
a WeEkly journal 0f practical information, art, science, mechanics, Chemistry, and manufactures.


## THE EAST RIVER'BRIDGE

The rapid progress made during recent months, in the construction of the great suspension bridge between New
York and Brooklyn, indicates that no very extended time will elapse before its stupendous network will have bound will elapse before its stupendous network will have bound
the sister cities together. The fine engraving which we present below affords an excellent idea of how the grand work of the new ferry house on the Brooklyn side. Each of the York anchorage wili probably be commenced early in the at about 800 feet from the tower, is advancing and the ma- side is to start from near the City Hall, and ascend gradually will look when it is finished, to an observer stationed in front sonry is already several feet above the ground. The New the intervening distance of 238 feet. The elevation of the

center of the bridge above the water will be 130 feet, and the roadway 80 feet wide. The view from the latter will be one of the finest in the world, both in beauty and extent.
It is believed that this thoroughfare will, when completed command an independent travel equally great with the exist ing ferries, which will retain their own business; and that even these two immense means of communication will ere long be insufficient to accommodate the rapidly increasing demands of the multitudes yet to line the shores, so that the building of submarine tunnels will eventually become a necessity.

## Srientifir Smmoruan.

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## INDICATING STEAM ENGINES.

Questions from our correspondents, in relation to the power of steam engines, recur so often that we think it may be timely to devote some space to their general consideration We are frequently asked what is the power of an engine of a giren size, making a certain number of revolutions per minute, with a specified steam pressure. Most of our readers know that the horse power of an engine is equal to the mean effective pressure on the piston, in pounds, multiplied by the piston speed in feet per minute, and divided by 33,000 . Hence those who send us queries of the nature mentioned above doubtless think that it will be an easy matter for us to determine the horse power. As a matter of fact, we suppose that very few of the answers we have rendered to these questions have been anything but rough approximation to the true solutions. We have been careful to hint as much, in working out each example; but perhaps it may be well to give a more definite explanation.
Referring to the rule for finding the horse power of an engine, it will be seen that the mean effective pressure on the piston is required. This, we believe, bas never been sent to us. True, our correspondents give the pressure in
boiler per steam gage, and sometimes mention the point at boiler per steam gage, and sometimes mention the point at which the steam is cut off in the cylinder. They have never back pressure resisting the movement of the piston, the initial pressure of steam in the cylinder, the amount of steam and exhaust lead, and the point at which the exhaust cushion commences. We will endeavor to show how all these things affect the solution of the problem.
The following, taken from a back number of our paper, is a fair specimen of questions of this character: "What horse power has an engine of the following dimensions: Cylinder $9 \times 16$ inches, working at 63 revolutions per minute, with a pressure of 70 pounds to the square inch?'
Accepting our correspondent's statement as the correct one, we cau readily represent the action of steam in the cylinder during the stroke by a rectangle, ABCD. Thus, while the piston is being acted upon by the steam, A B, 70 pounds above $D C$, on any convenient scale, will reprosent the steam or pressure line, the point, A, corresponding, to the commencement of the piston's stroke, and the point, B,
to the end. When the piston has reached the end of the stroke, the exhaust valve opens, and the line, B C, represents the fall of the pressure from 70 pounds, per gage, to nothing. The piston then returns, and C D represents the pressure during exhaust. When the piston has returned to the starting point, the steam valve is opened, and the line, D A, shows that the pressure rises to 70 pounds again, for the next stroke. This, we say, is the graphical representation of the action of the steam, according to the data given by our correspondent. Our readers do not need to be told, however, that it is not usual to work engines in this manner,
as it produces violent strains, and is far from being economical. The piston moves to and fro, and requires, of course
to be brought to rest before the direction can be changed. If it worked as represented in our diagram, the shocks that would occur each time the motion was reversed would be very severe. It is probable, then, that the exhaust valve commences to open, as at $E$, before the end of the stroke is reached. There will probably be some back pressure also, o that the exhaust line will be represented by $F G$, instead of CD. It is quite likely that the exhaust valve closes be fore the end of the return stroke, so that a cushion line, $G$ H , is produced, and that the steam valve is set with lead, so

that it opens at H. It would appear, then, that perhaps a
figure; A E F G H, may represent the action of the steam, instead of A BCD. and it will be seen that, if such is the case, the mean effective pressure per square inch will be considerably less than 70 pounds.
In the majority of engines, the steam valve has some lap so that it is closed before the end of the stroke, and the steam is allowed to expand, producing an expansion curve, I K, on our graphical representation, in which case, A IKFGH, giving a still smaller mean effective pressure, will represent the action of the steam.
In general, the initial pressure of steam in the cylinder is less than the boiler pressure, from which it would appear that LMKFGH nore probably represents the state affairs, in our correspondent's engine, than A B C D.
Those who have followed us thus far will doubtless accept our original statement, that the best answers we can give to questions like the one under consideration will only be rough approximations. But it is possible to arrive at the ruth, in cases of this kind. If a gage were attached to the cylinder, it would mark the varying pressure at different points of the stroke. The steam engine indicator performs this office admirably, recording the pressure at each succes. sive point, thus forming essentially such a diagram as we have already represented. This is the only accurate method by which the mean effective pressure of the steam can be ascertained. The indicator shows, in addition, many things of interest and importance which our space will not permit us to consider at present. The importance of knowing the rue power developed by an engine must be apparent to all ur readers, anis we need not enlarge uponit. The test of n engine with the indicator frequently discloses derange ments and imperfections that could not be otherwise discovered. The indicator, however, is an exceedingly delicate in trument, and must be carefully manipulated to secure ac curate results; hence tests of this character should be made by those who are truly experts.
We can readily perceive, from the numerous inquiries on the subject, that many of our readers realize the importance of knowing the power developed by their engines, and per haps our remarks will be useful in showing them the mean by which they can have their questions correctly answered.

DR. HENRY DRAPER'S RECENT DISCOVERIES IN SPECTROSCOPIC ANALYSIS.
In a recent number of the American Journal of Science and Art, there is an important paper on "Diffraction Spectrum Photography," by Dr. Henry Draper, which is being reprint d in England, France, Germany, and Italy. Until quite re cently, spectroscopic investigation has been conducted almost entirely by the aid of prisms; but the prismatic spectrum is far less suitable for exact inquiry than the diffraction spectrum produced by a grating of fine lines ruled on glass; because in the former case, the red end of the spectrum is con racted and the violet dilated, while in the latter the rays are presented in the true order of their wave lengths. Moreover no two prisms give spectra that are exactly alike in the amoun f this contraction and dilatation; and hence various ob erver have great difficulty in comparing their results to gether.
As all diffraction spectra are exactly alike, and, to use a tech nical term, they have no "irrationality of dispersion," it seems singular that prismatic observation has not long since been bandoned. But gratings have hitherto been very difficult to obtain; and, besides the spectrum produced by a grating is much fainter than that by a prism. Our distinguished ownsman Mr. Rutherford has, however, constructed a ma chine which makes better rulings on glass than any heretofore produced, and it is with one of these that Dr. Draper ha worked.
The main object of the present research has been to fur nish a photographic map of the violet and ultra violet ays of the spectrum, to serve as a permanent reference map and to complete the great work of Angström, whose " Spec tre Normal du Soleil" is unquestionably the most laborious and exact contribution to spectrum analysis made in recent times. Angström has, up to the present, failed in his at tempts to do the very thing that Dr. Draper has succeeded in accom'plishing so thoroughly. In many respects, indeed, Dr. Draper's work at the violet end of the spectrum exceeds in
exactness that of Angström int he visible regions, as is well seen in the part between the fixed lines $G$ and $H$, where the
map of one observer overlaps that of the other. Many line that Angström has omitted or misplaced are corrected by Draper ; and in one place alone, 17 new lines are added.
By an ingenious device, the wave lengths of rays entirely invisible have been measured with an exactness exceeding that of those that are visible; and errors have actually been detected in some of the fundamental wave lengths of the standard test books.
The photograph which accompanies the paper is of beautiful definition and large size. If the whole solar spectrum were presented on the same scale, it would be about 10 feet long.

## GAIL BORDEN

Upon a shady knoll in the beautiful cemetery of Woodlawn near this city, in full view from the windows of the New Haven railway cars, stands a substantial family monument in granite, which at one time attracted the attention of the passing traveller by the peculiarity of the emblem by which it was surmounted. That emblem consisted of a milk can, cut of solid stone, representing in form and size the familiar utensil so commonly used here in our streets, for the transport and sale of milk. This was the chosen monument by which our friend Gail Borden, inventor and originator of the great industrial product now known as Condensed Milk, had desired to mark his last earthly resting place, when he sbould have been gathered to his fathers. The desire thus expressed was honorably characteristic of the individual. He was emphatically a man of the people; and although in process of time, by the success of his mostexcellent and useful inventions, he acquired great wealth, he ever regarded himself as one of the humbles؛ of workers in the family of man; and the possession of riches never led him to put on aristocratic airs. He despised that sort of pride wh ch makes some people ashamed of the humble origin of their progenitors, and wished that, in this respect, the very stones above his grave should teach a useful lesson. Surely they commemorate the truth that honest industry is better than titled birth.

Gail Borden was born in Norwich, N. Y., in 1801, his parents being New England people. In 1829 he removed to Texas, where he was always esteemed for his probity of character and earnest efforts for the public good. He was at one time a United States Surveyor, afterwards a newspaper conductor, then the Collector of the port of Galveston, when Texas was known as the Lone Star Republic. In 1853 he succeeded in producing Condensed Milk, as a permanent article of manufacture, which heaccomplished by concentrat ing in vacuo. We well remember his early efforts in this direction, which were most persevering and arduous. The Patent Office for a long time refused to issue his patents, but finally yielded, and the new manufacture then received its first impalse. Mr. Borden's patents were obtained through this office. For over twenty years we enjoyed the uninterrupted friendship of this truly excellent man. Genial, kindhearted, benevolent, his life was a most useful one and his memory blessed. He died on the 11th of January, 1874, aged 73 years, at Bordenville, Texas, where he had established a large factory for the production of concentrated foods, chiefly meats. He leaves a large and interesting family. His remains are to be brought to Woodlawn. The trustees of the cemetery have removed the granite milk can from his monument, as an infringement upon the rules of fastidious taste. But no one can blot out the record of his noble life, nor the splendid results of his long and useful labors.
Gail Borden was the inventor and first introducer, in mer chantable form, of Condensed Milk. He may be said to have supplied the world with a new article of food. Medical authorities give it the highest place in the nourishment of the sick and the young. He lived to see the use of this most valuable product extended over the globe. Nearly all civil. ized nations, following his patterns and instructions, now have their factories for the supply of the article, which, as the years roll on, will be still more highly valued, while the work of its production will employ the industry of thousands of people. Gail Borden may be truly styled a benefactor of his race.

STEAM ON CANALS.
We have before us a report of the trial trips of the steam caaal boat, William Newman, through the Erie canal, in the seasons of 1872 and 1873. We have also the report of Engineer Greene on the trials of 1872. His report on the trials of last season has not yet been received. The figures in these eports only confirm what has frequently before been shown by experiment: that it is not sufficient to put a good engine into a boat to ensure success; the boat must also be modeled o suit the engine. The ordinary canal boat, built in the form of a box in order to obtain great carrying capacity, can not be propelled directly by steam power as cheaply as it can be towed. Thus it appears, from Mr. Greene's report hat the in 1872, developed an average indicated horse power vary ing between 30 and 35 , to produce an average speed of $2 \cdot 727$ miles per hour. This same speed could probably have been effected by towing with from 3 to 4 horses, and it is easy to see that the steam power is much the most expensive. The power developed in the trial trip in 1873 is not stated; but rom the data given, it probably exceeded 50 horse power, to produce a speed of $3 \cdot 691$ miles per hour. It is because such slow speeds are required on the canals that the inefficiency of this mode of propulsion is not at once apparent. If an ocean steamer only utilized about 12 per cent of the powe developed by the engines, probably the vessel would not be large enough to contain the machinery that would be re quired to produce a speed of 14 knots an hour. It appears to
us that the prize offered by the Legislature has stimulated invention in the wrong direction. It is scarcely possible to give a canal boat the form required for a steamer, without seriously reducing the carrying capacity. It would seem better, then, to place the engine on a separate vessel, which could be properly designed, letting this vessel take the place of horses to tow the canal boats.

## a year's inventive progress.

The frllowing schedule indicates the progress of invention in the United States during the year 1873, and consists in a list of the number of patents issued by the United States Patent Office to citizens of each State and Territory, to foreign subjects, and to members of the Army and Revenu Marine Service. The table also shows the relative ratio of patents obtained to the population of each political division:



Total to citizens of the United States 12,371 , or one patent to each 3,116 of the population. Total granted to citi-
zens of foreign countries, 491. Grand total, 12,862 , which zens of foreign countries, 491. Grand total, 12,86
includes reissues and designs, but not trade marks.
With reference to sectional distribution, the foregoing schedule reduces itself to the following;


By insuection of these data it is shown that, as compared with the number of patents issued in 1872, the aggregate of 1873 is smaller by 140 for citizens the United Stater, and by 31 for dwellers abroad. Considering numbers merely, New York stands first, with 2,826 , and New Mexico and Idaho last, with but 1 each. Connecticut, however, fairly heads the list, as relative population must also enter into the ealculation; her ratio is 1 patent to every 860 souls. The District of Columbia is next, with a proportion of 1 to every 1,208 . Arizona and Alaska are entirely unrepresented, and New Mexico has but a single patentee for 1873 among her whole population of 91,874 . The Southern States still present a low average; and in proportion to their population, fall $b$ hind all the rest of the cuuntry. A slight increase of four patents is noticeable over the aggregate of 1872. The list of States which show an increase over last year includes the following: Alabama, California, Iowa, Kansas, Louisiana, Maryland, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, North Carolina, Pennsylvania, Tennessee, Texas, and Washington Territory, also the United States Army. The remainder have decreased or else remained stationary.
It may be added as an interesting and perhaps significant fact that, in the fous political divisions in which the least number of patents have been granted, the circulation of the Scientific American is the smallest; and in other States, the ratio inc eases in proportion to the circulation of this paper among its inhabitants. Thus in New York, the State having the langesi number of patents, our patrons exceed those of any other State ; while in New England and the West, whence, as the statistics show, the most inventions emanate, the Scientific Americia has the greatest circulation.

## PROCEEDINGS OF THE PATENT CONVENTION.

The Patent Convention, the call for which was recently alluded to in our columns, began its labors at Washington, on January 15 th. Some two hundred delegates were present. The following is the organization:
President, J. M. Thacher ; Vice Presidents, N. R. Graham, W. W. W. Wood, H. E. Towle, Miles Pratt ; Secretaries, J. (. . Bancroft, W. C. McIntyre, and C'. F. Stansbury. The resolution of the Vienna Congress, declaring that the protection of inventors should be guaranteed by the laws of all civilized nations, for the reasons given, was adopted. The second resolution, declaring that an effective and useful patent law should be based on the principles set forth was modified by adding:

A patent should be gianted for a term of seventeen years, with a privilege of extension for the benetit of the inventor or his heirs for a further term of ac least seven years." Sev eral resolutions were offered touching upon the inventors' interests and the patent laws of the United States. C. M. Parks presented a resolution, recommending that Congress make use of the surplus fund of the Patent Office, now in the United States Treasury, for the erection of a suitable building in Judiciary square, for the exhibition of the models of in ventions. This fund is st

Vermin Killer.-Doré patents the use of the following misture for the destruction of bugs, fleas, ants, etc., and their eggs: Bisulphide of carbon 80 parts ; petroleum essence 20 parts. The liquid is to be applied to furniture, etc., by a brush.

## PSYCHIC FORCE.

Some time ago we published an account by Dr. William Crookes, the distinguished sclentist of London, editor of the Quarterly Journal of 'Science, Chemical Nevss, etc., of his ex periments and observations in connection with the phenome na of Spiritualism. We gave engravings of the special ap paratus designed by Dr. Crookes for the purpose of detecting the fraud, if any existed, and of measuring the actual de gree of invisible force that was alleged to be exerted. This apparatus consisted of a self-registering balance, which, to the surprise of the Doctor and his friends, went down before their eyes and registered a considerable degree of force when the medium, Home, simply pointed his finger at the balance, but did not touch it. The force thus manifested was designated psychic force by Dr. Crookes. The publica tions of the learned Doctor attracted much attention at th time, and subjected him to the severest ridicule among the learned. He however promised to pursue the investigation and publish further reports. This he has now done, and announces his intention to give still further details. Most of the wonders which he now describes took place in his own house, and were witnessed by parties of friends, all of whom give co
stated.

