## A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ARI, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

the proposed niagara bridge at lewiston, n. y.
In a recent issue we printed a letter from a correspondent C.A.H.,in which the possibility of erecting a permanent bridge across the Niagara River, at Lewiston, N. Y., was suggested, and the opinions of engineers on the subject asked. Our correspondent pointed out briefly the high importance of such a work, and offered, in event of its completion within twenty years, a subscription of $\$ 500$, and also a further and similar amount to go toward the creation of a trust fund of $\$ 100,000$ for the engineer whose slill may be used to the desired end.

With reference to the above, we have lately received a With reference to the above, we have lately received a
communication from Messrs. Clarke, Reeves \& Co., the well known bridge builders, of the Phœnixrille (Pa.) Bridge Works, inclosing a plan of a practicable bridge, from which the annexed engraving has been prepared.
so that certainly, to a few of that class, if they can be found with the progressive views which evidently characterize both C. A. H. and Clarke, Reeves \& Co., the undertaking would be no difficult one.

## Solders ate Soldering.

The operation of soldering appears, as it is in fact, a very simple one; but simple as it may be, it is only the practised band who can turn out a really creditable piece of work, even in the ordinary tinman'sline. The amount of practice neeessary depends in a great measure on the natural ability of the tyro; but a little patience and a fair amount of perseverance on the part of a mateur mechanics will, as a rule, enable them to solder up ordinary work in a manner as serviceable, if not so neat, as that done by the professional. It may be of assistance if we give a brief account of the process and
acid (muriatic, spirits of salts) ' killed" with zinc, that is to say, acid which has been supplied with all the zinc it can dissolve, melts over the surface of the work, removing any trace of oxide that may have formed since cleaning, and also acting as a covering from the air. Sal ammoniac, containing hydrochloric acid, acts in a similar manner, and rosin and tallow have the effect of temporary varnishes, preventing the surfaces from oxidising. The methods of effecting fusion are almost as numerous as the solders themselves; the principal are the copper bit, tinned at the part applied to the sol der, the heated iron which does not require tinning, and the blowpipe flame. For certain operations in the way of soldering, commonly called brazing. the heat of a fire or of a muffle is required, while for others the articles are dipped in melted solder, or melted solder is poured on the joint, and, in some cases, the heat is applied by a stream of heated air.


