. In default o a stiff paste, mold, bake, and heat red hot
a stiff paste, mold, bake, and heat red hot.
Who sells second hand scientific book
ciontific books out of date are of but little value.
How can I grind and polish smalllenses? I can How can I grind ond polish smallenses? I can-
gren not get rid of the scratches in lenses of about 1
inch diameter. A. Repeat the fine grinding with emery that has been suspended in water one hou hen poured off and settled; repolish w
Is there a practical way to transform motion in to heat? A. Two flat iron disks rotating in oppo-
site directions were found exceedingly wasteful of pite dir
(31) E. J. S. asks: What is the distance o 100 miles.
( ${ }^{2} 2$ ) II. C. C. asks: What is the difference in bulk between 1 lb . gold and 1 lb . silver: What s the difference in value? A. These metalsin our
coinage contain copper. It may be profitable for you to work out
con the answers yourself, from the following data
Value of 1 lb . of pure metal: Gold $\$ 30145$, silver $11 \% \%$. Weight of a cubic inch in lbs.: Gold $0.69 \%$
(33) W. B. C. says: On p. 36, vol. 32, you describe a new light invented by MM. Delachanal
:nd Mermet, of Paris. The description is hardly pongy fragments, which imbibe the falled wit phide." Is the carbon sumphide the liquid bisul-
phice? phide? 2. Do you understand that only a sufficient
quantity of this liquid ls appiied to saturate the porous substance, or would a surplus in the bo tom of the ressel be desirable? 3. Can you give
brief description of the St. Claire Deville apparat us and the Bunsen burner, as you understan hem to be adapted in this case? A. In answer to these questions, we cannot do better than'refe you to Seience Record for $18 \pi$, , p. 208 .
nade by the the how to stop the hissing noise made by the oxyhydrogen calcium light, when un der heavy pressure?
ing at the oritice in the jet.
jently enlarge the open ng at the orituce in or jet, .. Would enlarging in effect of producing greater light) to puttin heavier pressure upon the bags? A. It would simply tend to render incandescent a larger surface o the lime, with a corresponding decrease in the in-
tensity of the light from each point of the heated tensity
surface.
(34) G. R. asks: How many times is an ob nifying class of a power that increases the diame ter 1,500 times? I contend that it is increased 2 ,250,000 times; my adversary says that it is onl $1,661,150$. $\Lambda$. You are right
(3ij) N. R. H. asks: What preparation is used to stick gold leaf or powder to paper or card board, for book marks or illumination? A. Use
the slightest possible touch of oil on the surface, and apply gold leaf.
mixing it with size.
(36) C. M. says : I wish to make microscopic objecti ves of the following foci: $2,1,2 / 3,1,1,1 / 2 \mathrm{inc}$
What should be their respective dimensions? Try the following formula for a $11 /$ inches, and let
usknow the result: Single front: Plano conve; radius of curvut: Single front: Plano convex radius of curvature 0.0 inch, thickness 0.2 inch, diposed of a plano convex front lens 0.9 inch radius, double concave tlint, radii 0.9 and 1.5 inches, an ens: $5 /$ inch diameter, plano convex, 2.7 inches ra dius. Convex lenses to be of a crown glass slide
the double concave to be flint (Chance's heavy glass
(37) E. A. W. asks: Can a perspective drawing be reduced to a mechanical drawing? A. Not
unless the object is represented in all its parts,and unless the object is represented in all
the proportion of all the parts given.
(:38) E. L. asks: How can I remove the glaze from a cup, to make it porous for battery use? A. Porous cups can be bought for a few
cents each from any dealer in telegraph supplies, and it will not be worth your while to make them by such a process as the one you enquire about.
(39) C. C. asks: How is zinc used as a sub
titute for lithographic stone? A. It is used ex actly as the stone is. It is convenient to attach the inc plate to a slab of stone or slate