- These spiritual performances seem to involve something which, as Lord Dundreary would say, "no fellow can find out,"' and the Psychic Force theory of Dr. Crookes is perhaps as acceptable as any, while none of them tell us how the thing is done. None of the doings here recited surpass the tricks of the magiciau Hartz of this city-the box trick, for examiple, recently mentioned by us. The box is first tied up and sealed, then entirely folded up within a canvas slieet, and again tied and sealed, all being done by a committee of detectives before the audience. Into this box, in the course of two minutes time, Hartz then introduces a man, without disturbing the canvas envelope, ropes or seals. Other equal y curious performances might be mentioned, which, we be lieve, have never been explained
A correspondent of the New York Tribune says that, in classifying the various phenomena that have presented themselves to him in the course of his enquiries, Mr. Crookes refers, first, to the movement of heavy bodies, with contact but without mechanical exertion. This he states to be one of the simplest forms of the phenomena observed, varying in degrees from a quivering or vibration of the room and it when the hands of the medium are placed upon it. These movements, and indeed most of the phenomena, are preceded by a peculiar cold air, sometimes amounting to a decided wind, sufficient to blow a sheet of paper about the room and to cause a lowering of the thermometer by several degrees. The second class manifested themselves as percussive and other allied sounds; sometimes as delicate ticks; sometimes a cascade of sharp sounds, as from an induction coil in full work; detonations in the air, sounds like scratching, twit tering as of a bird, etc. The third class of phenomena con sists in the alteration of the weight of bodies. The fourth class, namely, the movemert of heavy substances when at a distance from the medium, he las seen in many instances. An empty arm chair, at his request, moved to where he was sitting, and then slowly back again, a distance of about three
feet. He has seen the movement of a heavy table, and chairs turned with their backs to the table, about a foot and a half off, each occupant kneeling on his chair, with hands resting on the back, but not touching the tablo. The fifth class is that of the raising of tables and chairs off the ground without contact with any person.
The sixth class is that of the levitation of human beings, which has occurred in four instances in his presence. He has seen Mr. Home raised completely from the floor of his room in several instances. The accumulated testimony, estab
lishing Mr. Home's levitations, Mr. Crookes considers over whelming; and he thinks it greatly to be desired that some person, whose evidence will be accepted as conclusive by the scientific world, shall seriously and patiently examine these alleged facts. The seventh class of phenomena consists in the moving of various small articles without contact with any person, which he has very frequently observed, and where there could be no suspicion of trickery. He thinks that when he is in his own dining room, seated in one part of the room, with a number of persons keenly watching the medium, the latter could not, by any trickery, make an accor deon play in his (Mr. Crookes') own hands, when the
keys are held downward, or cause the same accordeon to keys are held downward, or cause the same accordeon to possible to introduce machinery whichshall wave window curtains; pull up Vene ian blinds eight feet off; tie a knot in a handkerchief and place it in a remote corner of the room sound notes on a distant piano; cause a card plate to float about the room; raise a water bottle and tumbler from the table; make a coral necklace rise on end ; move about a fan so as to fan the company, or set in motion a pendulum when enclosed in a glass case firmly cemented to the wall. The eighth class is that of luminous appearances. He has seen a solid self-luminous body, of the size and nearly the shape of a turkey's egg, float noiselessly about the room, being visible for more than ten minates, and striking the table three times, with a sound like that of a hard solid body, before fading away. He has seen a self-luminous crystaline body placed in his hand by a hand which did not belong to any erson in the room, and a luminous cloud floating upward to a picture. In the daylight he has seen a luminous cloud
hover over a heliotrope on a side table, break off a sprig, and carry the sprig to a lady; and on several occasions he has seen a similar luminous cloud visibly condense to the form of a hand, aud carry about small objects.

The ninth class consists of the appearance of hands, either self luminous or visible by ordinary light. In one case a mall hand rose up from an opening in the dining table and gave him a flower. The hands and fingers do not always ap pear solid and life-like, sometimes indeed seeming like a
nebulous cloud, partly condensed in the form of a hand. He has more than once seen first an object move, then a luminous cloud appear to form about it, and lastly, the cloud condense into sha pe and become a perfectly formed hand. It this stage it was visible to all present. Sometimes it was life-like and graceful, the fingers moving and the flesh arparently as human as that of any person in the room. At the arm or wrist it became hazy, and passed off into a luminous cloud. To the touch the hand appeared sometimes icy cold and dead, at others warm, grasping his own with the firm plessure of an others warm
old friend.

In one instance he retaintd one of these hands n his own, firmly resolved not to let it escape. There was no struggle, no effort to get loose, but it gradually seemed to resolve itself into vapor, and faded in that manner from his grasp. The tenth class comprised direct witing, exhibited sometimes in darkness, sometimes in ligit. sometimes with out any apparent agency, at others through the medium of a hand. The eleventh class embraces the rarest phenomena namely, those of phantom forms and faces, which he wit nessed in a few instances only. The twelfth class covers phenomena that seem to point to the agency of an exterio intelligence, other than that of the medium or some person in the room. Althou;gh the hypothesis has been suggested that the medium is the source of this intelligence, by thos who think they see in this an explanation of many of th. facts, yet Mr. Crookes has reason to believe that, in certain in stances at least, they result from the agency of an outside in telligence not belonging to any human being present

## SCIENTIFIC AND PRACTICAL INFORMATICN.

EXTRACTION OF QUICESILVER MT NEW MLMAFIN, (AI
The mineral is treated as at Idria, that is, it is roasted is great cylindrical furnaces in which it is placed between stic cessive layers of wood. The mercurial vapots are cem densed in walled chambers. The presence of time in th: minerals greatly facilitates the disengagement of hemetal $4,400,000$ pounds of nercury are thus yearly obtained at an expense of about $\$ 27$ per 100 lbs . At Almader; in Spain the annual product is $2,200,000$ pounds, costing from $\$ 90$ to $\$ 180$ per 100 pounds.

## A New use for infusorial silica

Infusorial silica has been strongly recommended for sur ounding ice, ale, and beer cellars, fireproof s:ffes, stean woilers, and powder magazines. A firm in Germatiy have re ently made a se:ies of experiments on a larg. scale, and hey assert that the use of this earth has reduced the melt ng of ice in a cellar during the summer from $2:, 500$ to 10,000 pounds. This material is not inflammable, and is not in he least affectid by the hottest fire ; and it prevente the en rance of rats and mice.
electric discharges in air.
By allowing a series of sparks from an electromagnetic induction a $a_{i}$ paratus to be discharged between platinum elec trodes in pelfectly dry air, Böttger noticed the Formation of yellow vap rs; and after the lapse of a few minutes, nitrou acid was rtcognized by the smell. If the sparas are passed through $v=r y$ moist atmospheric air, or if the sides ui the glase vessel in which the experiment is concucted are moist ened with distilled water, and some is allowed to collect at the bottom, no yellow vapors are former: ; but the air, in a few minutes, acquires the characteristic idor of ozone, while in the water the presence of hyponitric sacid can be detecteci. Iodide of potassium and starch paper, the test in common use for the detection of ozone in the air, is thus shown to be an untrustworthy reagent, as it must in many casts turu blue by nitrous acid. It behoves meteorologists, now that their attention has again been directed to these facts by Proessor Bottger, to ascertain the exact condition of moisture under which the acid is produced, and to e: tablish a process for the estimation of crone, which shall be of absolute cer tainty.
Dr. Dotch of New York, who has for years occupied him elf with the artificial generation of ozone, states that strips of paper saturated witl the tincture of guaiacum afford a more sensitive and certain reagent or test for the presence of ozone than either the iodide of potassium and starch or pa per containing protoxide of thallium; and that such an ozonometer can be relied on to show at least 10 gradations or shades.

## Cimntific ghouls.

The tomb of Petrarch was recently opened on the occasion of the cenienary of the poet. The bones were found in quite perfect condition aud of an amber color; other than which, we fail to note a single fact of the slightest interest in the long account of the ceremony published by a foreign contemporary. It strikes us that the spectacle of a body of scientists, calling themselves the "Academy of Bovolenta," breaking open the grave of a great man, pawing over his bones, and glaring at his dust through their eyeglasses, with apparently no other object than to make him share his coffin with a bottle containing a list of their names, must be re freshingly idiotic.

## OZONIZED WATER.

Ramelsberg states that some of the substances sold as ozonized water owe their action to the presence of chlorine. Behrens and Jacobsen, on the other hand, find that some ozonized water is only a dilute solution of hypochlorous
acid. acid.

## ELECTRO-PLATING BALANCE

In the operation of electro-plating with gold or silver, convenient means of regulating the exact amount of metal to be deposited on the articles is afforded by the automatic ap paratus herewith illustrated, the invention of M. Roseleur, f Paris.
The objects are suspended in the bath, as shown, from one arm of a scale beam. A borizontal rod, fixed to the standard, supports at one extremity the soluble anode in the baih, and at the other con. nects with the positive pole of the battery. Theopposite arm of the beam carriestwo ecale The opposite arm of the beam carriestwo ecale pans, in the upper of which is placed a weight
sufficient to produce equilibrium in the appasufficient to produce equilibrium in the appa-
ratus. In this position, the current does not ratus. In this position, the current does not
pass, since the rods carrying the objects which pass, since the rods carrying the objects which
form the negative pole are not in connection with the battery. But if in the lower pan of the balance are placed weights, corresponding to the amount of precious metal which it is desired shall be deposited, the equiibrium is destroyed. Necessarily the beam descends to the right, and, at the same time, plunges a metallic point into a cup filled with mercury which is in communication with the negative pole of the battery. The circuit being thus established, the operation progresses and continues without necessitating attention, until a quantity of the a node is deposited on the objects, of sufficient weight to cause equiibrium with the weights in the lower scale pan. The beam then becoming once more hoizontal the point is withdrawn from the mer cury, the current is broken, and the action ceases.

## Fecundation of Vegetables.

M. Beer announces that he has pat Hooï breuk's process for the fecundation of vegeta bles in successful practice in the Botanic Gar den of Vienna.
This process, which, it would seem, achieves important results, consists simply in touching the extremity of the pistil (the stigma) of the Hower, just before it blooms, with a pencil dipped in honey or, better still, with honey mingled with the pollen of the same plant on which the operation takes place. The process has succeeded admirably, it is stated, on fruit trees, and even on certain particular branches of trees which had never borne. On the portions t:tus treated, fruit formed in natural course, while other parts remained in their normal condition.

## THE YAMA-MAI, OR OAK TREE SILKWORM.

The Yama-maï is a species of silkworm common in Japan, which derives its sustenance from the leaves of oak trees It has recently been introduced in Europe with considerable success, and is readily acclimated. In Austria, it is stated that Baron Bretton has obtained from a third generation 4,000 cocoons and 300,000 eggs. Our illustration, for which we are cocoons and 300,000 eggs. Our il
indebted to La Nature, shows inde worm fully developed and n its natural size, the young enlarged (1), and also the egg considerably magnified (2). The egg is round and slightly flattened in form, of a brown color, more or less dark, and is covered with black granules. Its reatest diameter is 0.09 inch greatest diameter is 0.09 inch , and its thickness varies accord ng to the state of incubation As soon as the young worm emerges, it rapidly attains,owing to its contact with the air, a size greater than it had in the egg. In a short time it grows to a length of $0 \cdot 21$ inch, as indicated in the lower portion of our en graving. The bead, first tho racic segment, and the legs, are of a reddish mahogany tinge, without spots, and the rest of the body is a golden yellow, the color of gamboge. All theseg. ments, from the second to the eleventh, are traversed by five longitudinal and sharply distinguished black lines. At the end of the first age, which lasts sixteen days, the caterpillar, after its change of skin, is 0.45 inch in length and of a subdued green color, slightly yellowish underneath. At the third age, after a second change of skin, the length increases to $1 \cdot 1$ inches, and the green color becomes brighter. Subse quently, during the fourth age, the body grews to $2 \cdot 7$ inches, and finally to $3 \because 2$ inches, when it becomes fully developed. The color at this period corresponds very closely to that of the leaves on which the worm feeds.
The caterpillar now begins its cocoon, uniting two leaves with several threads, which are, in turn, secured to branch es. Its nourishment consists in the tenderest branches, con trary to the ordinary habits of other worms. Finally, it ejects a large drop of transparent liquid and begins to spin. The chrysalis, which is the sixth age of the caterpillar, is


THE YAMA-MAI OR OAK TREE SILKWORM
A variation of seven degrees of temperature, it is said, would be sufficient to kill the germs. By this route the time required to reach Milan, from Yokohama, is forty-two days while, by the passage through the Indian Ocean and the Suez canal, it could be effected in thirty-nine days. The number o transhipments would be the same in both cases; but the American route passes through temperate latitudes, while the other would expose the eggs to the extreme of tropica heat.

A sOLUTION of pearlash in water, tbrown upon a fire, $3 x$ tinguishes it instantly; the proportion is 4 ounces, dissolved in hot water, and then poured into a bucket of common water.

Preservation of Vegetables by Drying.
contained in a closed cocoon. In order to open the latter, a reservoir of liquid is supplied at the rear end, which fluid has the property of softening tha silk, so that the butteridy can readily break its way out. The cocoon strongly resem bles that of the ordinary mulberry leaf silkworm, and the raw silk is readily mistaken for the work of the latter After a repose of fifty days the butterfly appears, and is

The vegetable designed to be acted upon is first picked and washed, then placed in a large drying room, fitted witl helves and sieves for the spreading, shaking, and turning of the vegetables during the drying, and supplied with dry air at a temperature of from $95^{\circ}$ to $100^{\circ}$ Fah., and from which the moist air is discharged through the chimneys.

After this they are subjected to pressure, formed into tablets of a certain size, wrapped in tin foil, and then packed in tin cases for preservation and for sending away. To pre pare this for use, it is only necessary to steep it for one hour in warm water, and then cook the same as fresh vegetables.
The following is an extract from the Aunals of the Central Horticultural Society of France: "It appears that there is established in Paris, at No. 5 Rue Marbocuf, under the direction of Messrs. Chollet \& Co., a manufactory for the preparation, by the process of M. Masson, of vegetable substances, with which the French navy and commercial marine are furnished. The Horticultural Committee pronounced the opinion that the desiccating process of M. Masson preserves vegetables without altering their constitution, and reduces them to a small bulk without impairing their flavor or nutritive quali. ties. M. Masson's processes are applied with entire success to most vegetables and several fruits. Thus all cabbages, spinach, parsley, cress, chervil, succory, and sorrel, are dried and pressed to a very small volume. It is the same with carrots, turnips. parsnips, celery, salsify, and viper's grass which are cut in thin slices and into small pieces, to make Julienne. C'auliflowers, Brussels sprouts, asparagus, and string beans, in order to resume their natural appearance, should not be pressed. Potatoes are perfectly preserved in thin slices. Peas and beans, in a green state, are succeeded with very well. Lastly, various fruits, and especially apples and pears, in slices, are aleo dried, and keep perfectly.

## Charcoal and Tar as a Surgical Dressing.

The London Lancet strongly recommends the use of a mix. ture of charcoal and coal tar, containing 33 per cent of the latter, in pulverized form, as a dressing for wounds. The powder exercises no irritative action, and is easily removed by lotions of cold water. The charcoal absorbs gases due to fermentation, coagulates the albumen, and prevents decomposition, in this respect materially aiding the action of the carbolic acid contained in the coal tar. For wounds which cannot bear the contact of the powder, 100 parts of pulverized coal tar are macerated for some hours in 400 parts of rather weak alcohol. The solution is said to be very efficacious.

## Salt in Sickness.

Dr. Scudder remarks: " I am atisfied that I have seen patient die from deprivation of common salt during a protracted illness. It is a common impression that the food for the sick should not be seasoned, and whatever slop may be given, it is almost innocent of this essential of life. In the milk diet that I recommend in sickness, common salt is used freely, the milk being boiledand given hot. And if the patient cannot take the usual quantity in his food, I have it given in his drink
This matter is so important that it cannot be repeated too of ten, or dwelt upon too long.
The most marked example of this want of commen salt I have cver noticed has been in surgical disease, especially in open wounds. Without a supply of alt the tongue would become broad, pallid, puffy, with a tenacious pasty coat, the secretions cions pasty coat, the secretions
urrested, the circulation fecble, arrested, the circulation fectble,
he effusion at the point of injury serous, with an unpleasant watery pus, which at last becomes a mere sanies or ichor. A few days of a free allowance would change all this, and the patient get along well."

## New Method of Preparing Aluminum

The oxide of aluminum is first prepared by any of the processes now in use, either from kaolin or clay. It is then mixed with wood charccal in the proportion of 40 parts charcoal to 100 of alumina, and heated to a red heat. While still hot, the mass is placed in retorts heated to dark redness, and chlorine gas is passed over it from a gasometer. The volatile chloride is condensed in the receiver, and afterwards decomposed by the battery; the chlorine which is set free is re turned to the gasometer to be used over repeatedly. Garneri employed a magneto electric apparatus.