## THE PROPOSED NIAGARA BRIDGE AT LEWISTON N. Y

Lewiston, we may here remark, is situated some seven of the solders used for joining the different metals. Solder. Of all the solders, those formed of differing proportions cf miles below Niagara Falls; and at this point the river ing is of two kinds-that in which a more or less fusible alemerges from the narrow gorge, which varies from 200 loy is placed between the two portions to be joined, and that to 400 feet in width, after making a last gradual descent of in which the metal itself is made to unite, a process known some 250 feet. Messrs. Clarke, Reeves \& Co. state, with re- as autogenous soldering, and in some cases termed "burnference to their proposed bridge, that the span is 600 feet. ing." The principle of soldering consists essentially in creThe structure is designed for a double track railway, 120 feet ating a temporary or rather incipient fusion of the parts to be above the level of the river, and for a carriage way, beneath joined, by the direct application of heat, or by means of a
this road a distance of 75 feet. 'The estimated cost is $\$ 800$. fusible alloy which will, when in the this road a distance of 75 feet. The estimated cost is $\$ 800$, fusible alloy which will, when in the state of fusion, unite over swift rapids and where the water is practically unfa thomable, the manufacturers claim to have overcome, and they offer to contract for construction as soon as a company is ready to supply the funds. Instead of occupying twenty years in building, Messrs. Clarke, Reeves \& Co., with their present facilities, believe that the work could be accom. plished in as many months. With reference to our correspon lent's proposed trust fund, they add : "There is so much oldfashioned liberality (rare in these latter days) in C. A. H.'s proposition to create a trust fund, that we take the trouble of writing this letter to show him that the construcion of a bridge across the Niagara river, at Lewiston, is a much simpler and less costly undertaking than he supposes."
The wide reputation of the above firm, and their uniform success in accomplishing the various difficult engineering feats which they have hitherto accomplished, are, to our minds, sufficient guarantee of the reliability of their opinions in the present. Since the work, therefore, is possible, it remains to produce the men who will supply the means and the enterprise for its prosecution. The amount required is so small that many of our great capitalists could bear it alone;
with the metal or metals to be fastened together. In the latter case, it is obvious that the metal or the alloy forming the solder must be more fusible than the metals to be soldered, and, moreover, must have a chemical affinity for them. But although there must be an appreciable difference in the temperatures of the points of fusion, as a general rule the smaller the difference-or, in other words, the nearer the fusion point of the solder approaches that of the metal to be joined-the more perfect the joint; for, as just mentioned, the nearer the parts can be brought to a state of fusion, the neater and stronger will be the union. the solder having then formed a true alloy with the metal to be soldered. It is also essential, for this formation of a true alloy, that the parts should be perfectly clean and free from oxide, and that they should remain so during the whole operation. To insure this state of things, several substances are employed, chief among which may be mentioned sal ammoniac, chloride of zinc, rosin and tallow. The effect of all these fluxes, as they are termed, is the same: they merely preserve the metals from being oxidised, a process which goes on very rapidly when metals are melted, and are not protected from contact with the air. The chloride of zinc, which is hydrochloric
lead and tin are by far the most numerous, and probably the most useful, if we take into consideration the variety of their applications. For different purposes, they are mixed in widely varying proportions; but the ordinary solder of the shops and commerce is known as either hard or soft solder, tinman's solder, plumber's solder, coarse, common, and fine, being all names for an article which is possibly never twice alike. The sealed plumber's solder (of the Plumber's Company of England) contains two parts of lead to one of tin and melts at $440^{\circ}$ Fah., or about the melting point of tin; but a solder made of equal parts of the metals is sometimes used, though rarely, as it is of course considerably dearer. Soft solder consists of two parts of tin to one of lead, and melts at $350^{\circ}$ Fah. or thereabout. It is said to be the ordinary solder used for joining tin plates, and, with the addition of one part of bismuth, forms ordinary pewterer's solder. As a matter of fact, however, the solder found in commerce generally is known as coarse, common, and fine; and the respective proportions of the metals are supposed to befor coarse, two parts of lead to one of tin; for common, equal parts; and, for fine, two parts of tin to one of lead. These proportions can generally be detected in the manufactured article, for coarse solder exhibits on its surface small circular spots, caused by a partial separation of the metals on cooling; but these are wanting when the tin exceeds the lead, as in fine solder. The great bulk of the solder made in this country comes from manufactories where it is made a specialty; but many of the larger firms who use it make their own, probably from having been disappointed in the quality of the goods bought of others. In the ordinary solder of

No. 1, or , is very rare that the in exceeds the lead, and to vary betwe solder, of the shops, will, cis a rule, be found to vary between one and a half to two of lead, and one of tin. The common stuff-that which plumbers use for making wipe joints in lead pipes-contains from two and a half to three parts of lead and one of tin. Such a mixture as this melts at less than $500^{\circ}$, that is, considerably below the melt ing point of lead, and has the property of remaining semifluid for some little time, so that, with a thick pad anointed with grease, the plumber is able to mold it to any desired shape. To render the solder hard without increasing the proportion of tin, some makers add a little antimony or copper, which has the effect of raising the fusing point without affecting the other qualities of the alloy. Although we have spoken of hard and soft solder in regard to alloys of lead and spoken of hard and soft solder in regard to alloys of lead and
tin, it is better to retain the names now employed in comtin, it is better to retain the names now employed in com-
merce, coarse, common, and fine; and when we wish to make merce, coarse, common, and fine; and when we wish to make
solder, to confine ourselves to the proportions mentioned as nearly as possible, for accuracy is not material. The mechanic by "hard solder" understands an alloy for uniting metals that are difficult to melt-a compound of copper and zinc, sometimes with a little tin-a brass, in fact; hence the term brazing has been substituted for soldering.-English Mechanic.