1. How is the wax removed from an electrotyp after it is taken out of the battery? My object is
to overcome the warping or twisting. A. Lift it to overcome the warping or twisting. A. Lift it
off. The plumbago prevents adhesion. 2. What is off. The plumbago prevents adhesion. 2. What is
used for flling or backing, lead or type metal? A Either will do.
(40) l. W. F. says: I have made three good pine for the top. Is this right? A. The so pine for the top. Is this right? A. No. The pur
ty of tone of a violin de;ends on the hardnes and immutability of the wood of which it is made. Hence old viilins are the most highly esteemed.
Look about for some very old hard wood; it may sometimes be found when an old house is pulle (41) J. W. asks: How can I prevent chick ens from eating their own eggs? A. Fill an egg
shell with pepper, and give it to them to practise (42) J. C. R. asks: What is the best method A. Give them plenty of gravel and dry sand rub themselves in.
(43) J. F. W. asks: How can I make shav
g soap? A. Take genuine Naples soap 4 ozs
owdered Castile soap 2 ozs., honey 1 oz., essence of ambergris, oil of cassia, and oil of nutmegs, st portion of this oap on the chin shaving brush wet with cold water. Do not pu water or the brush in the soap dish.
(44) J. B. S. asks: What can I use to polish vory with? A. Ivory turned in a lathe is readily polished by applying its own dust to it.
(45)R. J.S. asks: What is the correct rulefor certaining the size of a fly wheel for any given orse power of engine? A. Boulton and Watt giv
he following: Multiply 44,000 times the length o the stroke in feet by the square of the diameter of multiplied by the cube of the diameter of the fly multiplied by the cube of the diameter of the area of the rim in square inches.
(46) M. M. asks: How is the case-hardening A. Mix the ingredients thoroughly and put th cold.
(47) R. \& W. ask: How can we find the number of lbs. pressure obtainable from a wheel olutions per minute to 1? A. It would be difficult to obtain an accu rate result in any other.way than by making a few experiments, to get the necessary data.
(48) G. A. B. asks: From a post a gate i hung which extends horizontally 20 feet. In th ate has hinges, which allow one half of it to b opened without disturbing the half next to the post. Is the strain as great on the hinges of the to lie against the other half as when the whol gate is opened, that is, when the second half is in line with the first? A. The strain is the same in acting,and which represents the tendency to brea the hinges, is twice as great when the gate is ex tended.
Can I get a film of copper on a piece of steel wit outa battery? $\Lambda$. Yes. Clean the steel and im (49) J. S.M. asks: If a stick of timber is eet long, 12 inches square at one end and 18 inche square at the other, and of a uniform tape tick? A. $31 \cdot 66+$ cubic feet
(50) E. D. F. says: Given the area and radi segment. Is there any formula for finding this exactly? $\Lambda$. No. If two iron balls, one 1 inch in diameter and 10 inches, are at the same instant droppe from an elevation of 100 feet above the earth,
will both touch the ground at the same instant? will both touch the ground at the same instant?
A. The difference would not be essential ; but the A. The difference would not be essential ; but the esistance of the air would affect the balls differ are as the squares, while the weights are as th are as the squares, while
cubes, of the diameters.
(51) B. P. G. asks: Which is the best for a water pipe, lead or galvanized iron? A. We ca pitch.
(52) F. R. M. asks: How many degrees cot. $a=$ cot. $110^{\circ}+\frac{1}{\sin . ~} 20^{\circ}$ ? This formula is from Fairbairn's "Mills and Mill Work," part 1,p.160. Are there uny numbers, from $100^{\circ}$ to $110^{\circ}$, and from $15{ }^{\circ}$ or $20^{\circ}$, that will produce, according to formula,
or nearly so for the angle $f h k$ ? If there be such or nearly so for the angle $f h k$ ? If there be sucm
numbers within these limits, please state them A. You can readily work it, out with a table o nd tange nd solving it. It will be for some of our readers who ar beginning the study of trigonometry.
(53) M. B. L. asks: How can steam be su must attach a superheater. 2. What is the pisto speed per minute in the fastest passenger locomo(5) A. M.
(54) F. M. A. asks: How can I prepare mu
cilage for office use? A. Make a concentrated so lution of gum arabic in hot water, and add to it little Biatter sulphate of quinine, which will effec ually prevent it from molding. Only a very smal
(55) P. McL asks: How can I make mold with plaster of Paris? I have tried to do it, bu ter thinner when constructing the molds; and When ready to cast the metal, heat them nearly to the melting point of the metal; or thoroughly dry
the mold and coat it with a solution of shellae in lcohol.
(56) H. \& C. ask: 1. How can we make strong thick paste for pasting sheets of brown pa-
per together in large quantities? A. Melt together in an iron pot equal parts of common pitch an gutta percha. It is kept liquid under water, solid, to be melted when wanted. 2. Which make
the strongest paste, starch or flour? A. Prooably lour. 2. Isalum of any use in paste? A. Yes, to prevent its molding.