## HYDRAULIC ENGINEERING EXTRAORDINARY

 An iron conduit has recently been constructed which, ac cording to the Mining and Scientific Press, sustains the greatest water pressure in the world, namely, 1,720 feet, or 750 pounds to the square inch. It carries the water supply of Virginia City and Gold Hill, Nevada, from Marlette lake, situated at an elevation of about 1,500 feet above the former town, over a valley seven miles in width, the sides of which are steep and precipitous, and through a route presenting engineering difficulties of unusually troublesome nature. Th most awkward feature of the undertaking begins at an elevation of 1,885 feet above the track of the Virginia and Truc kee railroad, at a point about two miles west of Lake View Toll House, and thence follows by an easterly course the crest of the spur from which it starts: crosses the valley, at the toll house referred to, and gradually ascends to its outlet end, making the entire length 37,100 feet. The water at present is taken from Dall's Creek by an 18 inch flume four miles long, to the inlet, or western end of the pipe. From the outlet or eastern end of the pipe, the water is conveyed through a flume of the same size, nine miles long, into Virginia and Gold Hill, where it connects with the present city pipe system. In the future the water from Marlette lake will be conveyed to the inlet of the pipe, and be added to the supply from Dall's Creek.All the iron pipe used is coated, inside and oat, with a mixture of asphaltum and coal tar, thoroughly boiled to gether, each separate piece being plunged and rolled about in a bath of this mixture for from st.ven to ten minutes before being shipped to its destination. The a verage diameter of the pipe is $11 \frac{1}{2}$ inches, and its entire weight about 700 tuns. Nearly one million rivets were used to manufacture it, and some 35 tuns of lead were required in making the joints. At the point of heaviest pressure the iron is No. 0 thick, and is hot riveted with five eighths incli rivets, there being a double row on the straight seam and a single row on the round seam. The pressure grad. ually decreases as the ground rises to the east and west, and the iron decreases in thickness from five sixteenths to one sixteenth of an inch toward both inlet and outlet. But on its course to the outlet, it having to cross a great many spurs and sags, the iron varies of course according to the pressure.
The inlet has a perpendicular elevation above the outlet of 465 feet, but just now only 300 feet is used, as this head will sup. ply ten times as much as the two townshave heretofore had. This head carries into Vir. ginia about $2,000,000$ gallons every 24 hours ; and by increasing the head to its fullest capacity, the supply can be increased to 2,350 ,000 gallons per day.
Fig. 1 will convey an idea of the country over which this undertaking was carried out as it shows the profile of the pipe. The remaining engravings represent various ingenious plans adopted in the construction. Fig. 2 shows a lead joint in detail, said to be pertectly tigh and safe. One of these joints is made between every two leugths of pipe of 26 feet 2 inches in length each; $a$ is a wrought iron coliar, always one sixteenth thicker than the thickness of iron in the respective pipe, leaving a play of three eighths of an inch between the inside of the collar and the outside of the pipe. The collar is five inches wide. $b$ is the lead which is run in and caulked up ight from both sides three eighths inch thick; C is a nipple of No. 9 iron, riveted in one end of each pipe.
Fig. 3 shows the method of tightening leaky joints. At A is the clasp, the application of which, for forcing back the lead where it works out on account of the longitudinal expansion and 'contraction of the pipes, is clearly evident. A clamp is used to keep the lead afterwards in place. Fig. 4 is the elbow used for making short curves in the line of the pipe around rocky bluffs, hrough sharp cañons, etc. At B are angle irons riveted on the pipe on the outside of the curves which, by means of iron straps, are connected with the corresponding angle iron on the next pipe Fig 4 shows the manner in which the pipes and abs in strapped together, wherever the curve was sutficiently short to require this precaution against an outward movement. The iron strap is put on the outside of the curve to strengthen the pipe. Fig. $\overline{0}$ shows the self-acting air oi` vacuum valve, used at each high point on the line of pipe. When the water is on, the valve, $A$, is kept wide open ; the small valve, $C$, is shut, while the valve, $B$, is shut by the
pressure. If any air accumulates in the pipe, on the elevation where this air cock is placed, it is occasionally blown off, by opening the cock, C. Should a break occur in the main pipe line at a point lower than the air cock, and within its district, the valve, $B$, falls down and admits the air into the main pipe so as to prevent a va cuum. Should the valve, B, get out of order, the valve, A, is shut, and the other valve, B, taken off and repaired. After a break on the main line is repaired, and the water let
on again, the valve, B, being down or open, the air rushes


HYDRAULIC ENGINEERING IN NEVADA. only to close when the water begins to escape.
From the time of commencing the manufacture of the pipe until the water rau into Virginia City, only five months elapsed, ending in August last. The Risdon Iron and Locomotive Works constructed the pipe, and the credit of the accomplishment of the undertaking is due to the engineer, Mr. Herman Schussler
It is difficult to say which characteristic of our Western engineers is the more remarkable, the courage with which they attack the most stupendous and difficult problems, or the Euergetre."


Hydraulic engineering in nevada. It is a copy of a decree made
in the ninth year of the reign of Ptolemy III. (Ptolemy Euergetes) by the priests of Figypt, assembled in solemn conclave at the great temple of Osiris, in (anopus. which is called, in the decree, the " Temple of

Of this magnificent temple not a fragment now remains; indeed, its very position can only be conjectured. As to the town of Canopus itself, the visitor may trace its site by the high mounds of rubbish over it. It was built on a high promontory (a little to the west of the bay of Aboukir), about fourteen miles to the east of Alexandria. For many years past, nothing of its buildings above ground could be seen, and lately the very foundations have been dug up to provide stone for the fortresses now building on the spot, by order of the viceroy, Ismail Pasha.
The position of Canopus, on one of the large canals or mouths of the Nile, and on the high. est ground to be found for many leagues along the coast, must have made it healthy and pleasant; and it was a very flourishing, but, at the same time, a most dissolute, city. There was an open space, planted with trees, in front of the temple. On either side of it were altars belonging to the temples of the first order. After offering sacrifice upon these, and performng the necessary ceremonies for the apotheosis of Berenice, the assembled priests made the decree recorded on the stone.
One of the most remarkable points in this decree is the assigning Divine honors to a living person.
To the Egyptians, not the least esteemed prizes of their King's victory. were the images of their gods, which Cambyses, the Persian conqueror of Egypt, had carried off; and in grati tude for their recovery, his subjects conferred upon Ptolemy the title of Euergetes (the benefactor).
It praises the King's great care for the sacred animals, especially for the worship of Apis and Mnevis.
After setting forth the merits of their rulers, the promptitude and celerity with which they carry out their and proclaiming the extraordinary honors to be offered to ideas. There is a great future for a country which produces them, the priests established a fifth priestly tribe, for no uch men and such a a hievements.

## Hitherto, almost CANOPUS STONE.

Hitherto, almost the only guide for interpreting the higro glyphics with which the monuments of Egypt are covered has been the Rosetta Stone, brought to England by the British army, after the expedition of 1801, and now in the Bri tish Museum.
But this is in every way inferior to the stone of Canopus. Half the lines it contains are incomplete, in consequence of he stone being broken and the fragments lost; and of the remaining lines many are defaced or illegible; whereas the
stone of Canopus is almost as perfect as on the day it left the sculptor's hand. This inscription was accidentally discovered about seven years since at the southwest corner of Lake Menzaleh, one of the lagoons on the coast of Egypt; and on the old Tanitic branch of the Nile are the ruins of San, the Zoan of Scripture. It is a place very little visited, being remote and not easy to reach. But to judge from the numerous obelisks, statues, and remains of temples still existing there-especially that of Rameses II.-San must once have leeen a place of much importance. About five years ago a portion of the west wall of the temple of Rameses fell, and exposed the corner of a stone covered with Greek characters. in this state the inscription remained some time; at length its value was perceived, and it was removed to the Viceroy'smuseum at Boulac. It is of fine grained limestone, of light gray color, about seven feet high, two and a half feet broad, and the same deep, and bears three inscriptions, each on a separate side, in hieromplic, in (treek, and in the Hi glyphic, in Greek, and in the Hi ratic (or Egyptian) characters.
It is a copy of a decree made  them, the priests established a fifth priestly tribe, for no
other apparent reason than because the king's birthday was the fifth of the month Dios. And then they pass on to the real business of the meeting.
In addition to the three monthly festivals of the Euergeræ, on the 5th, 9th, and 25th days, "decreed in a former proclamation," they ordain that a general public festival for five days shall be held every year, in honor of the Euergetæ, commencing on the day " on which the star of Isis rises," "which in the sacred writings is considered New Year's day." Now in this 9 th year of the reign of Euergetes, the rising of " Si rius" occurred on the 1st of Payni (July 19th) and they de cided that this 1st Payni, reckoned according to the common computation, should be the first day of the Euergetan festival for four years. And that every fourth year, one additional day (besides the usual five intercalary days) should be kept as a public festival in honor of the rulers; thus introducing on every fourth year six instead of five intercalary days.
By the former of these two provisions, the priests introduced the Sirius year of $365 \frac{4}{4}$ days, in place of the common year of 365 days; and by the latter means, placing their reform under the protection of the monarch, they provided for the surplus six hours in every year, while by making the extra intercalary day a general festival, " both in the temples and throughout the whole country," they kept it in the people's memory.
The inscription does not inform us in what year this sixth intercalary day
was first to be kept, but it is natural to suppose that the new
arrangement would be brought into force as soon as possible, arrangement would be brought into force as soon as possible, that is, in the then existing year.
It is prolable that this reform of the calendar was not of fected with $\%$ ut, much opposition. It lasted through the reign rf Ptolemy III, But in B. C. 222-1 he died; his son Ptolemy Philopate: succeeded him, and then this sixth intercaluty day was no longor kept. There seems to have been a reaction Sirius the gear was no longer observed, and the common year, of his days only, again prevailed. The old irregularities radually became apparent: and the reform, which in consequence became necessary, was effected during the reign of $A_{1}$ rustus in the year B. C. 26.
The latter part of the inscription recounts the honors de creed to the deified Princess Berenice. Her statue is to be placed in the areat temple at Canopus, near the statue of Oimis. In all temples of the first and second orders, a statue of her, m:ade of gold and adorned with jewels, is to be kept in the adytum; a four days' festival in all the temples is to bs kept in memory of her, beginning on Tybi 17th (March 7 thi), the day on which the mourning for her ceased and her apotheosis was decreed. On the festivals of the other divinities her image is to be carried in the processica. Hymns are to be sung in her honor, and regular rations given to the maiden daughters of the priests who do service to her.
Lastly, the presiding high priest in each temple, and the temple scribes, are charged to set up in every temple of the first, second, and third order, and in the most conspicuous place, a copy of the decree, carved in Hieroglyphic, Egyptian and Greek characters,on a pillar of stone or brass
Gut of the many copies that must have existed, this is the only one hitherto discovered.

## Correspmadence.

## The Ventilation of the United States (i) the Editor of the Scientific American: <br> Allow me a few words of comment on the article on ventiliting the Senate Chamber in your issue of December 13,

Vectilation is a very simple thing; and to secure it, it re$q^{\prime \prime i}$ ires only to be not prevented or obstructed. Nature will ventilate ary apartment if it is only allowed to do so. As equily a; a man draws his breath, so will an apartment, crowded or cot, ventilate itself if it be allowed a throat to
$d_{\text {: }}$ it with. ' Jo derise fans, steam engines, exhausts, or injeetors to vrotilate the senate or other house, is only fool ishly trying to help Nature to do work which she can better क) withcut ielp. It would be no more absurd to invent a whirligig to put into a man's mouth to help him to draw his heath than it is to devise an injector and an exhaust to force in pure and draw out impure air to and from a room. To help a river over a waterfall is not more preposterous than, by moving apparatus, to accelerate the entrance of
fresh and the exit of foul air from a crowded hall. The same force which makes the water descend, gravity, forces cold air unde: hot air and makes it ascend. If the foul air of a crowden hall could be seen and handled, the nature of its movemenis would have been long ago as well understood as those of water. Supposing foul air were the color of dense smoke, it would be seen to accumulate at the ceiling. If it could be seen that it always tended upwards, a hole in the roof would be the natural result of the desire to get quit of it. The amount of haziness regarding this simple matter in the minds of scientific men is unaccountable. The thousands of pounds and the amount of abortive invention spent on the ventilation of our Parliament Houses might make the angels weep,and all for what? To force atmospheric air to obey a law of its nature, which it cannot of itself disobey. As the sparks fly upwards so will heated air, if it is not restrained; and herein consists the whole secret of rentilation. It needs no device to float a cork; neither does it need any machine, fan, steam engine, exhaust, or injector to purify the air of the Senate House. All that is strictly re quired is an entrance for fresh air below, and an exit for foul air above. These provided, ventilation will work in spite of all the wrong headed theories of the savans and without the well meant but useless inventions usually erected to assist Nature. If these holes are large enough, no hall need le cither impure or oppressive. If the place be talf filled, the supply of pure air will be enough. If crowded, it will be augmented to meet the larger demand. Every person who enters is a machine to make the current n:vards and outwards work more vigorously; and every one who leaves deducts from the demand and the power to suppiy. The atmosphere is a nicer balance than ever man
made, and vibrates to a counterpoise infinitesimal beyond made, and vibrates to a counterpoise infinitesimal beyond
his crucoption. It is a comfortable as well as an undeniable fac: til:st the objects which require ventilation are the very mean; to create it. Fires, lighta, and man himself, if they consume pure air, also heat it, causing it to ascend and give place to a new supply, which in turn is consumed, heated and pushed upwards. This process, which is never ending, is simple, admirable, exact, and complete. It requires no ssistance, has worked from the beginning of time, and will work, though there be neither savan nor machinist in ex istence.
If our halls, like the ancient Greek, were without roofs, ventilation would cause us no thought. The foul air from our lungs and bodies would ascend right into the air, and a fresh supply would come down to us through the same opening. But our houses and halls are ceiled, and the currents are prevented taking their natural courses. Even in a cending and descending currents through it would supply
all the ventilation required by a crowded assembly. But it is more convenient, as the modern fashion of buildings is and as our climates require, to admit our fresh air at the ower part of our houses instead of at the top. By this mode smaller opening in the roof suffices. A very much here I beg to take exception to a statement in the article re ferred to. It is there said that the machinery injects 25 cubic feet of air per minute for every man of 1,200 assem bled, or it is capable of doing so. This quantity is ridicu ously overdone. A man does not consume even one foot of air per minute by breathing; 15 inhalations of 60 cubic inches each make only 900 , and a cubic foot contains 1728 Take man by man in an assembly, half a foot per minute is all each will consume. One can inhale through a half inch tube more air than he requires. Even a quarter inch one will not oppress him much. I speak of a round tube, but, if you will, take a square one. Of this a square foot will re present 576 persons' breathing area, and will admit air suffi cient to supply that num ber. It may be said the velocity of air into a crowded chamber is not so great as that of the air through the tube when one breathes by it. But it is to be remembered the air is passing into the lungs only half the time, while the inward rush to supply an assembly hall is constant. The fact is the current inwards and outwards in a chamber, ventilated in the natural way which I indicate, quite as fast as the current in and out of a man's windpipe Bupt in an assemby ball at night, the lights must be sup plied with fresh air as well as the occupants. I need hardly mention fires, as it is not usual to have them in such places mention fires, as it is not usual to have them in such places
If they be used, they also must have their supply of air, and they will take an amount of inlet for themselves, equal $t$ the united areas of their chimneys. I suppose there are no fireplaces in the Senate Chamber; but a crowded hall get heated, and an extra supply of air is demanded on that ac count. If such is the case, it calls in its own supply. The relocity both inwards and outwards increases and the tem perature falls. If the air of a hall be pure, heat is not so oppressive. It is impure air that exhausts and makes peo ple pant. Taking your estimate, 1.200, as the usual numbe in the Senate Chamber, a hole in the roof equal to two quare feet, with an under inlet the same, are ample to sup ply all the breathing air rec; ired. The lights may be al-
lowed as much, and the hea' an equal space. As a large lowed as mucb, and the hea' an equal space. As a large
hole is about as cheaply made as a small one, and as plenty of outlet does not affect the pe iple below, the openings may be made double or even treble the size mentioned withou fear of inconvenience. These ol enings must be free to the tmosphere, but may be made with lonvres to keep out the ain. A hinged whylight is as good as anything else. As a istern of water will be emptied if any sort of hole be drive hrough the bottom, so will a crowded hall be refreshed i any sort of hole is driven through the roof.
I am sorry I did not get admission to the Senate House when I visited Washington, else I might be more precise in my suggestions. But I believe that there is a ceiling beween the outer roof and the audience, ant that this ceiling is pierced with ornamental fretwork, and that the piercing equal in area to what I have indicated as necessary for is equal
outlet.
The inlet oi fresh air is the next thing to be consid red; and while it is equally simple in principle as the out et, it is nct exactly so in practice. The outlet may beany where in the roof. It may be far larger than really required It may be one large opening, or it may be many small ones. The inlet must be a great many amall openings, or a disagreeable current will blow in one place and inconvenience those near it. But even this is a simple matter. An open ing in the masonry under the joists of the floor, communica ing with the outer air, will allow a fresh current to rise hrough small gratings in the passages between seats. Or if the corridors have proper air holes, a supply to the main hamber may be got from them by slits above the doors. Or ar may be let in along the channel where lie the heating pipes and allowed to find its way to the chamber through mall grate work along the base of the wainscoating. The modes for small inlets are endless. And let me say the united areas of the divided inlets need not be so great a those of the outlets, because they are supplemented by chinks of windowe, thresholds of doors, etc. I would im press on all objectors that no inconvenience from the cur ents will be felt, if an inlet area of 8 or 10 feet be properl cattered over a room of the size of the Senate Chamber
Allow me a few words on the long pipe proposed, to suck he air from the park 220 feet off. I do not know what purer air people would wish than that at the Capitol. It blew on me as fresh as mountain breezes. It is all people have to breathe who are walking outside; and if those inside get the rame, what else do they want? One undeviating law of air currents is that they always take the shortest avail ble cut and depend upon it, the ventilating air of the Senat ouse will never run through a long pipe if it can get in a an open door nearer its work. The whole thing is of a piece
with the London delusion, and indeed is a counterpart of it with the London delusi
from beginning to end.
Paisley, Scotland.
Wm. MacKean.
To the Editor of the Scientific An:W!?
I have read an article in your issue of Decembsr 13th, 1873, n the above subject, and I understood the difficulty (remedied by the charges described) to be the want of sufficient rea, and the proper arrangement of the air passages from he old fan to the Senate Chamber. Unless there is some mistake in your explanation, there was, in my opinion, no necessity for the new fans, engine, and the two air shafts,
which in all probability occasioned a large expenditure. I venture my opinion on these grounds: You say that the capacity of the old fan was 80 revolutions per minute, discharg ing 500 cubic feet of air at each revolution, making in al 40,000 cubic feet of air per minute; and that in consequence of the defect, it was producing but one fourth of the ventila tion that it had the capacity to furnish. As you state the capacity of the new fans to be 30,000 cubic feet per minute it appears there was at least no want of capacity in the oid fan, and that in comparison with forced ventilation, there is no advantage in ventilating by exhaustion. In ny opinion Mr. Hayden selected a very indirect, as well as an extrava gant, method of remedying a very simple matter.