## Srientific gmmoram.

MUNN \& CO., Editors and Proprietors.
NO. B7 PARK ROW, NEW YORK.
O. D. MUNN. A. E. BEACH.

## TERMS.

One copy, one year, postage included...
One copy, six months, postage Included.
ClubRates
Ten coples, one ycar, each $\$ 270$, postage included..
By the new law, postage is payable to advace.
e subscriber then recelves the paper free of charge
Norz. - Persons subscribing will please to give their full names, and Post Office and State address, platily written, and also state at which time they
wish their subscriptions to commence, otherwise they will be entered fro January 1st, 18tiu. ln case of changing residence state former address, as well as givethe new one. No changes can be made unless the former address ts glven.
well

VOLUME XXXII., No 8. [New Series.] Thirtieth Year.
NEW YORK, SATURDAY, FEBRUARY 20, 1875.


## bogus state laws concerning patent rights.

We have heretofore, on several occasions, called attention to the unconstitutionality of various State laws, by which local legislatures have attempted to regulate or prevent the sale of patent rights within their borders. In some of the
States, laws have been passed by which patentees or their States, laws have been passed by which patentees or their with certain State regulations, are made liable to fine and imprisonment.
We need hardly say that all such State laws are without binding force, and are in direct conflict with the laws of the United States; and any State judge or officer who should, under pretence of a State law, arrest or interfere with a patentee or his agent in the sale of a patent right, would be liable for damages and punishment in the Courts of the United States.

This question was adjudicated by the United States Court in the case of John Robinson, agent for the Goodyear Rubber Dental Plates patent, who, on offering to sell a right under the patent, was arrested and imprisoned under a State law of Indiana. The law in question made it unlawful to sell a patent right in that State unless the patentee or seller first deposited a copy of the patent with the county clerk, and made affidavit that the copy was genuine, had not been reroked, and that he was authorized to sell, etc. A certified
copy of the affidavit was also given to the patentee or seller, and he was further required to exhibit the same to any person who might demand to see it.
The United States Court held that this kind of legislation is unauthorized, that property in inventions exists by virtue of the laws of Congress, and that no State has a right to interfere with its enjoyment, or annex conditions to the grant. If the patentee complies with the laws of Congress on the subject, he has a right to go into the open market anywhere within the United States and sell his property. If this were not so, a State might nullify the laws of Congress and destroy the powers conferred by the constitution.
We believe there are some Western States that have not yet repealed their obnoxious patent laws; and for the convenience of district attorneys, lawyers, and patentees, we will state that the decision of the United States Circui Court, above alluded to, may be found printed in full on page 137, Vol. XXV of the Scientific American, date of August 26, 1871.

## metaline at the american institute.

Metaline is an alloy which, when applied to machinery, is alleged to obviate the necessity of oil or other lubricants. But while we are told that it runs on everything from watchmakers' tools to big steam engines, one of its most recent applications has proved far from beneficial-in fact, instead of
making the constituent parts move nicely, it has set them making the constituent parts move nicely, it has set them
to grinding, cutting, jarring, heating, and disaggregating in to grinding, cutting, jarring, heating, and disaggregating in rather cumbrous machine known as the American Institute, the whole inner mechanism of which metaline has appar ently disorganized. At the late Fair, it failed to slide smoothly through the hands of the judges, managers, and directors, and it drove the Board of the last mentioned so (morally) out of true that Professor Chandler, because the Institute gave a silver medal to metaline instead of a gold one, deliberately cut both the Board and the Institute. He resigned-he waxed warm in the journals-daily ones-he said that parts of the Board were welding themselves into a conspiracy. The alleged conspirators then published a long effusion, denying the soft impeachment.
To make matters still worse, metaline turns up again as the disorganizing element of the rotary engine tests. It did not clog the engines, but it apparently did the Fair official who supervised them. We hear of a protest to the results of the trials because the Superintendent of the Machinery, who made the calculations and had something-we know not what-to do in the way of supervision, was at the time engaged in negotiating with the successful competitor for a sale to the latter of metaline stock, and has since maintained business relations with him. Certainly no person acquainted with the gentleman will venture the assertion that
he could be biased, even in prospect of a possible fat comhe could be biased, even in prospect of a possible fat com-
mission; but those who have denounced the tests to us, for reasons best known to themselves, as unfair, claim that such dealing3 on the part of an Institute official are sufficient, on their face, to invalidate the results of so very close a ccm. petition.
The award of silver instead of gold to metaline, and other equally important misdemeanors, form leading arguments against the present management by the opponents of the bill now before the New York Legislature, which the existing officers of the Institute want to have passed. This bill provides for a president and twelve trustees as substitutes for the unwieldy Boards of Managers and Directors now in e8se. Both the metaline people and the Institute people include names which will be equally powerful in commanding the confidence of the public. The opponents of the bill assert that the measure has never been submitted to the Board of Direction or to the members generally, and that the present management attempted to rush it through the Legislature and have an election before a tithe of the members found out about it. A ring, it is alleged, would thus get themselves elected, and would be able to keep themselves in power indefinitely by exercising a right which the bill gives them to fill places among the trustees vacated by resignation, etc. This matter, however, appears to be a purely internecine war, and one which we have no doubt can be brought to a on both sides.