(57) H. J. M. says: 1. I find that if fully $300^{\circ}$, it is resolved into carbonic dioxide, carbonic oxide, and formic acid. How can I separate the formic acid from the other two substances? A.
Formic acid $\left(\mathrm{C}_{2} \mathrm{H}_{2} \mathrm{O}_{3}\right)$ is not known in the free tate. Its hydrate, or what is generally known a ormic acid, was originally obtained from red ants, and was named from that source. This may be
ne third filled with concentrated glycerin, in boil xalic acid as it will cover. The mouth much dry tort or flask should be connected with a receiver in such a manner that the formic acid distils over into the receiver, while the carbonic acid escapes.
When it ceases to come When it ceases to come oyer some fresh oxalic acid put into the retort, and the process is repeated with the same portion of glycerin until enough
acid has been collected. 2. How can I render the xalic acid fully hydrated? A. What is commonly called oxalic acid is the hydrate required. The an hydrous acid is not known in a free state.
(58) D. C. asks: How can I bore an oblong , $1 \times 1 \% / 8$ inches and 1 inch deep in a block of ectly smooth) in (having sides and bottom per The conditions, as stated, are incompatible.
(59) C. W. asks: I have a steam boiler hight 2 feet, diameter 1 foor, with a 2 inch Hue
hrough it. The head is made of cast iron $1 / 2$ inc hrough it. The head is made of cast iron $1 / 2$ inc will it stand with safety? A. About 80 llss . pe will it stand
square inch.
(60) L A.
(60) L. A. D. says: A. contends that a man orn in 1800, and living now, would have lived in contends that he would not. They will abide by your decision. A. B. is right.
(61) V. H. N. says: A turbine of about aches diameter proper, purchased by us, behaved of a printing house, and water was conducted to by a 3 inch pipe connected at a right argle to $t$ right the strect, then led 20 feet to cellar, thence at right angle to floor of second story (say 18 feet)
thence at right angle to wheel ( 1 foot). A 3 inch pipe, connected to bottom of wheel, discharged water near point of entrance in cellar. having siphon end to make it an exhaust tube. Under a few turns of valve ( 15 or more being required to open
t entirely) it drove a $1 / 8$ medium and a $1 / 2$ medium entirely) it drove a $1 / 8$ medium and a $1 / 2$ medium
job presses, with power to sparc. Now presum job presses, with power to sparc. Now presum
ing the exhaust pipe to compensate for elevation to second story, the fall was 102 feet. It was re eet up strect, difference is connected with mai in street at right angle, thence runs 130 feet to wheel in cellar, attachments being made to the pipe on the floor above. It gave scarcely any 16 apertures in whated examination, until 13 out of with valve entirely open, it seemsto with wood; and than the difference in elevation would justify. The water discharges right from the wheel into an open ditch. What is the cause? A. We judge, from your description, that increasing the length
of pipe, and diminishing the elevation, cut down the head to a serious
(62) M. U. asks: I have a steam engine 1 he feed pump be? You can make plunger ump with same strok
(63) W. B. says: 1. I have a small boiler 10 ve inch flue. The tubes anch tubes half around small pieces of pipe. The water is placed in the tubes and fire passes up between them and out at
top. The tubes are $1 / 8$ inch thick, and the ends are ecured by a bolt. What would be a safe press re? A . One of 150 or 175 lbs . per square inch, if
the boiler is well constructed. 2. What size of en ine ought it to run: A. One developing from 1 to $1 / 2$ a horse power.
(64) S. G. asks: 1 . Will an engine of 2 inch un a foot lathe with 10 inch swing? A. Yes. What size of boiler should I use? A. Give it from
(65) M. E. C. says: Our engine is 16x30 nches, and makes 80 revolutions per minute. It is mpossible to keep the journals cool. We have mple power. It would do the work with 20 or 30
lbs. of steam. A. The piston speed is not exces sive, if the engine has large bearings and is in good djustment, with the valves properly set and the rouble occurs from a reglect of some of these
(66) E. R. C. asks: Can you give me some information as to using lead pipe for carrying
steam underground? Will the expansion and contraction weaken the pipe? A. We have had no practical experience with the lead pipe for thi wer very well. We would be glad to hear from any of our readers who have used it.
(67) E. W. P. asks: In an artesian well er per minute might be expected at a depth of 2 eet below the highest point to which water will rise in the pipe, conceding that the supply at the head is inexhaustible? A. We do not know of
(68)
(68) J. W. says: I wish to build a smal ny upper work, save a frame and awning. Would five horse engine do to drive it: A. The engine oiler answer very well. Use an upright tubular answer your other question without more data.
(69) J. W. H. asks: What is the effect rom say $-20^{\circ}$ to $80^{\circ}$ Fah.? Does not the heat great $y$ increase the volume of air? A. If the volum maintained constant, the pressure increases. I