Chicago.

## Mental Arithmetic

## To the Editor of the Scientific American:

The young mechanic who hopes to excel in his chosen rade should endeavor to become skillfill in mental arithme ic ; and at the last analysis, all computation is strictly men al, the figures employed being only tallies t . r record resulte. I will give a table illustrating the theorem that the product f any two numbers is equal to the square of half their sum ess the square of half their difference, that long practice proves to be a useful method of multiplication.
$6 \times 6=36=\boldsymbol{6}^{2}$
$7 \times 5=35=6^{2}-1^{2}$
$8 \times 4=32=6^{2}-9^{2}$
$8 \times 4=32=6^{2}-2^{2}$
$9 \times 3=21=6^{2}-3$
$10 \times 2=20=6^{2}-4^{2}$
$11 \times 1=11=0^{2}-5^{2}$
This theorem may be expressed algebraically, thus: ( $a-\mathrm{x}$
$x(a+x)=a^{2}-x^{2}$, and numerically as in the table.
Suppose it is required to multiply 53 by 47 . Half thelt um is 50, the square of 50 is 2,500 , and the answer sought is that sum less $3^{2}=9=2,491$. In practice, such an exam ple can be solved almost instantaneously. If 47 times 54 were required, proceed as in the example and add $4 \pi$ to the product.
To use this method, corsiderable knowledge of square numbers and of some of their remarkable properties is required; and the careful study of difference series will be heneficial. This study has proved an excellent means of intiating pupils into the mysteries of square and other roots, nabling them to become proficient in a short time. There are many similar things in the curious and wonderful science of numbers that, like the magic squares given in your issur of December 20,1873 , are of far more value than is generally upposed. Let some one arrange them in a auitable form and put them into the hands of the Yankee bny.
New Britain, ('onn.
F. H. R.

The Relative Attraction of the Earth and the Sun To the Editor of the Scientific American
The semidiameter of the earth is, in round numbers, about 4,000 miles, and that of the sun 425,000 miles. An object situated on the surface of the earth will, therefore, when turned toward the sun, be 22,874 times farther from the center of solar attraction than it is from the center of terrestrial attraction; and when turned from the sun, it will be 22,876 times as far from the sun's center as from the carth's center. Now as the strength of attraction varies inversely as the squares of the distances, the pull of the earth's mass will be 22,874 times as great (on a body on the surface of the earth turned toward the sun) as the pull of an equal solar mass will be and when the object is away from the sun, the pull of the earth will be $22,876^{2}$ times as great as the pull of an equal solar mass. But, as the sun's mass is estimated to be 215,000 times as great as the earth's mass, the total pull of the sun
an object in the two supposed situations will be : $\frac{15,000}{22,874^{2}}$ 315,000
and $\frac{22,878^{2}}{2 i m e s ~ t h a t ~ o f ~ t h e ~ e a r t h . ~}$
$\frac{315,000}{22,874^{2}}=\frac{315,000}{523,176,276}$ and $\frac{315,000}{22,876^{2}}=\frac{315,000}{523,211,376}$ or $\frac{1}{1,660,877}$
nd $\overline{1,660,688}$.
Now if the foregoing estimates be correct, there must be, in certain situations, a sensible difference between the weight of a given mass when on the surface of the earth in the direction of the sun, and the weight of the same mass when the earth has turned it away from the sun. This could be verified by experiment.
Let the place be at the equator, and the time of the exper ment be one of the equinoxes. Suppose scales to be constructed of the capacity of several tuns and of the utmost possible delicacy. Now let us try our experiment with o weight of 10 tuns. Its weight at noon will be $10 \mathrm{~T}-166 \frac{1}{0} 87:$ of 10 T . and its weight at midnight will be $10 \mathrm{~T} .+\frac{1}{166} \frac{1}{013} \times 4$ of 10 T. or: Noon $w$ c.ight $=20,000 \mathrm{lbs} .-12 \mathrm{lbs} .10$ drams $=$ 19,987 lbs. 15 czs. 6 drams. Midnight weight $=20,000+1$ ? lbs. 8 drams $=20,012$ lbs. 0 ozs. 8 drams, making a difference between the noon weight and the midnight weight of 24 llss . 1 oz. 2 drams.
If astronomers have miscalculated the relative masses of the sun and the earth, will not this experiment indicate the fact? And if we experiment in the same manner with the moon's attraction, may it not lead us to modify nur state. ments of relative masses still further? And, moreover, may it not lead to a reconstruction of our tables of distances? If the principles set forth herein be correct, would not such an experiment be as worthy the interest of the great powers as are those expeditions of ohservation, so munificently aided, ta
make the transit of Venus and the total eclipse of the su contribute to our stock of astronomical knowledge? Brownville, Neb
W. B. Slaughter.

## Adjusting Jonrnal Boxes Horizontally.

## To the Editor of the Scientific American

Apropos of recent suggestions for taking up the wear of journal boxes, permit me to say that there is a common error among machinists to the effect that the wear upon the side of the main journal box nearest the cylinder is double that on the side opposite. Strange to say, the same idea is advanced as a theorem in a work on machine drawing, recently published by a noted writer on graphics. Some machinists, arain think that the wear is equal on each side of the center. The following is a demonstration of the true case:

The diagram be ing the skeleton figure of a locomo tive or stationary engine, let A, the point of traction on belt or rail, be taken as the axis
of moments.
Let $\mathrm{P}=$ pressure on piston, let $\mathrm{x}=$ pressure on front of box at 0 , let $y=$ pressure on back of box at 0 , let $R=$ radiu of wheel, and $r=$ radius of crank. With crank pin at $C$, we have $x=\frac{P \times(R+r)}{R}$ by equaling momenis. With crank pin at $B$, we have $y=\frac{P \times(R-r)}{R}$. Whence $x \div y=$ $\frac{\mathrm{P}(\mathrm{R}+\mathrm{r})}{\mathrm{R}} \times_{\mathrm{P}(\mathrm{R}-\mathrm{r})}^{\mathrm{R}}=\frac{\mathrm{R}+\mathrm{r}}{\mathrm{R}-\mathrm{r}}=1+\frac{2 \mathrm{r}}{\mathrm{R}-\mathrm{r}}$, by performing division But if $x=2 y$, then $x \div y=1+\frac{2 r}{R-r}$ must equal 2 ; whence $\stackrel{2 r}{\mathrm{R}-\mathrm{r}}=1$ and $2 \mathrm{r}=\mathrm{R}-\mathrm{r}$ or $\mathrm{R}=3 \mathrm{r}$. That is, the pressure on the front of box is double that on the back of box only when the radius of the wheel is three times that of the crank.
Or in a locomotive, let $\mathrm{P}, \mathrm{x}$ and y be as before, and $\mathrm{T}=$ train resistance. Then going forward, with crank at $C, x=$ $\mathrm{P}+\mathrm{T}:$ or with crank at $\mathrm{B}, \mathrm{y}=\mathrm{P}-\mathrm{T}$, whence $\mathrm{x} \div \mathrm{y}=\frac{\mathrm{P}+\mathrm{T}}{\mathrm{P}-\mathrm{T}}=$ $1+\frac{\partial^{\prime} T^{\prime}}{\mathrm{P}-\mathrm{T}}$ which, as before, is equal to 2 only when $\mathrm{P}=3 \mathrm{~T}$ The wear on both sides of the box will be equal only when $T=0$. The wear on the front box will always therefore be practically the greater, but not necessarily twice as great. Since the wear is proportional to the pressure, the formulit $x \div y=\frac{R+r}{R-r}$ and $x \div y=\frac{P+T}{P-T}$, may be used to determin the relative thickness of the two sides of the box.
Notwithstanding the weight of the engine throws the point of greatest wear towards the top or bottom of the box the fact of unequal wear, proved above, shows the necessity of making the boxes adjustable horizontally, as suggested by your correspondent.
W. L. C.

Lehigh University, Bethlehem, Pa.

## Animal Electricity and Magnetisin.

To the Editor of the Scientific American:
Among the components that make up the whole of man' vital parts, animal electricity and magnetism are of promi bent importance. Their existence has long been known but almost all else in regard to them seems mystery.
Air when taken into the lungs gives up a portion of its oxygen, which passes into the blood, and, when expired, is converted into carbonic acid gas. The latter gas amounts o about three and a half per cent of the whole expiration In the process a combustion takes place, wherein a portion of the oxygen combines with the blood, and another portion with carbon, to be exhaled as carbonic acid gas. I presume that this combustion or transformation is the cause of ani mal heat. But this is foreign to the present subject. Fara day discovered that oxygen was the most magnetic of al gases, holding the same place among gases that iron does among metals. When reduced to proportions and figures, if 17.5 represents the magnetism of oxygen, air would rate $3 \cdot 4$, while carbonic acid gas is diamagnetic and would be represented by 0.0 . The amount of carbonic acid gas taken into the lungs with air is quite small, but from each healthy person sixteen cubic inches are exhaled per minute, or twenty-three thousand cuhic inches per day. As this gas is composed of carbon one part and oxygen two parts, it fol lows that about fifteen thousand three hundred and thirty two cubicinches of oxygen, charged with magnetism in the proportion above stated, has the total amount of magnetism daily eliminated frorn it by the vital organs of each individual. What becomes of this magnetism thus extracted from the oxygen of the air? It enters the lungs; it does not go out again. The sequence is beyond question: it is taken up by the organism and remains there to be used in the vital forces. Thus in the life giving gas, not only is to be found the property of supporting life, by purifying the blood and furnishing heat for the body, but, also, the magnetism tha performs an important, but a far more subtile part. An at mosphere of pure oxygen, if supplied to the lungs, increase the heat, magnetism, and electricity of the body, by the conversion of a much larger proportion of oxygen into carbonic acid gas, and quickens life to such an extent as to cause death from exuberance. When an absence of oxygen from the blood has almost caused a cessation of magnetic and electric currents in the body, an injection into the circulation of blood charged with oxygen will cause their instant return and just in proportion as carbonic acid gas is exhaled from the lungs, do we find a supply of these fluids remaining. I have referred to animal electricity and magnetism a
dentical. In vital economy I believe them to be so in sourc of supply; and while manifestations of one may be had without the apparent presence of the other, yet there is so much to join them together, and so little to separate them that the day of doubting their identity, in this respect, has about passed. Oxygen and ozone are the same, and yet how different! Are not both different conditions of the sam hing:

John Hill.

## Columbus, Ga.

## THE SILVER MINES OF PERU

by professor jamies orton
Peru was conquered and explored by the early Spaniards under the belief that it was El Dorado; but there are no fa mous mines of gold in the Republic save those of Carabaya. It better deserves the name of La Plutcu, for its Andes ar hreaded with silver. The annual yield of Peruvian silver, however, is decreasing, owing to mismanagement. A thor ugh scientific survey of the country is needed, and then judicious system of mining. We are confident this will re veal

## Rocks rich in gems and mountains big with mines,

That on the high equatorridgy rise."
The most famous silver mines in South America, afte those of Potosi, are the mines of Cerro de Pasco, sixty eagues northeast of Lima. They are situated on the At antic slope of the Andes, over 13,000 feet above the sea where the prevailing rock is conglomerate. The silver, dis covered by an Indian in 1630, occurs in the native state; also as sulphuret mixed with pyrites, with cobrizo (a carbonat of copper and lead, with sulphuret of copper), and with ox es, forming what are known in Peru and Mexico as paco. and colorados. The ore is treated to salt and mercury, but so rudely that generally one pound of mercury is lost to every half pound of silver extracted. Fortunately, Cerro de Pasco is only 200 miles from the celebrated quicksilve mines of Huancavelica. According to Herndon, the ore ields only six marks to the cajou. (A mark is eight ounces and a cajou is three tans). A representative specimen in ou possession contains 0.004 of silver. During the last two cen turies and a half, the mines have produced about $\$ 500,000$, 000. The annual amount of ore mined has been 50,000 caous, yielding an average of four and a half marks, the amalgam containing 22 per cent of silver. Just now, work has nearly ceased, owing to the inadequate means of drain age. But at Cerro de Pasco, as at other places, it has been found profitable to re-work. by the improved modern method the tailings left by the old Spanish miners.
Hualgayoc, fourteen leagues north of Cajamarca, has long ben celebrated for its rich mines; but plethora of water. There are many good mines in the vi cinity of Lampa and Puno on the borders of Lake Titicaca those of Manto, Salcedo, Chupica, and Cancbarani were fa mous in Spanish history. The ores of Huantajaya near Iquique yield from 2,000 to 5,000 marks to the cajou. Mass es of pure silver have been found on the surface of the plain one weighing 800 lbs. Rich deposits occur also in the prov ince of Cailloma, north of Arequipa; and at Yauli, San Ma eo, and other localities near the Oroya Railroad. Extensive veins have been recently discovered at Chileta, the terminus of the Pacasmayo railroad, the oreassaying from $\$ 60$ to $\$ 200$ tun
But the most numerous and promising silver mines of Peru are, without doubt, located in the department of An cache, just north of Lima; not because it is a richer region than the eastern cordillera, but because it is the only district which has been scientifically explored. This has been done by the accomplished naturalist, Professor Raymondi, under the patronage of Mr. Henry Meiggs. The report just pub ished at Lima contains assays of specimens from the most valuable mines in which the silver occurs. It appears: (1) That silver is not very common in the native state. (2) That he minerals richest in silver are pyrargyrite ("rosicler" or uby silver) and stephanite (brittle silver glance). (3) That he greater part of the silver, however, is extracted from trahedrite, galena, and many mineral oxides (pacos or color ados). The pacos richest in silver ore are those which result from the oxidation of stephanite and pyrargyrite; the poor st are found in great part of oxide of iron, in which the sil er is minutely disseminated in the native state. (4). It is worthy of notice that the silver ores are constantly associa ed with antimony. Even the galenas having a cubical tructure always contain a small percentage of antimony.

## New House

The coincidence of a man's moving into a new house and ying soon after has frequently been a subject of remark, and there is an avoidable cause-the house is moved into efore the walls and plaster and the wood are sufficiently ried. Sometimes the cause of death is the poisonous character of the water conveyed through new lead pipes. No water for drinking or cooking purposes should be used in a building supplied with new lead pipes, in whole or in part, for at least one month after the water has been used daily his gives time for a protecting coating to form on the inner surface of the pipes, when their chemical change from conact with water generally seases.
But the damp materials of the househave the most decided effect, especially on persons over fifty years old or of frail constitutions; whereas if the person were in the full vigor of life and health, not even an inconvenience would be erperienced.
In building a new house, or on going to live in another loality where the water supply is not far from the house, it should be ascertained with the utmost certainty that the
spring or well is higher than the privies or barnyards. In sidious and fatal forms of decline and typhoid very often re sult from persons drinking water which is drained from the localities named.
The safest plan, and the only safe plan for furnishing dwellings with the most healthful and unobjectionable wa ter, is to have a watertight cistern, and let the water from the roof of the house or barn, or other outhouses, be conveyed into it through a box of sand several yards long, this box to rest on a board, or cemented bottom and sides, so that no outside water could not get into it.-Hall's Journal of Health.