## aCCURATE ALIGNMENTS.

We have a slip from a Philadelphia paper, giving some particulars of the tunnel through the Musconetcong Moun-
tain, on the line of the Easton and Amboy Railroad. The tain, on the line of the Easton and Amboy Railroad. The some 450 feet above grade. In making a tunnel, as our readers doubtless know, we have given a hill in which a hole is to be bored, the position of the ends of the hole, and the grade at which it is to be run; and as two headings are run at once, one from each end, it is very desirable that they should be on the same line, and should conform to grade, so that they will meet in the middle of the hill. The length, direction, and grade of the headings must then be calculated from outside measurements; and it becomes an interesting lines, as actually run, conform to the requirements. In the case of the Musconetcong Tunnel, the statements are made that the length, as ascertained by chaining over the mountain, only differed from the actual length, measured after the headings were completed, by six and four tenths inches, that the center lines of the two headings were only out of line about one three-hundredth of an inch where the headings met, and that the grades of the two headings, where they met, coincided to within one eight-hundredth of an inch.
The measurements were made with ordinary instruments;
and if the results are reported correctly, the work reflects great credit upon the engineers having it in charge.
In this connection, we may mention a statement, in a Virginia paper, that an engineer, in the employ of the Belcher Mining Company, in joining two drifts by a short tunnel, $128 \frac{1}{2}$ feet in length, could not detect any error in the alignment, after the two headings were connected.
The Hoosac tunnel, it may be remembered, is 25,031 feet long, and there is an ascending grade of twenty-six and four tenths feet to the mile, from each end to the central shaft. On testing the work, after the completion of the tunnel, it was found that the error in alignment was nine sixteenths of an inch, and the difference of level, between the two headings, at the central shaft, one inch and a half.
While upon the subject of "great bores," some reference to the Mont Cenis Tunnel may not be out of place. This is about 40,000 feet in length; the level in the Italian side is about 435 feet above that of the French side, and the leve] at the summit, where the two headings meet, is about ten feet above the level at the Italian end of the tunnel; so that the two headings run to meet each other on very different ascending grades. On testing the work, after the two headings were joined, it was found that the heading from the French end was about twenty-four inches too high, and the error of alignment was about eighteen inches.

## flying machines.

We have recently perused a very interesting paper by Dr. Barnard, of Columbia College, in which the writer, in his charming style, discourses of "Aerial Navigation," giving both his own views and the results of the researches of M. Bruignac, a French mathematician. As many of our readers are devising plans for sailing in the air, we think it well to give a brief resumé of Dr. Barnard's article.
As birds fly with wings, it occurred to man to employ the same device-but only to meet with failure. The reason of this is obvious. A bird has sufficient strength to fly, and man has not. Hence the conclusion that, if a man wishes to fly, he must use some artficial motor to drive the necessary mechanism. In regard to this mechanism, it appears that a revolving wheel, such as a propeller, is better than a pair of wings, since the latter have an intermittent motion, and it is more difficult to construct them of the requisite strength and still have them light. At this stage of the inquiry, it becomes necessary to determine, by experiment, the effect of a revolving wheel in propelling a machine through the air. If the wind strikes against a plane surface, it creates a certain amount of pressure, depending upon its velocity; and inversely, if a surface is made to revolve at a high velocity, it encounters a resistance according to the velocity. M. Bruignac's experiments upon the pressure of the wind give the following results:

| Velocity of the Wind. |  | Prebsitre. |  |
| :---: | :---: | :---: | :---: |
| Infeet per second. | In miles per hour. | In pounds per sqr. foot. | In pounds per sqr inch. |
| 33 | $22 \cdot 495$ | $2 \cdot 75$ | 0.0191 |
| 49 | $83 \cdot 406$ | $6 \cdot 17$ | 0.0428 |
| 65 | $44 \times 319$ | 11.00 | 0.0764 |
| 98 | 66.815 | $24 \cdot 50$ | $0 \cdot 1701$ |
| 147 | $100 \cdot 243$ | 55.50 | 0.3854 |

Instead of making the aerial vessel with a flat end, it can have a conical form, by which the pressure of the air, or the resistance that it must overcome, can be reduced to about $\frac{1}{d}$ of the amount required in the case of a flat surface of the same cross section. It is to be expected that the machine cannot always sail in a calm; and on the supposition that it is to carry only one man, and is to advance at the rate of 20 miles an hour against a wind of the same velocity, it must have a motor capable of exerting about 5 horse power. The method of moving the aerial vessel, however, does not present so many difficulties as the means to be provided for keeping it in the air, and enabling it to rise or descend, at the pleasure of the navigator. It can be kept up by having a balloon attached to it, in which case, as the moving surface is largely increased, it must have a more powerful motor; or either vertical propellers, or an immovable plane, can be employed. A kite is sustained in the air by the pressure of the wind against it, provided the direction of the wind is oblique to its surface; and it is easy to see that, if the kite lique to its surface; and alm air at the same velocity as the wind has, it would be sustained in exactly the same manner, wind has, it would surface on the aerial ship, in an inclined position, will sustain the vessel when it is put in motion This fixed surface seems to be the simplest mechanism that can be devised for the flying machine, in connection with two propeller wheels, turning in opposite directions, so as to keep the machine in an upright position. The best angle of inclination of the fixed plane, that is, the angle in which the least amount of surface is required, is $54^{\circ} 10^{\prime}$ with a horizon. tal line; but the power required for motion in this case is very great. By reducing the angle between the fixed surface and a horizontal line, the power required for propulsion is diminished; but it is necessary to give the machine a much higher velocity, in order that it may be sustained in the air; or if the original velocity is retained, the area of the fixed surface must be largely increased, which will of course add to the weight. It must be remembered, also, that the machine will not be sustained unless it is in motion, so that it cannot rise from the ground, but must be launched from an elevation.
M. Bruignac finds, from a number of calculations, that, by attaching balloons to flying machines, they can be propelled by the aid of less power than in the case where a sustaining plane surface is used. The best form of balloon is that of a
horizontal cylinder with conical ends, the slant hight of the cones being equal to the diameters of their bases. The resistance to motion of a plane surface has been given in the preceding table; and it is found by experiment that, if three
bodies having the same cross section are moved through the bodies having the same cross section are moved through the air at the same velocity, having the forms respectively of a circular plane, a sphere, a cone with slant hight equal to diameter of bases, the resistances to motion in the two latter cases .will be (calling the resistance of the plane R ) for the sphere $\frac{\mathrm{R}}{2}$, and for the cone $\frac{\mathrm{R}}{3}$.
The most favorable form of aerial machine, according to M. Bruignac, is a combination of a balloon with a sustaining plane. By his calculations, it appears that the most advantageous design, for a speed of 20 miles an hour in a calm, must not weigh, with engines, navigators, fuel, stores, etc., more than 2,200 pounds, and must have the following dimensions : There must be a balloon, filled with hydrogen, 22 feet in diameter and 94 feet long, together with a sustaining plane 94 feet long and 16 feet wide; and an engine capable of exerting from 6 to 7 horse power. This is equivalent to saying that the problem is impossible with our present means of construction, and would seem to settle the matter conclusively, unless it can be shown that a more favorab be
plan than the best one discussed by M. Bruignac can be plan than the best one discussed by M. Bruignac can be
designed. It is pretty evident that, if a machine is not pracdesigned. It is pretty evident that, if a machine is not prac-
ticable even in theory, there is little hope of its actual ticable
success.
Dr. Barnard concludes his paper with an exceedingly practical suggestion, which we commend to all our readers who are endeavoring to work out this problem. If it is possible to lift a given weight into the air, and make it move in any desired direction, it is certainly easier to do the same with a part of that weight. Let the inventor, then, attach his lift ing apparatus to some vehicle on land, as, for instance, a railroad train, and, by sustaining some of the weight, make it move more easily; let him remove the locomotive, and put in its place his aerial propeller. If this works well, there is some hope of actually getting into the air; but should it fail, it would seem advisable for him to abandon his experi. ments.