## creases.

(70) C. S. asks: 1. Will it be safe to use vert it into steam again? A. Yes 2. Will th vert it into steam again? A. Yes. 2. W
condensed steam be soft water? A. Yes.
(71) E. G. P. says: I have seen the bottom responding with the shape of the gravel and small ocks on the bottom. I found it much more difticult to walk across the creek, from the unevennes the bottom, than on clear ice on the surface During this time there was no ice running on the surface. How in this? A.
wasen solid during the winter. It is well known that heo winter
istic. Which of the two predominates? If all heat were annihilated, can the amount of cold be estimated? A. Heat and cold are only relative terms, so that a body could not be cold unless it ad some heat. Were heat annibilated, we should and could take no more account of heat and old.
( 72 ) L. F. M. and others.-The square of e diameter (expressed in inches) is the numbe er for $a$ side. It is also the number of circula nches in the circle (a circular inch being the are of a circle whose diameter is one inch). Hence a circular inch is about 0.7854 of a square inch, ive square of the diameter multiplied by $0 \cdot \pi \%$, (73) W.S. C. asks: What is meant by a team biler pring . prime when water is mingled with the steam.
An artesian well is said to be one bored to a
am of water that will force itself up out of the well, and that the water will rise as high as the source of supply. How then can an artesian well diver water higher than its source? A. It can not, but the source of the water may be very dis-
tant. There are some artesian wells which are csimated to be more than 200 miles from the sourc of supply
There isa kind of powder claimed to keep coa il from exploding.
Where does the supply of oxygen come from cid, which the plants require. 'The plants tak he carbon and set free the oxygen.
(74) R. M. asks: I am building a smal eam engine with a square cylinder, of wrought iron, to be bolted together. The bolt
are to be 2 inches apart; the cylinder is. 4 inches in the clear by 8 inches long. Would such a cylinde be as good as a round one? A. You will havedif culty in keeping the piston tight without exces ive friction. You do not send enough data ${ }^{1} \mathrm{n}$ Whe detcrmination of the other points.
What will cut off the attraction of a lodeston from steel? A. It can sometimes be done by stri
ing the bar, or bringing it under the influence more powerful magnet, and reversing the poles. Is there a rule for telling how much lumbe here is in a log? A. We do not know of any that applicable in all cases.
(i5) R. L. asks: What sized boiler, engine and propeller would it take to run a boat 20 feet ong by 4 feet beam, and 3 feet depth of hold at 1 The boat is too small to carry the machinery re uired for such a speed
(\%6) J. V. asks: How can the area of a cir . A side of the triangle is equal to 0.6942 time the radius of the circle
Would a locomotive be able to run through a
rift of wet snow 6 feet high and about 25 fee rift of wet snow ${ }^{3}$ feet high and about 25 fee wide? A. Some engines are powerful enough.
what is an easy process of testing gold and sil er? A. They can be treated in solution by varirecipitates Consult a rood work on chemistry
(r7) H. A. J. asks: What will remove a kerosene stain from a ca
colors? A. Try benzine
(78) G. W. H. says: 1 . I am making mal and $\beta$ inches stroke Would it do rdinary rowboat? A. Yes. 2. What kind of pro peller wheel should I use? A. One of 2 feet diameter and 3 feet pitch. 3. Would a boiler 2 fee in diameter by 3 feet high be
(79) D. H. asks: 1. In testing a boiler with old water through a rubber hose, does the hos
ustain the same pressure per square inch as th oiler? A. Yes. 2. If the entrance to the boile ismaller than the hose, will the ho he same pressure as the boiler? A. Yes.
(80) D. H. M.asks: What is the process of oil knives, chisels, etc.? A. Heat
quench them right out in oil.
(81) J. H. F. asks: 1. What kind of clay d tists use for modeling? A. The material used i nodeling is common potter's clay of the best qual
ty, made so wet that a mass of it will not stan n inch higher than its own width without suppor Is modeling done by the hand or trowel? A iodes fixed in wooden handles, or various shapel pieces of ebony or boxwood. Both are to be con sidered merely as occasional aids to the fingers, o o be used in portions of the work which canno e reached by the finger
(82) J. M. asks: 1. How can I give paraffin fine red color? A. By the application of magen ta and stearic acid, to the purified paraffin, a mos ume paraffin? A. We can give you no recipe fo the purpose.
(83) J. G. asks: How are red and green
ghts made for use in tableaux? A. Red fire is lights made for use in tableaux? A. Red fire is
made by using 61 per cent chlorate of potash, 16 o sulphur, and 23 of carbonate of strontia. Gree ire, 61 per cent nitrate of baryta, 22 sulphur, and
(84) M. M. \& Co. say:'There is a person here
who proposes to sell a recipe for causing 50 gallons who proposes to sell a recipe for causing 50 gallons
of water to mix with :50 gallons of lard oil, thereby of water to mix with:0 gallons of hard oil, thereby
doubling the cuantity and not deteriorating the
value of the oil for lubricating purposes. Is this a value of the oil for lubricating purposes. Is this a
fraud? A. Yes. We know of no chemical which fraud? A. Yes. We know of no cb
will impart such properties to water.
(85) H. J. asks: 1. Are green paper hangings, that have been on the wall four or five years poisonous? A. Very probably. 2. Is the gas arising from coals taken from a stove as poisonous as that arising from burning charcoal in a room?
Yes, if the gas given ofr is of equal amount. In a recent article in your paper, you stated that kerosene oil barrels were poisonous. Is refined
kerosene poisonous? A. It is injurious if taken kerosene poisonous?
in large quantities.