## Solvent Powers of Water

Water is a physical rather than a chemical agent in bleach ing and dyeing; it is tie vehicle which carries the chemical substance to the cloth to be operated upon, or which removes he matters necessary to be removed from it. When a sub stance is mixed with water, it may either be dissolved by it and disappear, as salt does; or it may remain in suspension as chalk does. Nothing is considered to be actually dissolved in water if it can settle out again, or if it will not pass with the water through a filter made of paper or calico; thus to talk of dissolving ground chalk in water is incorrect, for f allowed to stand it would settle out; or, if the mixture were filtered, the water would pass clear, while the chalk would emain upon the calico; but blue vitriol (sulphate of copper) or example, does really dissolve in water, and the liquor al flters through together; to deprive the water of the blue itriol would require chemical means different in kind from filtration. Water, therefore, dissolves some substances and not others. Water does not dissolve the same quantity of all soluble substances; of some it can dissolve its own weight, and more; of others a small portion; and of some ex tremely little. As a rule, hot water dissolves more than cold, and more quickly than cold: but, upon cooling, the excess ostly falls out as crystals. This point deserves notice, for liquor, which is of right strength when a little warm, may e too weak when it becomes cold; left in a carboy, for ex mple, in a cold place, because the salt crystallizes out; his is the case only with those salts that are but sparingly soluble, as chlorate of potash, cream of tartar, sulphate of potash, etc. The crystallizing is sometimes troublesome in team colors which, right enough wien freshly made, become filled with small crystals, and rough on the machine; it is elt in the case of an ageing liquor, which contains chiorate of potash as an active agent, which, crystallizing out, leaves the liquor weak and not able to do its work. As a usual thing, the drug room upon a printing or dyeing works should e cool, but there are some liquors better in a moderately warm place; brown vitriol, for example, in winter time is apt o go solid in the carboys, if kept in an exposed place.-Am. Tex. Manuf

Sir Richard A. Glass.
Sir Richard Atwood Glass died recently at Sou thampton, aged 53. It was at his factory that 1250 miles of the first Atlantic cable of 1866 was wholly constructed, under the direction of Mr. Glass, who, on the successful completion of the undertaking, after ten years of unremitting labor, received the honor of knighthood. He retired from the company in 1867, and afterwards became chairman of the Anglo-American Telegraph Company. He was for a short time a member of the House of Commons.

## The Detection of Death.

The late Marquis d'Ourche, one of whose friends was buried live, left a sum of 20,000 francs $(\$ 4,000)$ to the French Academy of Medicine, to be given to the inventor of a simple process of ascertaining when death has really occurred, and a further sum of 5,000 francs to be awarded to the discover of a scientific method of verifying death. Altogether 102 essays were sent in for adjudication. Most of the papers ontained such absurd suggestions that the list was practically limited to 32 competitors. The large prize was not warded, but the 5,000 francs weredividedbetween four competitors. No new facts, likely to enlarge the domain of forensic medicine, have been elucidated by these investigations.

Messrs. Macnatght, Robinson, \& Co.. of Southwark, London, England, have sent us diagrams of a most complete system of wrought iron girders for building purposes, made by them and kept constantly in stock. Their sections are cheifly of the double T form, and range from 2 to 6 inches in width, and from 3 to 14 inches in hight. The list also includes flitch plates, bolta, nuts, washers, etc., an arrangement very convenient for builders, who by consulting the chart can ascertain the approximate cost.

We have received from Messrs. (ioodnow and Wightman, of 23 Cornhill, Boston, Mass., an illustrated catalogue of tools, lathe attachments,and machinists' supplies, which provides for nearly all the possible wants of model makers and experimenters in mechanics. The line of small gearings is extensive and comple te, and the book describes several now gages and combination tools, of value and interest to all inventors and amateur mechanics.

A New Application of Gypsom.-Gypsum mixed with 4 per cent of jowdered marshmallow root will harden in about one hour, and can then be sawn or turned, and made into dominoes, dice, etc. With 8 per cent of marshmallow, the ardness of the mass is increased, and it can be rolled out into thin plates, and painted or polished.

## IMPROVED PATENT CANDY CUTTER.

This machine is intended for cutting "beefsteak" and other candies in which nuts, etc., are intermingled, and which are cut from a loaf-like mass into slices while warm. The apparatus consists of a knife reciprocating to cut the candy, and provided with means of constant lubrication to prevent the adhesion of the warm candy, and to cause it to cut more freely.
The frame supports a table and a beam, on which the operating parts are mounted. The candy is made into a long loaf-like mass, with nuts, etc., and placed on a long movable board, A, and against a block on its back end. This board is fed up under the knife as slice after slice is cut off. The box, B , incloses the candy on the sides to hold it in place and in shape, and remains stationary, while the candy and its supporting board is moved up. The wheel, C, is turned by a hand crank, and rotates a smaller wheel having a fly wheel on its shaft. This fly whee has a connecting part, D , from a bearing on its rim to one on the knife frame, E, to driv the knife back and forth to cut the candy The knife frame has guide bars at its ends playing back and forth in bearings, $F$, on posts attached to the beam, as shown. The bear ings move up and down on the posts, and the latter are hollow, with one side open. The bearings connect with vertical screws within the posts, so that they may be raised or low ered by turning the screws, to feed the knife as it cuts. These screws have bevel pinions on their top ends, gearing with bevel pinions on the shaft, $G$, which extends over both posts. The shaft is turned by a hand crank, to raise or feed the knife on the candy, regu larly at both ends. The edge of the knife moves through boxes on each side of the candy, which contain sponges saturated with oil, for lubricating as above noted. These boxes are borne by arms from bearings, so that they will move up and down with the knife and kee the lubricator to its edge. The board, A, is moved up by pinion and rack underneath, not shown, with suitable ar rangement for gaging its feed, to regulate the thickness of the slices uniformly.
This machine has been in use in the shop of J. Essig candy manufacturer, Keokuk, Iowa, for the past six months, and, we are informed, has given perfect satisfaction.
For further information and purchase of patents and rights, address the patenief, Francis Quinn, Keokuk, Iowa Patented October 1, 1872, and October 14, 1873.

## IMPROVED FURNACE BRIDGE WALI

The invention which we illustrate herewith is a bridge wall, constructed so as to produce the same action on the flame as the flat wick does in the lamp, namely, forming it into a thin sheet or, rather, breaking the flame into thin sheets, thus preparing the flame before charging it with rents of air so that the latter can penetrate ever pour The result is claimed to be nearly perfect combustion
Fig. 1 is a side elevation of a boiler set in brick work, which a portion is removed, showing an end view of the bridge wall in position. Fig. 2 is a vertical section taken through the bridge wall, back of the fire box. A is a con duit or pipe, having its outer end on the outside of the brick work, and extending across the back of the fire box, entering into the conduits, B B, at the opening, shown at G, Fig. 2. This pipe, A, is for the purpose of conveying the air and also heating it before entering the conduits, B. It is protected from the direct action of the fire by the brick work shown at E, Fig. 1. B B represents two air conduits ar ranged in a vertical plane passing longitudinally under the boiler. The portions which are exposed to the gases or flame present waved surfaces, and are so arranged in rela tion to each other as to form a ziz.zag or serpentine flue, through which the flame or products of combustion are com pelled to pass on their way out of the fire box. It will be noticed that the top and bottom of the zig-zag flue terminate cearly in a point. In this portion of the conduits are perforations or a continuous slit for the admission of air, striking the flame cross wise, in fact in every direction (as shown by arrows in Fig. 2), on its way through the zig-zag flue. It will also be noticed in the form of this flue that a di rect line is avoided. The ob ject of this is to cause the flame, when it strikes the flue to be completely broken $u_{p}$ into thin sheets, and thus pre pared so that the air can pene trate every portion. At the same instant, therefore, tha the flame is broken up, it is thoroughly charged with cross currents of heated air in ever possible direction, producing combustion of the gases before entering the stack. C is an opening into the side of the gas burner, where the connec tion is made with the pipe,A. D shows a wall closing the conчо!ұәәа between the after par:
of the boiler and fire box, compelling the products of combustion to pass through the zig.zag flue. The inventor states that this bridge wall has been thoroughly tested, and that the advantages gained by its use are, first, a saving of 25 per cent of fuel ; second, the benefit of the coke or solid part of the coal, which, under the present construction of furnaces, it is claimed is wasted; third, all the sooty matter is consumed before reaching the stack, and also all the gases, so that but a very small portion of the heat escapes.
The improvement is further claimed to be efficient and urable, not liable to get out of order, and to require no at tention after being set in its place. It can be applied to both locomotive and marine boilers. For further particulars ad.


Quinn's patent candy cutter.
dress the inventor, Mr. W. F. Beecher, 93 Seneca street Cleveland, Ohio.

## THE BAFFLE DRILL-PROOF SAFE

An ingenious contrivance has recently been patented by Mr. Henry Goering, of Birmingham, England. Experience

has shown that a skilled thief, as a rule, by boring a num ber of holes through the chilled plate to which the lock of a safe is attached, invariably succeeds in removing the lock bodily, and the safe, with its contents, may then be dealt with at leisure.

beecher's furnace bridge wall
consists in the arrangement, at the back of the door and in front of the lock, or at any other required part of the safe, of a series of cylindrical steel rods, free to turn in a frame or bearing pieces. These rods are arranged side by side, and as near together as is compatible with their perfect freedom of motion, excepting immediately in front of the key hole in the door, at which part a space is left for the passage of the key to the lock. One or two series of rods may be used. Where two are employed, the axis of one of the series may cross the axis of the otherseries, or be placed perfectly parallel with it at pleasure. The patentee provides flat or angular rotating bars, which may be employed instead of cylindrical steel bars. The practical effect of the use of these steel rods is simply this: When the door of a safe or strong room is provided with theinvention, the burglar's drill, after it has drilled through the plate of the door, comes against one or more of the rotating steel rods, which, under pressure of the drill, turn on their axes and move from under the drill, which is thus prevented from obtaining a bearing upon them. By this means access to the lock, for the purpose of picking or destroying it, is prevented. Wherestill greater security is desired, a plate of hardened steel or chilled iron is fixed in front of the steel rods. This plate is pierced with angular perforations, or armed with ribs or projections on the face turned towards the outside of the safe; and in use these perforations or ribs intercept the drill of the burglar, which is either broken or so much injured in contact as to be almost noperative before it can reach the steel rods. At a public trial, says IIardioare, Metals, and Muchinery, a number of hard steel drills were put through the iron and steel plates with a ressure of from 12 to 15 cwt . behind the drills; but when the latter touched the revolving steel rods, they failed to bite, and were in nearly every case broken. Beyond this, the clicking of the revolving rods, when touched by the drills, was quite loud enough to raise an alarm sutficient, in ordinary cases, to frustrate any burglarious enterprise

## On Some Metallic Spectra.

(1). Lead. When the induction spark from an electric coil passes between two electrodes of lead, the spectrum consists merely of narrow lines; when the electrodes get covered with oxide of lead, there are the numerous characterstic bands, and some of the lines then disappear while thers retain brightness. The action of the condenser it it in if almost axal he lines, and, where they are extinguished through oxida tion, the condenser restores 'iem. (2). Chloride of gold. In
a gas flame, this gives maguificent bands crossed by slightly a gas flame, this gives maguificent bands crossed by slightly
nebulous lines, extending from yellow to blue green. With he spark in a solution of $\mathrm{AuCl}_{3}$, the spectrum consists of green bands, and a certain number of narrow lines, distri buted between red and violet. The relative brightness of the lines varies according to the mode of operation. The author points out changes undergone by the lines $\delta 506 \cdot 3$ and $\delta 523$ then one modifies the degree of dilution, the length of the an the direction of induced current (3) Thallium, dill he salt of thalles brigh green line $\delta 534.9$, another, faint and nebulous, having for
wave length 568.0 . It seems to belong to thallium, for its elative intensity is maintained with various salts of thallium carefully purified. (4). Lithium. From theoretical considrations, the author was led to expect the probable existence of a new line in the spectrum, having 413.0 for wave length. He obtains merely a trace of this line on passing the induc ion spark in a solution of LiCl , but it can be easily had with he spark in $\mathrm{Li}_{2} \mathrm{OCO}_{2}$ at red heat. Two series of measurement ave 412.9 and 413 for the wave length.-Comptes Rendu Chemical Newos

## ractical Science as a Trainer

Professor Williams, in an interesting article in Nature, re lasting to remarkable practica achievements of Count Rumford says: The main interest of the career of this wonderful man ap pears to me to lie in this, that it affords a magnificent demonstration of the practicai value of scientific training, and the me thodical application of scientific processes to the business of life I have long maintained that every father who is able and willing to qualify his son to attain a high degree of success, either as a man of business, a soldier, a sailor, a lawyer, a statesman, or in any re sponsible department of life, should primarily place him in a laboratory, where he will not merely learn the elements of science, but be well trained in carrying out original physical research, such training being the best of all known means of affording that discipline of the intellectual powers upon which all practical success depends.

## OVERHEAD STEAM CRANES FOR DOCK PURPOSES.

 The Middlesbrough docks, Yorkshire, England, whic have recently been made by the North Eastern Railway Com pany to accommodate their greatly increased shipping traffic, possess many points of interest and novelty, prominent among which is the system of steam cranes employed, a sys tem which we illustrate herewith.It was found that no fixed crane could be kept constantly employed at Middlesbrough on account of the great variation in the length of the ships, steamers, etc., while, further more, as the total area of quay room would be, in the first instance, somewhat limited, the space occupied by a fixed crane would be attended with serious inconvenience. The same objection existed to the adoption of the ordinary con struction of portable cranes, involving a separate line of rails for them to travel on. There was also the further condition that the cranes must be capable of loading and discharging vessels, the sides of which were 15 feet to 20 feet above the level of the quay, as rapidly as lighters, which would fre quently be 20 feet below the quay level, and that in both cases the driver should have a clear view of his work. Under these circumstances it was decided to state the leading conditions to various manufacturers of cranes, and invit them to give tenders and price for what appeared to them best adapted to fulfil these conditions The design adop ted, says Engi ncering, to which we are indebted we are indebted for the engrav ing, was that ent Appleby Broth ers, of London this design, as will be seen from the engraving, consisting of a traveling staging or gantry, on which is mount ed a steam cran d a steam cran of the same con struction as tha sent by the firm to the Vienna Ex hibition (see page 95 of our vol ume XXIX.), and which is in suc cessful use at so many of the docks and har bors in Englan bors in Englan and on the Con tinen
The traveling staging of each crane has a span of 23 feet, cente to center of rails one of the latter being laid close to the edge of the quay, and th quay, and the other in the The clear hight is The clear hight is 17 feet 6 inches which allows the uninterrupted cir. culation of loco motives and all kinds of rolling stock on each of the two lines of rails which are spanned by the panted by the gantry. The tra 12 feet, center to 12 feet, center to
center. The fra center. The fra
ming is composed ming is composed of a pair of timber uprights, braced and strengthened by cast iron brackets, and two ets, and two

It might at first sight appear that the road to carry these cranes must be of unusual strength, but on further consideration it will be seen that this is not absolutely necessary, because the base obtained is so large that there is comparatively little strain on the road, in fact, probably no more than on a line of rails of the ordinary gage, carrying a portable crane of the usual type, working the same loads at the same radius. Several of these cranes have been in successful operation for some time past, and a number more are in course of construction for the Middlesbrough Docks. The system, evidently, has great advantages urder the conditions above named,as well as for working in crowded railway stations, or in stone quarries, timber yards, etc., and it appears singular that an arrangement at once so simple and efficient should, until now, not have been brought into more extensive use, especially for dock and railway traffic.