## THE "SCIENCE" OF SPIRITUALISM.

Kesuming the subject from page 80: Gordon's materialization was a startling novèty and too good a trick to be lost. Its successful revival, however, necessitated a patience of waiting till the little drawback of the exposure should blow over, and a shifting of the scene of action to a safe distance from the unfriendly climate of New York. The conditions were complied with; there was a waiting of a
year, and the performance was repeated in the city of London year, and the performance was repeated in the city of London
under the mediumship of Miss Florence Cook. But Gordon's invention was expanded and improved, for Miss Cook substituted living persons for the masks; she constructed the celebrated and original Katie King, whose genuineness as a veritable spirit was certified to by witnesses whose testimony on matters of this world would be unimpeachable. The precise modus operandi was not found out. Katie appeared only a few times and London knew her no more. The medium explained that she had over-exerted herself, and thus had impaired her power of materializing, which, we take it, implies that a wholesome caution or forewarning had come upon her. The original Katie has probably made her last appearance in public.
But a duplicate or imitation Katie made her debut in Philadelphia in May, 1874, and was a greater success there than the original. The proprietors were practised mediums, Mr. and Mrs. Nelson Holmes. They had just returned from London; and it is pretty certain that they were acquainted with Florence Cook, and that they brought her secret with
them. The theory that the London and Philadelphia tricks them. The theory that the London and Philadelphia tricks
are substantially the same is tenable till something more are substantially the
plausible is proposed.
The new Katie was welcomed with enthusiasm by the leading spiritualists, and her desertion of England for America stimulated their patriotism ; to them she was the final
and overwhelming demonstration of practical spiritualism. and overwhelming demonstration of practical spiritualism. The weak in faith were strengthened, and new converts were
added to the fold in droves. For months, the Katie King mystery was the most prominent sensation for newspapers and magazines. But great success made.the Holmeses too bold and magazines. But great success made. the Holmeses too bold
in continuing the show; and they came to a grief in Novemin continuing the show; and they came to a grief in Novem-
ber last, which early in January became wholly inconsolable. ber last, which early in January became wholly inconsolable.
The trick was found out and fairly exposed; buu. the Holmeses and the devotees persisted, denied, and sophisticated, and thus kept Katie King alive as a spirit for more than a month.
The credit of the exposure is almost wholly due to the Philadelphia Inquirer. The facts of evidence against the Holmeses, as they were developed, were published in the Inquirer. But the evidence so appearing in disconnected
fragments, although convincing to most sensible people, was misunderstood, perverted, and sophisticated by the spiritual misunderstood, perverted, and sophisticated by the spiritual
partisans. A methodical statement which should end all doubt and controversy was therefore prepared and published, in an article occupying about fifteen columns of the Inquirer of January 9 and 18, 1875. The statement is in the form of an autobiography of the lady who personated Katie King; it was verified by her affidavit sworn to in the presence of several prominent citizens of Philadelphia. It was further confirmed by the lady having in her possession the robes and ornaments worn at the show, and the presents which she had received from her admirers in the character of Katie; she was fully identified by respectable people who had seen her
at the show. Also Dr. Henry T. Childs, Hon. Robert Dale at the show. Also Dr. Henry T. Childs, Hon. Robert Dale
Owen, and others, who had been zealous and admiring pa
trons of Katie King,are witnesses to the truth of many of the shy will facts. The Inquirer promises that the autobiography will be published in book rorm; we commend the book
in advance as an antidote to the spiritual delusion, which in alvance as an antidote to the spiritual
will be effective as well as pleasant to take.