Minerals, etc.-Specimens have been re ceived from the following correspondents,and examined, with the results stated:
M. A. P.-The brilliant metallic particles are copper pyrites; they are imbedded in an impure
quartzose rock.-'I. $\Lambda$. H. -It is a ro 2 k , composed of quartz and mica.-E. W. S.-The sand is made up mostly of pure white quartz sand, and the
brightshining appearance is due to little scales of bright shining appearance is due to little scales of
mica. It can be employed where a fine white sand mica. It can be employed where a fine white sand
is needed.-O. H. P.-It is sulphuret of iron.-A is needed.-O. H. P.-It is sulphuret of iron.-A
box, directed to Rev. L. S. Bacon, contained red argillaceous (clay) shale, containing sufficient red oxide of iron to make it appear like an iron ore, but not enough to make it fit for working. When
shale of this character gives a good color on grindshale of this character gives a good color o
ng, it is sometimes used as a coarse paint.
A. B. asks: What is the material used in the manufacture of corduroy, which gives that
fabric so disagreeable an odor whenever it is wet? - H. S. asks: Is there a good and speedy dryer for lithographic ink ?-C. H. U. asks : How is the black stain and finish,similar to that used on lead pencils, made?-W. asks: How can I make rice paper? L. K. Y. asks: In what way can I plug up screw
holes in finished work, so the plugs will not show? holes in finished work, so the plugs will not show?
-J. E. M. asks: What will keep sumac or bark liquor from souring in warm weather ?-J. W. B asks: How can I bleach yellow paraffin?-E. L. asks: How can I make a preparation for coloring eggsblue, red, and yellow?-J. W. asks: Is there a cheap mode of soldering or otherwise making a tight joint on black sheet iron pails ?-J.N. P.says : being in a burning house; the insides are not burnt, but the backs and edges of the leaves are very black. What can I do to take it off?

## COMMUNICATIONS RECEIVED.

The Editor of the SCientific Ambrican acknowledges, with much pleasure, the receipt of orsubjects:
On a Ride on a Locomotive. By G. M. G. On the Patrons of Husbandry. By W. R. S On Chemical Telegraphy. By G. L
On Rubber Ligatures. By R. B. M. On Rubber Ligatures. By R. B. M.
On Telegraph Alphabets. By J. M On Boiler Explosions. By T. F. T.
On Cleansing Dirt from the Han
On Steam Climbers. By W. E.S. By B. F. R. On Frozen Water Mains. By A. C., by W.T. F., and by F. T.
On Polarity of Water. By J. T. On Flies. By C. T.
On Kaolin. By G. B.
On Kaolin. By G. B.
On Talking Ants. By R. A. H.
On Flying Moths. By J. S.
On Finding the Meridian. By J. $\Lambda$. M., and by C
Also enquiries and answers from the following:
E. E.-F.F. A.-J.T.-J. M. S.-A. G.-R.-T.L.-
A.A.P.-J.D. M.-W.L S.-D. L. B.-W. P.-A.S
J. H. P.-A.S.G.-S. B.-E. R. H.-J.L. B.-A.G.
-R.-H. C. W.-H.O.T.-E. J.E.-T. H. N.-J.C.G.

- A. R. L.-G.-J. C.B.-H. T. B.-A. Y.-R.E. M.-
S. \& S.-J. M. - L. D. - A. F.-S.A. T. - W. M.

HINTS TO CORRESPONDENTS.
Correspondents whose inquiries fail to appear should repeat them. If not then published, they
may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.
Enquiries relating to patents, or to the patentab:lity of inventions, assignments, etc., will not be
published here. All such questions, when initials published here. All such questions, when initials it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.
Hundreds of enquiries analogous to the following are sent: "Who makes firemen's respirators, in-
vented and described by Professor Tyndall? Who vented and described by Professor tyndall? hio
makes the best ten horse engine for a sawmill? Who makes a lathe for turning wooden bowls? What is the price of galvanized iron water pipe? Who sells machines for sandpapering wooden rollers? Who sells sash holders that are efficient substitutes for sash weights? Who makes the best dynamometers? Who sells dentist's diamond
drills? Whose is the best mode of drying lumber? Who sells an icebox constructed on scientific principles? Where can seeds of arundo arenaria be obtained? Who sells machines for turning croquet balls? Is there a glass bead factory in the United States? Who sells diamond drills? Who sells the most economical steam boiler? How small are hydraulic motors made? Who can give particulars as
to drying lumber bysteam? Who makes a spiral spring that will sustain 500 lbs .?" All suoh personal inquiries are printed. as will be observed, in the oolumn of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that volumn. Almost any desired information can in this way be
expeditiously obtained.
[OFFICIAL.]