Sumac.
Sumac is largely used in tanning the finer kinds of leather, especially in the manufacture of the hard grained moroccos and similar goods. It is also employed as the base of many colors in calico and de laine printin?. Probably the consump. tion of this article throughout the country for all purposes aggregates more than 20,000 tuns, thirds a bout two thirds are imported from Sicily, not because just as good sumac caunot be grown in this country, but because, until a few years ago, our people did not know its value, or in what way to prepare it for the market. The sumacs of Virginia. Maryland, and Tennessee in particular are said to be the best in the world, and even their worst varieties have been officially pronounced by experts to be better than any imported from Sicily.
Almostevery farmer has a clump of these bushes. They are called by some "shoemake," by others "red shoemake." Pro. shoemake. Pro
bably many farbably many far-
mers may have mers may have
tried to kill thern by cutting down. If they have, they know how difficult a task it is. It grows like asparagus, all the better for being cut ; and when once started upon a lot and cut upon a lot and cut it is as easy to cut it is as easy to
The only trouble is in curing it properly. This must be done with all the care that is bestowed upon tobacco or hops. Exposure, after cutting, sure, after cutting, to a heavy dew injures it, and a rain storm detracts materially from its value. It is cut when in full leaf; and when properly dried is ground, leaves and sticks together. An acre wrought iron plate girders, which are connected to the tim- ble on its gantry, so that it will travel from end to end, all |in full bearing will produce not less than three tuns; and when ber uprights by four wrought iron plate brackets, strength ened with angle irons. A strong carriage, with the necessary roller path and brackets for the gear required to transmit the traveling motion, which will shortiy be referred to, is firmly bolted at the extreme end of the girders nearest to thedock, while the girders are planked over so as to form a store for coal and water. The crane, and the whole of the substructure, is designed for a working load of 3 tunsa the maximum radius of 21 feet from center of crane post to the plumb line of the lifting chain, while the crane itself is as has already been stated, of procisely the same construc tion as those which have given satisfactory working results elsewhere, with apparatus for altering the radius by steam
from a maximum of 24 feet to a minimum of 14 feet. The traveling motion is transmitted from the crane en gines by suitable gear and shafts to the traveling wheels, and warping drums or capstans are fitted on a countershaft n the inner side of each frame, so that these warping drums can be driven independently of the traveling wheels. This simple addition is found to effect a very large saving in man ual labor and time.
Another great advantage which has been demonstrated by practice is that the cranes can be so readily concentrated shown in the engraving three required; and inded, load a long screw steamer having three hatchways; this is evidently a most important consideration with owners and shippers, especially under circumstances which so frequenty arise where great dispatch is essential. Or two cranes can be brought together for any exceptional heavy lift. The cranes were tested with the maximum working load of 5 tuns, and subsequently for speed, when each crane delivered 50 tuns per hour from the trucks into the steamer's hatch way.
The arrangement we have described may be modified with
vana




The Commissioner of Agriculture advises to plant in rows n order to cultivate between, either by seed or cutting of th roots. We should advise cuttings by all means, as sumac is as tenacious of life as the blackberry or horse radish. It will never need but one planting, and the crop can be gath ered any time from July to the time of frost. If it is cut later in the season, and annually, the leaves and the stocks can be ground together. If the cutting is delayed until the stock has formed into solid wood,the leaves must be stripped from the stock, and the stock is thus wasted. It is doubtful f anything is gained in the weight of leaves after the mid dle of July, at which time almost every tree has completed what is called "first growth" for the season. An auction Gale of 1,406 bags of Sicily sumac, damaged on the voyage f importation, recently took place in Philadelphia, and will $\$ 53$ per tun ; 37 bags sold at $\$ 45 ; 178$ bags at $\$ 72 ; 200 \mathrm{bag}$ at $\$ .59$; 221 at $\$ 66 ; 531$ at $\$ 49$, and 137 bags at $\$ 30$ per tun

Abtificial Alizarine. - Messrs. Lucius and Baüning ox dize anthracene by a mixture of nitric acid and bichromate of potash; the anthraquinone thus formed is boiled with nitri cid, whereby nitrothraquinone is formed; this is then treated with an alkali, and the alizarine formed precipitated by an ch. Purpurin is contained in the product thus formed, fo that made in other colorf actories.-Reimann's F'̈̈rberzeitung.
E. L. C. says that the experimentin the wear of gold coin, eported in our issue of January 17, was not conducted in manner to produce a correct result, as the gold coins used were heavier than the silver ones, which of course would cause greater wear on the gold. The correct way to test
them would be to take a gold coin and a silver one of the same weight, regardless of size; then weigh out 20 pound of each, and proceed ín the manner desc.ibed.
Kingaroo and Ailigator Skins. -The hides of kangaroos are imported in considerable quantities from Australia to San Francisco, where they are tanned. Thiey give a leather quite thin, much more supple than calf skin, and yet less permeable to water. Alligator skin from the South has been used for some time in this city for the manufacture of heary boots for winter wear

The use of Epsom salts is found to give brighter tints to cer tain aniline colors, especially primula and methyl violet. Sul phurous acid is also beneficial for these colors, the tints bein brighter and less readily rubbed off.
Saffrinin.-If mixed with strong sulphuric acid, this dyetuff developes a fine blue tint, becoming emerald green by addition of a little water. By suitable additions of water and acid, nearly all the prismatic colors can be produced.

In some recent experiments on the droera, it was found hat the leaves could reach round and catch a fly anywhere within half an inch of the plant. The flies have to be tied as it takes the leaves about an hour to get round.

## DECISIONS OF THE COURTS.

 United States Circuit Court---Southern District o New YorkIn Equity-Before Woodrut, Judge.] A patentee may maintain a suit at law up on his patent in his one name
althongh he is under a contract to assignft to o hers,it it has not beene $x$ -

 lease.
he elthercan be recover damages for any infringements committed after
he has and and assigned the patent. he has sold and assigned the patent.
The pendency of a suit upona patent in one district 1s no bar to the pros.
ecution of a suit upon it another, whatever may be the effect of a re
covery in such forelgn suit.
































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 Sipt patenable nature of the tivention deactibed tind and geared by the
















## 



























































 Gerge Far ining, to complat anant.

1mproved Type Writing Machine.
John Gallowas, New York clty.-There 1 a a roller, of suffic
John Gallowar, New York city.-There is a roller, of sufficient size to re
celve a sheet of the paper to be used, and covered with cloth. This is mounted on a horizontal shaft which revolves in bearings attached to the frame. The paper, in connection with the colored paper or cloth from
which the color is obtained for the impression, is rolled around the roller, and its edges are secured by a clamp. To the inner end of the roller is at-
tached a spiral thread, which works between the pins of a shaft, so that the oller may be moved longitudinally upon its shaft at the same time that ti is carried around thereby. By suitable means, the teeth of the shaft may be turned down out of gear with the thread, so that the roller may be
pushed back at once. when required. By sultable construction the roller is pushed back at once. when required. By sultable construction the roller is downward movement of sald parts ralsing a push pawl one tooth. A pawl, which is plvoted to the frame, has its engaging end resting against the teeth
of the whecl, to prevent said wheel from belng turned back by the friction of the pawl as it is ratsed. A long block or hand plece is perforated longi-
tudinally to recelve a silde upon the forward bar of the movable frame. Opon the inner side of the forward end of the sliding block is formed an arm which projects through a slot in a plat at , the ends of which are secured
to the side bars of the frame. In the plate, at the upper and lower edges to the stde bars of the frame. In the plate, at the upper and lower edges
of sald slot, are formed notches, and the free end of the arm is so formed that it may fit into the upper or lower notches, according as it is inclined upward or downward. Upon the top of the slotted part of the plate are
formed the letters of the alphabet, the nine digits, a comma and a period, which charactersare arranged in two rows, one row corresponding with the
upper and the other with the lower row of notches. Upon the lower side of the sliding block are formed two rows of ratised type correspondng with
the characters, and which project at suctia an inclination that, when the arm is in the notch of either the upper or lower row of notches, the corresponding row of types will be in proper position for making the impression. In
using the machine, the paper is placed upon the roller and the block is grasped with the hand, and is moved to bring the arm successively into the notches corresponding to the letters of the word to be formed upon the
paper. As the arm is brought into each notch, the block is forced down, scaused to rotate twice the usual distance, and thus formsa space between

Improved safety Attachment for Car Trucks.
George C. Offen, Portland, Me.-The rollers are about three times as wide
as the truck wheels, and are provided with short side flanges, and turn in racket-shaped bearings, which are pivoted in suitable manner to the cros plece, to keep square on the track in case the truck is thrown off the track.
They are hung at suoh hight above the track that they just clear the same, may be connected sultably to the englne, to notify the engineer when the wheels are off the track. On the damaging or detaching of any wheel, they
carry immediately the truck, taking the place of the wheels, and may precarry immediately the truck,
vent damage and accidents.
lmproved Lock.
Herrmann Stein, New York clty, assignor to himself and Herman Dale,
Brooklyn, N. Y.-This invention consists in a revolving tumbler which irectly on Y. This disk-shaped spring plate with projecting teats. The small slots or reoo overcome the strong pressure of a plan of wires of sufflctent strengt to overcome the strong pressure of a plate on the tumbler, so that the lock
cainnot easily be tampered with, while the direct action of the tumbler on
the bolt prevenis lie forcing hack of the same by a chisel or other imple. ment.

Improved Burglar Ala rm.
Henry L. Brown, Middletown, Conn.-The object of this invention is bulldings; and conslists of an alarm movement and bell, in combination with a wire or cord and gas burners, so arranged that, in the act of opening the door or vindow with whick the alarm is connected, gas is turned on, a
flame is produced, and the alarm given. A wire or cord is attached to an arm in the wall and to a second arm, which is attached to and projects from wound up by means of a key on the main shaft, and is held and prevented from giving the alarm by the wire. This wire is attached to the vibrating
escapement shaft by a crank, so that themovementis held stationary by it. When this wire is broken or parted, the alarm is given. A gas pipe is con ected with the service pipe, and the burner on the end thereof is supplied With a small jet of gas, which is ignited when the alarm is set for use admits of a flow of gas through a plpe to a second burner. The two burnfrom the second burner is ignited by the flame from the first burner. The ormer gives a full flame, which envelopes the wire and, in a few seconds the alarm.

Improved Machine for Printing Oil Cloth.
William E. Worth, San Francisco, Cal.-This invention consists of a re
tcally meving preas for carrying the printing block and pressing it on the cloth. The block is mounted on a frame carrying a platform for the ope ators, and shifting laterally on another frame, which shifts forward and
back over the printing floor, whereon the cloth to be printed is laid. The principal frame is provided with mechanism for shifting it, and both frame re capable of having their movements arrested by stops, so that the print will match properly.

Improved Bench Plane.
George W. Huber fustable to any thickness of shaving without the use of a hammer. It con ists in the firm mounting of the plane iron between a cap plece with con necting clamping bolt and set screw, and a supporting shoe, which is plvot by a conical eccentric pivoted to the

Improved Saw Gumming Machine.
Henry Baughman, Dorn's Gold Mine, S. C.-In this invention an emery or one end, so as to be presented to a circular saw by means of two frame An eccentric dog regulates the depth of the cuts in the saw by the tool by coming against the stde of the frame. It can be set for cutting deep or
shallow notches by turning it on Its pivot. The tool is driven bya belt op erated by any sultable irlving mechaniem. The contrivance for holding mall circular saws consists of a clamp and cenier pin fitted on a slotted bar which is detachably connected to the frame. The clamps side along
the slotted bar through which the center pin passes, and are secured at any point for saws of any size by nuts on the center pin screwing all fast.
There is a bar with a gage screw for controlling the edge of the saw by be gg ecrewed wast duringe screw for controlling the edge of the saw by be to shift the saw. $\Lambda$ stop button is employed to engage with the framean old the Recuring frame when gumming straight saws, which are moved up saws. The saw frame iswelghted, so that the end on which the tool mounted is borne upward.
Improved Gauntlet Glove. plecess, contrived to arrange one or more pinked or otherwise ornamented
edges of the material of which the glove is formed, around the band at the middle, to make a more stylish finish than is aflorded by the plain sorface f a band composed of only one plece.

## Improved Culinary Tongs.

ookyn, N. Y. This is a pair of wire tongs of whtch a coil formed on it to give it elasticty so that the points are held closely togethes the prongs are forced apart

Improved Device for Converting Motion Joseph P. Taylor, Hudson City, N. J.-This is an improved apparatus fo
applying motive power for propelling machinery, and for other purposes applying motive power for propelling machinery, and for other purposes,
by a pendulum lever connected with a rotating wheel, a continuous roby a pendulum lever connected with a rotating wheel, a continuous ro
tary motion betng produced by means of a ratchet wheel and two ratche
pawls. The wheel and the ratchet are revolved on a central shaft, and the pawls are carried one to the right and the other to the left, by the oscllla Hon of the pendulum lever, and alternately drop into gear with the ratche
by their own gravity and rotate the wheel. They are thrown out of gea y their own gravity and rotate the wheel. They are thrown out of gea weights. An impulse is given the pendulum lever by means of a cord a

Improved Automatic Railroad Signals.
Jane D. Evans, West Chester, Pa., executrix of Henry S. Evans, deceased.
This invention is an fmproved device, by the use of which rallroad trains Fill be enabled to set the signals automatically as the train approaches an leaves a station, a crosstng, a curve,or other place requiring care. Posts ar
e
set upon each side of the dangerous place, and in such positions that the set upon each side of the dangerous place, and in such positions that th
ignals attached to sald posts may be readily seen from such a distance will enable the engineer to readily stop his train beforereaching said point The signals are pivoted to the posts and are connected by chains which ar attached to the rotating part of sald signals, so that each signal may be op-
rated by and from the other. As a train pasees in the opposite direction a projecting wheel placed upon a journal extending from the side of the
engine strikes and presses down inclined bars arranged upon engine strikes and presses down inclined bars arranged upon the other side
of the track, which bear down upon the ends of levers, which are piv ted to the thes, and the inner ends of which are jolnted to the tnner end
other levers, which communicate with the chains which work the sig nals. The inclines when relteved from the downward pressure of the car
wheels are again raised to their former position by colled springs place Wheels are again ralsed to their form
beneath them in recesses in the thes.

Improved Ventilating Car Window.
Charles B. Knevas, New York city.-This invention consists in a hors perforated. It is secured to the lower part of thelcasing around the lowe pivot of the sash; and with its circular part inward and its ends out ward.
The flanges serve as stops to limit the movernent of the window upon its Divots. With this construstion, the forward side of the sash, whicheve end of the car moves forward, is swung inward, so as to form front and
rearopenings between the side bars of the asid sash and the frame. The windo not cnly ventilates the car by causing a move ment in the air, but the window serves also as a shield to prevent cinders
and dust from entering the car, which cinders and dust strike against the incllned surface of the window and are projected outward. Small bolts re secured to the bottom bar of the sash upon the opposite sides of it
pivot, and in such positions that their lower ends may enter holes in the Improved Washing Machine.
Kinderhook, Mich.-This Invention
nas for its object to mprove the construction of the washing machine for which letters pa arge roller are held down by the half bearings which slide up and down the slots of the standards. The half bearings are rounded off to recelve
the rubber bands. The journals of two inner small rollers revolve in bearthe rubber bands. The Journals of two inner small rollers revolve in bear
ngs in the standards, and the Journals of two outer small rollers, all four eing below the large roller, pass through short eurved slots in the stand upon the outer sides of the standards. The npper parts of the rubber band are whole, but their lower parts are split. The improved construc
ton allows the outer lower rollers to yield more readily as the clothes ar entering and leaving the machine, and prevents the tendency to press th
rollers out of position. The cross bars are connected and held in plac gainst the outer sides of the standards by the wires, the ends of which ar edges of the standards, and, at the inner stde of said standards, are bent wice at rightangles, so as to pass beneath the outer small rollers, and thu e out of the way of the clothe

## Improved Car Coupling.

Willam Charles Brooks, Stoneham, I'a.-The upper part of the drawhead omprises the top and two sides, between which is a hollow longitudinal pace, in the lower part of whid is the other part on the ara head, whic plvoted to the sides at its middle part. At the inner end this lower por press a coupling link, which has a hook on the upper side, up into a notch behind a corresponding hook on the lower surface of the top side of the
drawhead. The two parts of the drawhead are beveled at the front end forma bell mouth to guide the end of the coupling Hrk into the spac at the front end when the cars come together. The link forces the front
end of the lower part down sufflctently for its hook to pass hooks on the nd of the lower part down sufficiently for its hook to pass hooks on th
nder side of the top of the drawhead, and the spring instantly forces upagain, and holds it so as to keep the hook of the link in connection With the hook of the drawhead. To disconnect the hooks a push ded with a apring to hold ti up. The push pin is arranged above the link o that, by betng pressed down by the lever, It will press the link and the he side of the car where it can be reached to uncouple the cars withou golng between them.

Improved Umbrella.
eorge Moncrief, Stoneham,
James H. Dugan and George Moncrief, Stoneham, Mass.-This invention consists of an arrangement of an umbrella top, so as to revolve upon the
anale to relleve it when strong gusts of wind blow aga inst it quartering or when the top strikesagalas. ed places. The sald arrangement consists of a notched revolving ring fio
the ribs, between two collars on the handle, and a revolving notched ring n the runner, also be colars on the han

## Improved Portable Fire Extinguisher

Isaac C. Andrews, New York city.-There is an inner bucket for contain haped notches to recelve pins formed upon the bow or $U$ shaped bar. The ends of the arms of the bow pass up through tuffing boxes in the cover, and their ends are secured to the ends of the oke. Upon the lower or inner side of the cover is formed a stopper hich fits into the mouth of the acld bucket. The bottom of the actd
bucket is recessed to receive a loop, which is connected with the bow by a hort chain. To the upper or outer side of the cover is rigidly attached the end of a rack bar, which passes up through a longitudinal slot in the
yoke, In which slot is pivoted a lever, upon the lower end of which is rmed a segmental gear wheel, the leeth of which mesh into the teeth o the rack bar,so that by operating the lever ratchet the bow may be lowered
or ratsed. Upon the inner sides of the arms of the bow are formed toes which, as the sald bow is lowered, strike against the upper edge or mouth
of the actd bucket and push it off the stopper. This allows the bucket to over, and approaches a horizontal position the pecularform o the sockets allows it to escape from the bow, and it drops, bottom up ward, into and hangs suspended in the alkall solution in the middle of the
lowerpart of the outer or alkall vessel. The rapidity of descent of the bucket causes it to carry the greater part of the actd with it, which act becomes thoroughly and evenly mixed, the swinging motion of the sus pended bucket greatly ass'sting the mixing.

## Improved Button Holder.

Minor J. Cooper, New York cits.-The holder consists of two plates of
neta which are forked at one end, the space between the prongs belng V shaped. One of these plates has grooves on the inner edges of the prongs which grooves recelve the buttons. This $V$ shape of the openings adapt the holder for buttons of different diameters. The cloth passes in be-
ween the two plates, and is pressed upon the buttons by the prongs of
 When the bolder is in use by the fingers of the operator. The button is then semn on with a needle and thread, in the usual manner. The advantages claimed are that the fingers are not exp
on 1 s performed with much greater ease

Improved Machine for Shaping Brush Woods.
John imes,
 attached a Aange of such a might as to a alrord smace tor the pratites of the brubh, bo that the sala brsties may serve as a gulde it plact ing the brish Rett usp Is held securely, while betng operated upon, by the plate, which

 of the plate opposite the cutter ls turher supported against the upward

 ng thist may be made beling around the back of the brush, where it chia h


## aas of ple roment in th

 Tanged, respectively, th front tand rear of a A hopper, from which the eseed 1 s entrally discharged as the machine advances. The improvement relate opper, whereby one distributes or disperses the seed after being depositImproved Machine for Removing Snow from Rondways. George Hart, Tarrytown, N. Y.-This invention consists of a small loc:
motive engine, which is surrounded at the sides by a casing, with incline ndless belts with buckets, which take up the snow from rotating brushe r wings and convey it over connecting chutes to a separate tank. where
he snow is melted by steam connecting pipes and the direct applitation of heat. The different parts witch come in contact with the snowar eated by atean from the boller, to prevent the clogging of the machin Improved Skate
ogether with it and Drtmouth, N. S.-The rumer has standards formed oupprt of the heel plate, sole plate, hecl clamp, heel dog, and tor
sol clamp. The toe clamp and heel dog are mortised to it on their standard
so as to slide freely back and forth, and they extend down to the upper dge of the runner, and have a thumb nut screwed on the lower extremity on to cramp and bind them fast at any point by screwing the nuts down
on the runner. The sole plate and heel plate are also notehed a lit te to recelve projections and lock togetherwith them when sald plates are
connected to the runner. Sald plates have a strong semicircular brace at ached to the under side, and these braces are engaged with the standard own, and moved endwise. At the same time the notches of the plate and the projections lock together. The standards also have a projection passing entirely through the plates, to secure them against lateral move.
ment. There is also a vibrating heel plece, clamped by ineans of a pendant hank and a cam lever. The latter has a slot and a projecting point, it combination with the shank of the heel plece, provided with an incline. to be cut or formed in the shapes required by the dies by which they are unched out of the plates of which they are formed, and that the ony it lamps and dog, the fitting of the nuts, and the fastening of the bracest he plates.
Improved Water Closet.
John F. Nellson, New York city.-A round valve in
pened by a lift handle, when all the water and other matter are discharge rom the basin and clbow plpe through the valve seat. A float then sink and admits water through to the basin, thence through the elbow to the is formerst mentioned. On releasing the handle the round ow gradually enters and raises the float and closes the supply pipe. To vold overflow, a third chamber and an intervening piston that works he
ween the valve and float are used. This greatly lessens the chances of ticking, but will not always prevent it. To provide an outlet to meet this loyed. This piston not only serves as a gutde to cause the valve to pas erpendicularly to its seat; but as soon as the water reaches it, it will be
Ifted and carry with it the valve, thus opening an outlet for the surplus

ending the whole length of the carrige of a end, by a the carriage of a spinning mule or jack, and ched from end to end of the carriagetrack, and prevent one end the ends, as may be needed from time to time, to adjust the carrlage.

## Improved Corn Sheller.

John Marshall, Cordova, IIl.-The corn to be sicelled is placed in the hop-
per, from which it is fed to an endless apron or elevator, which consists of wide belt provided with cross slats, and passing around rollers pivoted to eframe work of the machine. From the upper end of an elevator thn he cylliader is cast hollow, and with its shellis about half an inch thick, and he cylinder are formed a number of pairs of holes to recetve the shanks of ibs. These holes are arranged in rows, longitudinal with the cylinder, and in such a way that the ribs of one row may be opposite the spaces between
the ribs of the adjacent rows. The ribs are made of steel er wrought frou. re half round in form, and are provided at their ends with shanks project in sections, with semi-cylindrical ribs upon their inner or concave sides The sections are arranged about a quarter or three elghths of an inch apart, and thetr edges have oblong or oval notches formed in them, which are so arranged that the notches of the adjacent edges may alternate with each
oher. It will be seen that while the said notches supplement the function of the parallel spaces between the sections in alding the ready discharge o o prevent the cobs taking the same course.

## Improved Fish Grappling Spear.

ooksare jointed togeth rand provided with springs, which are bent when the hooks are opened
nd held by the toggle joint until the latter is sprung, ard then close them With suffictent force to secure the fish. The springs are jointed to the stock
nstead of befng permanently attached as they have always been arranged o that the hooks can be released from the power of the springs, to facllite the opening and setting of them. One of tho rod and over a pulley, and communicating with slides : 80 one sleeve toward the spear hooks, and the other sleeve toward the top of the handle, the rock lever will be turned around to open and reset the
ooks; and by moving the sleeves in the oppositc directions, the lever will be turned back again to free the connecting rod so that sald rod will allow
 one of said springs. The springs are arranged in a clip to which a rock ever and cam are pivoted; and the form of the rock lever and the connec-
ion of the rod with sald lever are such that, dur!ng the tlist part of the on of the rod with sald lever are such that, during the flrst part of the
ovement of said lever in the direction for opening the hooks, the tension the springs is so lessened that when the opening of the hooks bcgins th be readlly effected. This clip has a set screw which acts in conjunction with the cam for producing and varying the tension of the springs; and the
cilp ts made adjastable forward and backward on the stock along the cllp is made adjastable forward and backward on the stock along the
springe, also to vary the tension.

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W. P. D. will find a recipe for a transpar he description of a paste that will not sour on p . 280 vertising columns for book publishers' names., J. M can repair his waterproof sult, if it be made of rubber
 read the directions on p. 408, vol. 21, for destroying mothys.-P. H. R. should consult a qualifled medical
mant and beware of nostrums. -A . S . willitnd direction for destroy ing red ants on p .122, vol. 27.1 F . can mount -S. H. s. will tind a recipe for a waterproof and fire a. Whd forelgh inven

olum
$\underset{\text { B }}{\text { B }}$ F. P. asks: 1 . Is it an easy thing for door, irom the outside? 2. If so, can they pick a lever
lock, If the key is taken out when the door is locked for the night? Which is sarest?
hans the latter way be somewliat the saf est, thongh
neither of them would be likely to five wnch trouble to
D. R. IH. asks: In the case of two steam
 with the hose (2 eng ths, or 100 feet in the tirst case be
ing level and in the second being laid up the hill, and the water gages on the engines showing each 160 ins. to th
square inch, is there any more presure on the tuch the huse laidd up the hillt han that lailo on the level ground
suppose not.
C.W. Jr. asks: Is there any special cause
F. M. H. asks: Which of the three methods would be best for keeping the celling over the smoke
stack of a 15 horse power boller rom heating? The plpe ly with it for 9 fect. 1. Nalla pitece of tin tifht to it.
Have it hung on wires about twe inches from it.
. Have a pan made and have it hung on wires about incties from the eliling and keep it full of water.
What is a oood treatise on stean heating? A. 1. Frob ably the last method is the best. 2. Box on "Heat."
our advertising columns for booksellers' addresses.
$\underset{\text { W. . A. B. asks }}{\text { W. . Wills silver coin answer for }}$ allo?"? 2. Has the Unitee states nickel connage any alloy in it? 3. I had dome old gold, and tried to separate
the allus from it by the moist method. I dissolved it in
 which cont. Then pourea orf the supernatant 14quor remaining. Then I Iadded and ana regia, , but It would not
dissolve the precipitate. Why is this? chloride of gold of it? 4 . I wished to make a plating solution for rubbing on with a sponge, according to a
formula in an electroplating manual: I trst took some pieces of pure siliter (Worn anodes) and dissorved in
pitric acid and water When idssole ad I dissolved the resulting crystals of nttrate of silver fin rain water. Then (as per manual) I threwin a few crys
tals of hyposulphite of sooa. A brown prectpitate wai formed, which eventually turned black. I threw in at excess of the hyposulphite to dissolve precipitate, but it
would not dissolve. Why isit so? How can Imake it into solution? 5. Having a quantity of opper wrires coated with silver (siluging wres) I dissolved them in in
nitric acld, then diluted it with rain water, and precipi nitric acid, then dlluted it with rain water, and precipi-
tated wilh pieces of copper. 1 p oured oft the supernaant liguor. $\Lambda$ white mass remained. How shalli make mirrate of silver out of this, in order to make silver so
lution? 6 Could you tell me how to test the strength of my batteries by some simple contrivance that I $I$ could
make myself? $\Lambda$. 1 . Yes. 2. The nickel 1 s alloyed with acertain proporion of ocper. 3. The matertal you vent for gold is a mixture of nitric and hydrochloric acidf, and the solvent in this case is the nascent chlorine which is liberated, forming chloride of pold. 4. Ammo
nia will dissolve the precliptate. 5. The white mass copper from the silver solution. This will dissolve dilute nitric acid, forming nitrate of silver. 6. Consult ome good work on electricit
F. H. asks. What is the proper rule for re-
ducing logs to cord measure? ducing logs to cord measure? $\Lambda$. $\Lambda$ rule frequent Sirth of the small end of the log, in feet, by
ength in feet, and divide the product by 128 . Wh. E. C. says: I wish to be a machinist. 1 and algebra? 2. I am now 16 . When will I be ol nough to enter a shop? 3. Will I have to serve as a.
pprentice? If so how long and on what terms? A. You should know something about drawng. 2. W.
think you are old enough now. 3. Arrangements ar ditirerent in the various shops, and we adv
mare some inquiries from their proprietors.
W. McC. asks: Can you suggest a substance is better than shellac, as adhesive as that material, but
harder, and such as will render the wheels capable of belng used both wet and dry? A. Such whele are
made, to be used both with oil and water. We belleve the process of manufucture is patented.
J. C. S. says: I have an engine 6 inches J. C. S. savs: I have an engine 6 inches
bore by in inches stroke, now running liou revoltions
per minute, and soing about 3 horre power of work. At per minute, and aing about 3 horse power of work. At
what spead should it be run to do that amount of work
wth least steall, at 20 pounds pressure, the driving pul.
 ley becin
Probab
better.

## W. \& B. ask: Will three fans blowing into a cominon recerer, to supply blast for puddlug fur naces, be as ettiective as the same three fias blowing turough separate pipes? A . We suppose so, if applica-

S. Says: 1. Lhave a blank in which I wish to
cut teetil ior a gear. The dameter is 4 inch. I want the

 ow many threads to the inch to cut a worm to run in at ear? $\Lambda$. We advise you to study some standard work o
earing. "The Engineer's and Machinist's Assistant,"
W. E. C. asks: Why is it that when a piece is necessaly to bore the hole out, as it has contracted解 the process? A. We supponet, that the stel, when when annealed. As the nature of hardening is not un-
derstood, it might be ditficulc to give a precise reason
H. C. asks $: 1$. Whatwill be the difference in We work of a pump, he perpendicular hipht veling 18 orame roof tile? 1 . The difference would be that due to he friction of the water in the pipe, caused by its in
rease of length. See article on " Friction of Watur
rease of length. See article on "Friction of Water
Pipes," p. 48, vol.29. 2. We think there have been
C H of patents for roor tiles.
Het : "Graic, : I find the following memor he railway at this place, which is built nearly stratpht as a line can be drawn and at the above grad.
ient, the cuts referred to are through sold Sus limestone, which is is great currosity to many. I saw
 hith at toothed wheel, on the engine, works, to aid the ago, an, was winented (ou cliaimed to be be by ar resident
or this city, a naster mechanic in oun or the

 ide. A. We think this Idea is quite an old
id nothing to give a contrary impression
P. C. asks; 1. What is meant by meau pres.
are on the piston of an engine and hoi is tit calculat

How many tuches in cylinder are allowed to a
He horse power in minufacturing an engine? 1 . The aver.
age pressure during the stroke. It must be determined age pressure e aring the stroke. It must be deterninined
ny experiment.
piston

 oints,
oint.
J. F. M. says: I wish to build an engine with a two inch cylinder, with stroke of 19 Inches. 1. Can
get a piston speed of 30 feet per minnte with connections? 2. Can I Ise e directacting valve, moved
oy the plston, usting no crank or staft, only the recipro eating motion
not with safety
S. K. S. ask
S. K. S. asks: 1 Iow is the storm glass (rethe horse power of a double cyllunder engine? The cyl Inders are set so as to act on the crauk shaft at ripht
angles. $\quad$ Is the number of revolutions the number Which the engine makes while doing its usual amount ithin plass tube about 12 Inclies long and $₹$ finch diame drams, niter $11 /$ drams, sal ammoniac 1 dram, broot spirtt 24 flutd ounces; dissolve. The top should be cor ered with a brass cap with h very small hole through it
ortited over with bladder. 2 . Fiud the power of one cylinder by the poocess frequently gliven in these on
G. M. asks: 1. What is the best process of Q. M. asks: I. What is the brest process of
photoraphnngon wood for engraving s. IIow is ood
best prepared for pencil drawing? 3. Which is consid est prepared for pencir drawing? 3. Which 1s consid
red the best, a photograph on woud or a pencild rawing oo cngrave from? 4 . When types or stereotypes are

restosto
M. M. asks: 1. Do loones lose any considerable portion of their value as manure, by becing reduced
with caustic alkali! 1 notice that the steam escap nf from them while bol hos
of ammonia. 2. When bones are reduced with sulp smurle acid, a pungent vapor is discharged. What is that vapor,
and 1 sit in in urious to inlale? 3 . If 100 lbs. of bones are and is it in in urions to inhale? 3. If 100 1bs. of bones are
reduced with cuustcic alkali, and 100 lbs. with sulphuric recuced with caustic alikali, and 100 libs. with sulphuric of the alkell) will posesess the reaceater value as manure? ties as the bones, and how can they be reduced to a con dition suitable for use as maulure? $\Lambda$. 1. The action of
the alkall will be such as to dissolve or decompose the rganic matter of the bones.
gas, from the decomposition of the carbonate of lime in the bones by the sulpnurlc actid. 3. The valuable con.
the sttucnt of bones is phosphate of lime. A portion of
lime is removed from this by the action of sulphuric ble in water. 4. No. They can be chopped up tine and mixed with
men
J. L. E. asks: How can I remove white
paint froma black alpaca garment? $A$. Rub on to the

C. W. C. asks: 1 . Was not II. B. M. Sh. Ship
Captan, which foundered tin the Bay of biscay 3 or 44 sears ago, the urst turret ship on the Coles system? 2.
Was she not anew ship? 3. About how many men were drowned? A. 1. We think so. 2. Yes. 3. Somewhat
drer
E. S. asks: 1 . Is there any possibility of
polished silver corroding so as to become a non con Ductor of electricity, by beng buried dintere ground, ex.
posed to woather. or by any other treatment? oosed to wather. or by any other treatment? 2. Can
hard rubber be turned into nuts having threads cut, etc., nd will they be strong enough to turn with a wrench? 3. How are platinum points fastened to sounders? 4
Can platinum be worked into strips and riveted or sol tered to wires, and will it become corroded so as to im
pair its conducting powers under any circumstances?

R. asks: Will it be safe to use, for dyeing,
 could not answer positively without knowing more par
C. B. R. saves: 1 . The rain water taken from ortland cement. What is the probable cause, and
vhat will help it? 2.1 am now usimg an engine, the cyllinder of which is $16 \times 8$, making 60 revolutions. I dinensions for a new evlluder? I want the shafting to run faster to to oway with o so much countershat ting
and to sue smaller pulleys. Which would be the best a ase smalier pulleys. Which would be the best 1. We cannot answer this question without knowing power from the present engline by running it twice $a s$
 If you have plenty of room, the tue boller may be de.
:riable on some accounts, especially if you use hard E. F. J. asks: If a camnon on the stern of a
 solution of this problem, and we should be glad to hear
A. J. D. asks: What is your opinion of the tactory is 100 feet long, and 2 stories high, the booller
belig in the west end, and the chimney going up.through ne corncer of building. My idea is to put a drying roon int the second story, 12 feet wide $x 8$ feet high $x 100$ feet
ionk, and connect with the chimney, just on the second Hoor, a brick flue and build it horizontally to the eas end ofbuilding, then turn it into dry room at the bot.
tom, the lieat from the furnace to pass through this tlue com, the heat from the furnace to pass through this the
into the dry'ing room, and into a luce leading back into ito the drying room, and into a nue leading back into
hie chimune again. The main difificulty is to prevent tialg tire to the lumber or staves. Do you know of an Nan th which thint can be prevented? A. Your didea
loes not strike us very favoraly. It would be difticult secure perfect immunity from sparks, and probably
ou wonld seriously in iure the draft in your bolter.
H. © (C. (Co ask: How can we best ascertain epressure in lbs. during stroke, by piston speed in J. B. E. asks: 1. Who will, on application,
ainine me sind, should I pass examiuation, give me
 boilier strone enough to stand a pressure of 120 bss. pro
vider that each brace has a surface of orer 92 squar inclies to brace. A. 1. The supervising tuspectors ap,
poointed by the Gccernment prant licenses to those who ass sali if factoris examinations. 2 we thith such bria
E. J. . II. asks: If water be applied to a
wheel mate eupon the princtple of some of the rotars steanumengines, could a better percentage of power be
obained than from the present improved turbines?
o. t seems probable that the turbine wheel will give be
J. W. F. asks: Plase give mee a correct rule for extimating the horse power of a high pressure
eng ine and also for estimating the ammount of horse get difterentans answer, that vary very much. The cil
 5). The boiler is 16 feet long and 4 feet diameter, with the number of revolutions of the engine increase the horse power? I tried your rule as pis en to M. C. in . Xo
3 , vol. 22, but wis not sure 1 was right. A. Areal Lon teet $x+12 \times 0$ $\times s 0 \times 4(10)=-3,3000=109.3$. This solution supposes ine square inch, which is probally untrue. An increas power. In regard to the horse power of a boller hors niny dififerent meaniuss. In some cases a boiler of one
orse power designates a boiler that furnishes stean nough to produce one horse porer, when used in an that exiaporates one cublc foot of water an hour ; others many other slymina the Franklin Institute, appoonted to investigate thit meaning of the "horse power of a bollier" "aliled to
make any recommendation that was anproved by the more th
H. M. P. says: If I I have a cylinder full of
water with a nlexivie tube running leythwise through ,also full of water, and I put 50 pounds pressire on the tube beling closed: What resistance would be re
 ing ch
E. C. asks: 1 . Does the induction coil, if of ful than the tuducing or battery current? If so, what lenpths of wire enust be employed to produce an in
duced current equal to the inducing one? 2 . How is the coil produces a current of greater intensity than the atery current. thint is. one capable of giving siok
decomposing waier, etc. 2. The carbon cell 1 s filled with a mixture of a solution of bichromate of potash and di-
lute oil of viriol, and the zinc cell with dillute sulphur.