## INDEX OF INVENTIONS

Letters Patent of the United States were Granted in the Week ending March 16, 1875, and each bearing that date. Acid, ob
Advertis Advertising medium, C. F. Form H. F. Torsch. Air compressor, rellef, G. H.
Alarm, burglar, M. E. Lasher Alloy, bronze, s. Doubleday. Anatomical specimens, jar for, J. M. Maris. $\Lambda$ nvilis, casting steel-fa
Atomizer, C. Weed....
${ }_{\text {Awning, C. J. Trumper }}$
Bag. rubber coated, W. D. Grimshaw.
Barre barrow, J. H. Brown........
Barrel crozin, Barrel crozing machine, Steel and Munson
Bed bottom Bed bottom, P. C. Ingersoll.
Bed bottom, E. W. Tucker (r) Bed bottom, spring, E. P. Bennett.. Bedstead, C, Snyder.
Bedstead, wardrobe,
Bedstead, wardrobe, R. G. McClure
Beer vent, J. W. Spahn
Beer vent, J. W. Spah
Bird food holder, S. E. Tompkins.
Blacking for boots, etc., C. Alvo
Blind stop, G. Woodward
Boiler feeder, F. McGuire
Boller, feed water heater, H ... ....... Book clip, H. T. Dunlap.
Boot or shoe tip, Merrill and Holt
Bowling alley, A. A. Hamlin...
Box, sheet metal, W. C. McGAl
Brick. mold for angle, J. H. Mathes
Bridle bit, J. P. Hisley
Brush, w
Brush, W. A. Megraw.
Bucket ear, J. D. Field
Buckle, trace, J. P. Hisle
Burial caskets, coating for, C. H. Mulligan. Burners, lamp black, P. Neff
Burner, waste gas P Nef
Burner, automatic lighter, E. L. Megill
Can for mixing paint, w. w.
ar coupling W, A. Schwar
ar coupling, W. Green.......
Car starter, D. D. Hardy.
Car truck, railroad, A. Gilman
Car wheel, S. B. Chapman ............
Cars, moving railioad, B. Fheps. Carriage, child's, R. Kreter..............
Carriage painter's easel, A. G. Rykert
Carriage spring. J. Enders.
Carriage top, C. Heergeist
Carriage top support, A. Goo
Cart, dumping, J. J. Adgate........
Cartridge, metallic, F. w. Freund.
Chair, J. V. Meigs .................
Chair, folding, G. E. Whitmore.
Charr, tillting, w. Gardner..
Chair, tilting, R. W. Myers.
Clamp, s. Kuh...
Clamp, S. Rydbeck....
Cloth shearing machine
Cloth shearing machine, I.
Clothes dryer, I. Whipple.
Clothes pin, O. F. Porter.
Clothes pin, o. F. Porter..........
Cline, J. W. Milet
Coal hod, E.W. Byrn...................
Coke, machine for cruehing, C. Glazie
Compress, A. A. Lelievre..
Cooler, beer, B. A. Stevens................
Corks, removing wire from, G. A. Potte
Corpse cooler, C. Hoff....
Corpse cooler, c. 0 . Peck
Corpse cooler, C. O. Peck .........
Cotton chopper, T. C. Burnham.
Cotton chopper, T. C. Burnham.............
Cotton chopper, Mickle and Dearring....
Cotton planting attachment, S. H. Wade
Cotton planting attachment, S. H. Wade.
Cotton worms, destroying, w. T. Willie..
Cotton worms, destroying, W.
Curtain inture, H. E. Busch
Cutlery, handle for, O.W. Taft
Digger, potato, M. W. Kno.
Drill chuck, J. O. Rellley
Drill chuck, J. O. Rellley.
Drill, corn, J. B. Ludlow.
Drill for well boring, J. M. May (r)
Egg beater, M. Cline...............
Ejector, fluld, G. Westinghouse, $J$
Elevator, J. B. Sweetland......
Elevator, stump,
Elevator, stump, J. M. Bachelo
Elevator, stump, J. H. Barnes..
Engine, compound, c. E. Emery Engine gompornor, steam, Judson and Cogswell. Exercising machine, , . M.
Farm box, M. M. Murray..
Faucet, bothing, A. C. Meyer...
Fire arm, breech loading, E. Burt
Fire arm, breech loading, D. Conner
Fire arm, breech loading, F. w. Freund
Fire arm, breech loading, C. A. King
Fire arm, breech loading, C. A. King
Fire arm, breech loading, J. Lee....
Fire arms, sight for, F. W. Freund
Fire arms, stock for, J. V. Meigs
Fire plug or hydrant, D. Minich....
Gaiter, congress, J. W. Tutewiler.
Gas from hydrocarbon, F. G. Voig
Gate, swinging, F. Raymond
Glue dryer, s. T. Swasey.....
Glue dryer, S. T. Swasey
Grain band, c. L. Travis
Grain drill, B. Kulns.
Grate, J. Bying on........
Grate, parlor, G. W. Walk
Harness clip, F. Conway.
Harrow, w. T. McGhee.
Harvester, M. L. Gorham.
Harvester, C. D. Shrader.
Harvester rake, I. Dodenhoff (r)...
Harvester rake, $A$. A. Henderson
Hooks, snap. A. B. Conde
Jack, lifting, J. J. Adgat
Jewelry die, G. Stetter
Kettle, heating or cook
ettle, heating or cooking, G. W. Walker
Kiln, brick, R. F. M
Knob, door, S. Hiler
Knob rose, S. Hiler.

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Picture frame hanger, Dobbs \& Brayton....
Piers, construction of, Milroy \& Butler....
.... 160,
$\cdots .160$,

| Lamp extingulsher, W. H. Zimmerman ............. |
| :--- |
| Lamp pendant, E. Stevens................... |
| Lampblack, manufacture of, Fales $\&$ Neff........ |
| Lampblack, manufacture of, | $\stackrel{\substack{\text { Lam } \\ \text { Lam } \\ \text { Lan }}}{\text { In }}$ Lath rn, L F. Betts... Lath sawing machine, P. W. Hart...

Lath sawing machine, M. S. Norton. Lathe centers, grinding, M. N. Lemman. Leather, finishing, J. H. Radey............
Leather seams, pressing, J, w. Hatch. Limekiln, Cole \& McCulloch .......................
Liquids, drawing effervescent, Malmström et al. Lock for doors, etc., H. Winn..
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Mangle, Mangle, H. Tamms. Measuring distances, W. F. Harrsch Measuring distances,
Meat chopper, A. Nittinger, J
Metal, machine for Metal, machine for shearing, Walsh \& Dutot.
Mill, disintegrating , $\mathbf{G}$. Mill, disintegrating, G. B. Davids..... Mill spindle, ‥ s. Cat hcart.. Milstone balance, J. A. Althou
Millstone bush, R. S. Cathcart Mower, la wn, H. C. Crowell... Music leaf turncr, F. G. Johnso Neck tie, A. J. Adams.
Needle book, F. Swan
Nut lock, J. J. Adgate
Pan forming machine, G. Kiergaard Pan forming machine, G. A. Bow
Pantaloons, etc., J. W. Davis (r) Paper bag machine, H. S. Merril
Paper clip, W. V. Perry Paper cllp, w. V. Perry.......
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Pistol stock, w. L. Godfrey. Piston, T. S. Davis.
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Plow. J. O. Minor
Plow, steam, J. Fogart.
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Pump bucket, chain, A. L. Corey..
Pump or motor, rotary, N. Upham Pump or motor, rotary, N. Upham.....
Pumps, sectional lucket for, G. W. Burr Railway, elevated, L. Lotz ..
Railway rail joint, J. M. Ke Rallway rall joint, J. M. Kenny....
Rallway rail joint protector, I. Mills Railway rail joint protector, I. Mills
Reversing mechanism, R. B. \& J. C Rule, measuring, G. S Has
Sad irou, J. M. McMaster. Salls to ospars, attaching, $H$
Sash balance O D Davis

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Sawmill head block, F. N. Whitcomb.
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Sawing laths, machine for, P. W. Hart.
Sawing laths, machine for, M. S. Norto
Sawing machine, J. Gehr....
Sawing machine, w. P. Hale.
Sawing machine,
Sawing machine, M. M. Miller.
Sawing machine, scroll, J. Hale.
Sawing machine, scroll, J. Hale.......
Seaming machine, double, F. Kenney.
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Separator, grain, w. S. Clymans....................
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Sewn
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Shep skins, dressing, R. Ha
Shirt stud, E. W. Averell
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Shoe, A. Ballard (r).
Shoe, A. Ballard (r)..
Sifter, ash, F. Anthes
Sifter, ash,F. Anthes.....
Sign, street. H. B. Finney

Stench trap. R. L. Walker......
Still, rectifylng, E. F. Prentis.
Still, rectifyling, E. F. Prentiss..............................
Stone, etc., machine for sawing, English \& willard
Stove, w. Doyle.............
Stove, barrel. J. F. Scholes
Stove, barrel. J. F. Scholes
Stove, cooking, r. Thomas
Stove fire back, G. W. Herrick.
Straw twisting machine
Straw twisting machine, S. Kuh...............
Sugar cutting machine, G. P. Ockersliausen
Sugar, refning, F. O. Mattheessen
Surcingle, H. M. Witter.
Table and bed combined, oftice, D. Walker
Table, ironing, S. C. Hamlin
Table, ironing, S. C. Hamlin......................
Tenons, machine for relishing. E. A. Rowley..
Toy fire arm, E. T. Starr..........
Valve, check, w. H. H. Bowers
Valve, check, W. H. H.
Valve, safety, A. Orme
Valve, safety, A. Orme.........
Valve steam, J. Johnson....
Vegetable washer, J. Brooks
Vehicle axle skefn, b. Snyder
Vehicle chafing iron, G. Smith
Wehicle fender. H. M. Curtis
Wagon cover, E. M. Saunder
Wash benches, F. and M. Way
Washing goods in the piece, C. J.
Watch key, ratchet, G. $\Lambda$. Beidler
Watch key, ratchet, G. $\Lambda$
Water closet,, . H. Gould
Water meter, $A$ Guthrie
Water meter, A . Guthrie...............
Water wheel, R. R. Royer........
Wind wheel, S. and D. Johnson
Wind wheel, S. and D. John
Windmill, 0 . B. Blakeslee
Windmill, G. H. Lucas.
Windmill, A. and G. Raymond
Windmill, A. H. Southwick.
Wood, apparatus for preserving, G. B. Smith
Wrench, J. L. Whipple
Wrench, pipe, H. Otto.

## DESIGNS PATENTED.

8,206.-Aquariums.-J. W. Fiske. New York city.
$8,207 .-$ MUstard Botrie.-J. Gulden, New York city 8,208.-CARPET.-A. Heald, Philadelphla, Pa.
8, 8,209.-Gacntlet.-B. G. Shults, Johnstown, N. Y.
8,210.-Perficim Bottle.-G. Storm, Philadelpha,

TRADE MARKS REGISTERED.
2,287.-Prefomery.-W. B.Dorman, Georgetown,Mass.
2,288.-Cooz Stove.-M. L. Filley, Lansingburg N. $\mathbf{Y}$.