M. R. B. asks: How can common cast iron be plated with tin? A. Clean the iron,
muriate of zinc, and dip Into melted tin.
T. S. says: My house burnt down, and some
*20 gold pieces were tarnished by scooping them up. carrying them tu an iron pot, and coollng by pouring
cold water on tue. Has the said gold been injured, How can I remove the brown color to to tre them the
same appearance as before? A. Your gold has not bee same appearance as before? A. Your gold has not been
Injured. You can remove the tanntinhed appearance by
rubbing with jeweller's rouge, until there is a sil ht
P. T.S. Asks: The cast iron water back in
my range, which has been tin use about six montha, con-
 the range state that they uever knew such a case. Ca,
you ungestan any remedy? The water used 18 soft water, ratn water from a lead cistern. Would it be practica.
ble to galvanize or nickel plate $a$ new water back?
 If the water back 18 in constantuan ue, It teems rems likely that
the trouble arises from some outside connection. It Would not cost much to gsivanize the water back. Pro
ably any good plumber could have it done for you. C. F. M. asks: What is the best solvent fo
tindia ruber, and what (lf any for tanned leather? Tnda Fubrer, and what (If any) for tanned leather? A.
There are various solvents for rubber. O De of the beat and heapest t sabisulphlde of carbon. We are not aware
that tanned leather has ever been reduced to solution that tanned leat her has eve
by any chemical solve nt.
$\underset{\text { wooden pipe discharge per minute water would a a }}{\text { a }}$
 our artlcle on "Friction of Water in Pip.
vol. 29 , for formula applicable to all cases.
A. A. asks: Where do fleas breed \% A. Chiefliness in the household and fresh alr will hinder their
mult multiplication. Oil of pennyrosal will drive them from
any particular locality. R. F. asks: What is infusorial oarth? A.
it is earth which contatins the remalins of minute ani:
 1uches fall? What are the most economical proportions
for such a wheel, namely: dameter, number of buck. ets, and depth of shrouding
water wheel manufacturer.
M. M. asks: Will the applying of brakes to driving whieets of engines have greater tendeucy to
check the pped ora single engine than if applited to the trucks of the tender? If the power now appled to to
the trucks of the tender be applied to the driving the trucks of the tender be applited to the driving
wheela, will the speed of the entines be checked any
duicker? w . We think it would be beeter to apply the quicker? A. We thnk it would
brake to the trucks of the tender.
W. H. asks: 1. Of what is non-explosive Nunpowdir composed? 2. Can you tell me of a good
renovating mixture for cloth clothng? 3 . What is meant by a saurated thecture ? 4 . What does this mean:
"Add water three ozs., and a anmonia till slighty ti ex. porarily inexplosive has been tried in England. It con sisted In mixiug fine glass dust with the powder. What you refer to may be somethnng similiar. 2. A Ilttle curd soap dissolved In water and mixed with a little claritied
ox gallis a good cleaning mixture for clothes. $\mathbf{3}$. $A$
 the s, a body is asid to be in excess when more has beeen


## COMMUNICATIONS RECEIVED.

The Editor of the Scientific American acknowledges, with much pleasure, the re ceipt of original papers and contributions upon the following subjects:
On Nail Biting and Finger Sucking. By On Steam on the Canals. By A.. and by On
$\mathrm{W} . \mathrm{M}$.
On Creeping Rails. By H. H. P
On Magic Squares. By E. W.
On Machinists in the Navy. By J. Q.A. On Devil Fish. By J. T. N.
Also enquiries from the following

Correspondents in different parts of the country ask Who makes machines formolding candles? Who makes
roadometers? Who makes machines for cutting tobacco? Whose is the best coal heating apparatus? Who
makes nilliard table cushons, that can be attuched to a nakes nilliard table cushions, that can be attached to a
common table? Who makes shoe peg making machines? Who makes a wheel for grinding bayonet
grooves? Who sells a family flour sifter? Makers of the above articles will probably promotet heir interests adierting, ia reply, io the Scientific American. Correspondents who write to ask the address of certain
manufacturers, or where specifled articles are to be had, manufacturers, or where spectifled articles are to be had,
also those having goods for sale, or who Fant to tind
partners, should send with thetr communtoations an also therse should send with their communications an
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and anlount suffictent to cover the cost of pubitication under
the head of " Rusinees and Personal" which is specially the head of " Business and
devoted to such enquirles.

## [OFFICLAL.] <br> Index of Inventions

Letters Patent of the United States
December 30, 1873,
Those marked (r) are relssued patente.]
Atr, compressing, J. Ericsson
Alarm, burglar, J. J. Kane.
Bale te, octon,, . Weil.....
Barrels, forcing hoops on, J.
Barrels, forcing hoops on, J. Greenwood

Bed bottom, spring, H. A. Hight, Sr
Bevel rest, J. E. Seavey........ Bit stock, L. Feely. Blade for agricuitural implements, w. scot
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Cotton chopper,
Cradle, portable,
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Cultivator Insect destroyer, C. T. Hur
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Citter, sausage, J. Knopp.......
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Fire arm, breech loading, A. Henry..
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Fire arm, repeating, Smith \& Wes
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Garden implement, J.M. Lunguest
Gate, farm, D. A. Neldilg.
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Hats, machine for ironing, R. Eickemeyer
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ron, etc., working scrap, D. D. Parmelee.
ewelers' catches, G. H. Fuller
Jewelry pln, J. P. Courtney....
Journal box, lubricating, J. M
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Ladder, A. P. Smith
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Mop head, Marsto
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Mug, beer, w. C. King.
Needle threading hook,
Nubla and vell combined. J. W. Tuttle
Nut look, L. Leeds...
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Nut lock, C. R. Watrous
Oakum with tar, etc., coating, J. F. Stalra
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Picker, cranberry, J. Weston.
Pleture frames, wooden mat for, H. S. Hale
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Piplng, steam and water, J. H. Mills.
Pltman, Holly \& Robertson.
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Planter, corn, J. Klar
Plow, J. J. Mitchel
Press, , baling, J. B. Root...........
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Printing press dellvery, T. J. Mayall....
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Pump, steam vacuam, Mral Lacrix (r)
Purfler, middlings, E. N. La.
Radlator, Indirect steam, J. H. Mull
Rallway rall chalr, S. Ferris
Rallway the, H.
Rallway tie, H. L. De Zeng.
Refrigerator, H. A. Roberts
Roof truss, P. L. Welmer
Rubber, hand, w. H. Blye
Sacks,etc., emptyIng and fil
Safe and vault, J. Crump...

Safe and vault, J. Crump....
Sash fastener, J. D. Shewell Sasi habener, S. Chard...
Saw fillng machine, W. W. Saw, scroll, J. B. Wright Sawing:machine, D. R. Pratt............
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Sharpening machine, J. H. Curran Sharpening machine, H. H. Rorke Shutter fastener, P. Keffer. Shutter fastening, H. A. Skinner............
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Sickle sections, tempering. F. Meyer.. Sole edge trimmer, W. Webster Splnning whirl,
Spoon, J. Hart
Spring, vebtcle, c. W. Sala dee
Spring for velicle Spring for velicle sea
Stock feeder, U. Bore
Stone tool
Stove, E. Smith (r)
Stove damper, E.F
Stove
Stove, design for hea
Stove leg, w. Doyle.
Stump exuractor $F$.
Sugar manufacture. M. H.Aschenbrenne
Teeth, flling for decayed, C. E. Blak
Telegraph insulator, Fox
Tool, compound, J. Dillon.
Tool, compound, J. Dillon....
Trap, mole, R. I. Huggin
Truck, Pratt \& Munhall
Valve, B. Fitts...
Valve, J. A. Necher
Valve, J. A. Nichols.
Valve for steam pipes,
Vault cover, illuminating, J. K. Ingalls Vehtcle, Parmiter \& Bradle
Vehicle holdback, Burdick \& Flanders Wasting machine, P. Hibbs...
Washing machine, L. Holderm Washing machine, s. N. Page Water wheel, M. Chandle Water wheel, J. B. Hamilton Windmill, E. Crump. Wines, medicated, v. Brosseau Winnower, rotary, J. H. Adamson
Wire stretcher, Congdon \& House Work holding d
Wrench, J. Lee

APPLICATIONS FOR EXTENSIONS. Applications have been duly flied, and are now pending
for the extension of the following Letters Patent. Hearings upon the respective applice:
the days hereinafter mentioned:
27,678.-Fabtening Artificial Teite.-A. M. \& J.
abay. March 18.


EXTENSIONS GRANTED.
26,874.-Clothes Dryer.-P. B. Hawse.
$26,679 .-$ Dotble Skamina Machine.-L. T. Hurbert.
$26,689 .-$ Pivot Bearinge -F. C. Lowthrp

## TRADE MARKS REGISTERED

 1,588.-CraArs.-Gllmor \& Gibson, Baltimore, Md.1,589.-SADDLe Tries.-S. E.Tompkins, Sing Sing, N.
1,590.-Corfer.-Hawley \& Co., San Franclisco, Cal.

## DESIGNS PATENTED

 7,079.-Fiaurks.-J. D. Smith, Washlngton, D.C.
7,080.-Printing Types.-J.M. Conner,Greenville,N.Y


## SCHEDULE OF PATENT FEES.

 On each Caveat.......On each Trade Mark. On filing each application for a Patent (17 years) On issuing each original Patent.
On appeal to Examiners-ln-Chief

## On application tor Relssue.

 On granting the Extens On filing a Disclaimer. On application for Design (7 years) On application for Design (14 years).
## CANADIAN PATENTS

List of Patents Granted in Canada
Jandary 5 to Jandary 9, 1873.
2,967.-F. H. Whitman, Harrison, Cumberland county,
Me., U. S., assignee of E. H. Woodsum, South Boston Mass., U. S. Improved gain cutting machine, called 968.-J. McLarty, Strathroy Midlesex, Ontario. Im. provements in ladders, called "The Improved Flexible Ladder." Jan. 5, 1874.
2969.-F. R. Butcher, St. John, New Brunswick. Im. provement in spring bed bottoms, called "Butcher's
Improved Hinged Slat Spiral Spring Bed Bottom." Jan. 5, 1874.
,970. W. T. Rand, Fitch Bay, Stanstead county, P. Q., 970.-W. T. Rand, Fitch Bay, Stanstead county, P. Q.,
and T. B. Rider, Magog, Stanstead county P. Q. Im. provements on saw arbors, called "Rand's Improved
Saw Arbor."" Jan. 6,1844 . Saw Arbor. liamson, G. N. Clark, D. B. Jones and E. Moore, all of Canterbury, York county, New Brunswick. Improve-
ments on life preserving dresses and air buoys com. ments on life preserving dresses and air buoys com-
bined, called "Poole's Life Dress and Buoys" bined,
1874.
2,992.-
U.S., and Jillings, Cleveland, Cuyahoga county, O., on self J. T. Raplee, Montreal, P.Q. Improvements on sili -acting car couplers for rallway cars, call
"Bilngs' Automatic Car Coupler." Jan. 5,1874 . Conn., U. S., and R.M. Bassett, of same place. Improvements on manufacture of shovels, spades, hoes,
grocers' scoops and other like articles, called "Low-

2,974.-W. O. Grover, Boston, Suffolk county, Mass., U.S.
Improvement on bird cages, called "Grover's Im. Improvement on bird cages,
proved Bird Cage." Jan. 5, 1874 . ,975.-G. Calcott, Thorold, Welland county, Ontario.
Improvement on stovee for heating apartments, called
5,1874 ,976.- N. P. Slade, Rockford, Winnebago county, Ill., U.
S. Improvement on antl-freezing writing fuld, called Slade's Non Cold.' Jan. 5,1874
.
U. S. Improvements in mail bags, called "Meyerhoffer's Improved Mall Bag." Jan. 8, 1874. 988.-I. A. Welch, Hamilton, Ontario. Improvements
on tlat brushes, called "I. A. Welch's Improved Flat Brush." Jan. 8, 1874.
Improv. H. Porter, Bradford, Simcoe county, Ontario tal Plate." Jan. 8,1874 .
tand.
2,980. - W. Ferris, Pleasant Plain, Warreu county, o., U.
S. Improvementa on knife and pitman connection S. Improvements on knife and pitman connection for
reapers and mowers, called "Ferris' Improvement in Pitman Connection for Harvesters." Jan. 8, 1874 . 2,981.-I. O. Jones, Boston, Mass., U. S. Improvements
on rakes, called " Jones' Reversible Rake." Jan. 8, on ra
184. 2,982.-J. B.
preparing
matimm, ca matism, called "Gully's Ant1-Rheumatism Belt." Jan 8, 1874.
2,983.-w. 2,983.-W. Dunlop, Toronto, Ontarlo. Improvements on
stench traps, for sewer and waste water drains, called stench traps, for sewer and waste water drain,
"Dunlop's Improved Drain Trap." Jan. 8, 1874. 2,984,-J. Richards, G. W. Waitt, E. C. Shapley and C.F.
Jones, all of Pblladelphia, Pa.,U.S. Improvements in Jocos,ative chimeys, called " Richard's and Meehl's Locomotive Chimney." Jan. 8, 1874 .
985.-A. S. McDouell, Osgoode, Carleton county, Onta. rio. Improvements in cultivators, called " McDonell's Cylinder Cultivator." Jan. $9,1874$.
,986.-B. T. Nichols, Raselle, Union county, N. J., U.S. Improvements on nalls and spikes, cal
Improved Nailand Splke." Jan. 9,1874 Improved Naris, spike." Jan. 9,187 , quilting frame, called "Jarvis' Adjustable Quilting Frame." Jan. 9, 1874.
2,988.-P. Cope, Perryopolis, Fayette county, Pa., U. S. Improvements on brackets for fence
"Cope's Fence Bar Bracket." Jan. 9,1874
2,989-W. T. Doremus, New York, U. S. Inprovements on springs for furniture and other purposes, called "Doremus' Springs for Furniture and Other Purposes." ,990.-F. E. Dixon, Toronto, Ontario. New window fastener and support, called "Dixon's improved sas
Fastelier." Jan. 9, 1874. 2,991.-I. I. Lahaye, Reading, Berks county, Pa., U. S.
Improvements on car coupling, called "Lahaye's Improved Car Coupling." Jan. 9, 1874.
2,992.-E. F. Austin, Rochester, Munroe county, N. Y.
U.S. Improvements on ottomans, called "Austin"s
Coblned U. S. Improvements on ottomans, called "Austin's
Combined Ottoman and Ladtes' Companion." Jan. 9, 1974.
2993.-C. ment in bolsters, spittsburgh, Pa., U. S. Improve ment in bolsters, springs and standards for wagons,
called " ${ }^{\text {Saladee's Bolster, Spring and Standard for }}$ for Wagons." Jan. 9, 1874.
2.994.-E. Chanteloup, Montreal, P. Q. Improvements
in self feeding hot water furnaces, called "Chanteloup's Improved Self Feeding Hot Water Furnace," Jan.9, 1874.
,996.-E. Math
hemorroides, called " Onguent pour Hemorroudes, du
Dr hemorroides, called
Dr. Mathien.". Remedy for plles. Jan. 9,1874 .
$2996 .-T$. A.Lundy \& E. Walker, Guelph, Well county, Ontario. Machine for Guelph, Wellington blinds, called "Lundy \& Walker's Independent Blind
Roller." Jan. 9, 1874 .

## HOW TO OBTAIN Patentrs and larveats no <br> ATENTS are now granted to inventors

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Gaivanilinc Castings.-Malleable




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