2,291.-Mrdicine.-Henry \& Co., New York city
$2,2,22-$ Flour.-T. C. Jenkin s , Pittsburgh, Pa.
$2,2 \times 33 .-\mathrm{P}$ 2,293.-Prong Hors.-Reisig et al., New Castle, N. Y.
2,294.-Cigars.-A. Schuneman \& Co., Detroit, Mich 2,249.-Cigars.-A. Schuneman \& Co., Detroit,
2,295.-OILs.-W. C. Stiles. Jr., Volcano, w. Va.
2,296.-SoAp.-Kendall M'fore 2,296.-SOAP.-Kendal Nry
2,29.-ENTREMTrs.-Underwoo. \& Co., Boston, Mass.
2,29s.-BuRNING FLuID.-B. A. Rose, Urbana, Ohio. 2,299.-Burning Fluid.-B. A. Rose, Urbana, Ohio
2,299.-Liniment.-E. Maatman, St. Louis, Mo. 2,299.-Linimint.-E. Maatman, St. Louls, Mo.
2,300.-Frrtilizers.-Patapsco Guano Co.,Baltimore,Md.
2,301.-DYEING Chemical.-Weeks et al., Boston, Mass.

APPLICATION FOR EXTENSION.
SCHEDULE OF PATENT FEES.
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On each Caveat............................................................5
On each Trade mark.........
On flling each application for a Patent (17 years).... $\mathbf{\$ 1 5}$ On fliling each application for a Patent (17 years).
On lisuing each original Patent.............. On Issuing each original Patent.
On appeal to Examiners-In Chitef.
On appeal to Commissioner of Patente.
on application for Reissue.
On Hlling a Disclaimer.
On an application for Desi................................ $\$ 10$
On application for Design ( 7 yeary) years)...................... $\$ 15$
On
CANADIAN PATENTS.
List of Patents Granted in Canada;
March 12 to $19,1875$.
4,487.-P. Mayrand, Gentilly,
chine. March 12, 1875.
4,488-G. R. Edwards ,
,480.-G. R. Edwards, Galena, Ill., U. S., et al. Safety whiffletree. March 12,18
$4,489 .-$ J. B. Hava, New O
of cod liver ofl. March 12, 1875.
4,490.-J. S. Garner, Galena, Ill.,
March 12, 1875.
4, 411 -J. A. Lakin. Westfield, Mass., U. S. Overdraw bar check. March 12,1875 .
4,492.-H. B. and E. W. Rathbun, Mill Point. Ont., et ,1/.
Barrel heading cutter. March 12, 1875 .
Barrel heading cutter. March 12, 1875.
4,493.-C. C. Roe, Hamilton, Ont. Machine belt buckle.
March 15, 18\%5. March 15, 18 To.
4,494.-C. I. Corbin, East Oxford, Ont. Extension of 287.
Rake. March 15, 1875 . 4,495. - M. Pettingill, M
coupling. March 15, 1875.
4,496.-E. .
4,496.-E. L. Howard, Boston, Mass., U. S. Fagotting
attachment to sewing machines. March 15, 1875. attachment to sewing machines. March 15, 1875.
4,497.-C. F. Rttchel, Corry, Pa., U. S. Brush block hor-4,497.-C.F. Ritchel, Corry, Pa., U. S. Brush block hor-
Ing machine. March 15 , 875.
4.498.-L. Coté, St. Hyacinthe, P. Q. Forming stiffeners for boots. March 15, 1875 .
4,499.-J. S. Anderson, Fintville, wis., U. S. Wash
boiler. March 15, 18 ins. 4,500.-R. Paradis, St. Hy chine. March 15, 1875 .
4,501.-T. Rtchardson et al., Fergus, Ont. Gang plow. March 15, 1875 .
4,502.-J. K.
16, 1875.
4,503.-G.
4,503.-G. Houlton, St.
boxes. March 16, 187 .

Wheel. March 16, 187\%.
4,505.-J. Collins, Montreal, P. Q. Bag tie and fastener.
March 16, 1875. March 16, 1875 .
4,506.-J. C. Feacock, Finsbury, London, England. Non-
conductor of heat. March 16,1875 .
conductor of heat. March 16, 1875
4, L ever. buckle. March 17, 1875.
4,505.-L. J. House et al., Stanstead, P. Q. Stump ex-
4,505.-L. J. Hose et al., Marstead, P. Q. Stump ex-
tractor and stone puller. March 18, 1875 .
4,509.-C. C. Jones, Fredericton, N. B. Combination
barrel pump. March 18, 1875 .
4,510.-S. E. Foster, Minneapolis, Minn., U. S. Vehicle
spring. March 18, , 875 .
4,511-F. G. White, Ot
March 19, 1875 .
March 19, 187
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