The lady objects to the use of her real name in connection with the spiritual fraud, and we will continue to call her Katie King. She was born in Massachusetts, January 1,1851, was married at 15, and has a child eight years old. Her husband died two years ago, leaving her penniless, and her child and an aged mother depending on her exertions for their support. Last spring she set up the enterprise of keep ing boarders in Philadelphia; the Holmeses boarded with her and got their living by the practice of spiritualism. But Katie fell among Philistines, and her enterprise lasted only a few weeks. In her extremity she entered the service of the Holmeses and was by degrees taught to tolerate and to practice deception, and at last to exhibit herself as a spirit.
The grand secret of the Holmeses was the device for ge ting Katie on and off the stage of exhibition without being discovered by the spectators. The device was a dummy board in a partition which constituted the rear of the cabinet the partition separating the exhibition room from a private apartment or other hiding place; the dummy board was a board neatly cut in half, the lower half serving as a door for Katie's exclusive use. At one house in Philadelphia, the cabinet was erected against a doorway leading to a bed room the back of the-cabinet being the partition with its cut board substituted for the door. At another, the cabinet was erected against a window, the embrasure of which, by means of the
partition, was made into a secure but narrow hiding place for partition, was made into a secure but narrow hiding place for
Katie. The partition with its dummy board was an essential part of the stock in business, and was carried by the me diums in the various journeyings.
The eshibition had two acts or parts: first, a dark séance wherein a guitar was thumped, bells rung, and things stirred up promiscuously, being the ordinary and silliest of spiritual performances; next came what the mediums designated as the light séance, wherein darkness was made visible by a
single and shaded kerosene lamp, placed as far as possible from the cabinet. For the light séance, Holmes locked him self in the cabinet, and Mrs. Holmes kept guard, seated at the door of the cabinet. The performance begins by the display of masks at the window of the cabinet, cil la Goradon Katie King says these false faces were generally recognized by persons in the audience as the veritable spirits of thei deceased friends. At last Katie herself appears at the window
or in the doorway of the cabinet, and talks and walks precisely like a human being.
Katie's first appearance was on the evening of May 12 ; w quote her account of it
' I entered it the first time, after the dark séance was over, from the be 1 room. Mr. Holmes was in the cabinet. After
one or two false faces had been exhibited, I gently drew aside the curtain hanging over one of the apertures, showing th audience my face, and in a very low whisper, scarcely audible, said: 'Good evening, friends,' then drew back my head and drew down the curtain. The sensation in the au dience was great.
Although somewhat excited, I was amused to hear the different remarks: ' Did you hear it speak?' ' I wonder who it is?' ' How beautiful it was.' ' I do wish it would appear again.' The lady medium, who was on the outside of the cabinet, among the audience, appeared very much pleased indeed at the reception I had received, and remarked that "she thought something unusual would occur,for the spirits had been drawing from her so hard all evening, to enable them to materialize, that she had scarce any vitality left." After the excitement had subsided a little and various requests had been made that I should appear again, I pulled the curtain to one side, showed my face at the aperture, and three or four voices at the same time said: ' Who are you?Please tell us your name.' I answered in a low whisper, as before : 'I am Katie King, you stupid.'
These cant phrases, 'you stupid,' '
These cant phrases, 'you stupid,' 'I shan't,' be sure I am,' etc., were used by Florence Cook (so I was informed
by Mr. and Mrs. Holmes, ) when personating Katie King it was very important that I should use them, so that and people would think I was the same Katie who had appeared in London. The sensation among the audience was greater than at first, and often was the question asked: 'Can this possibly be the Katie King who appeared through the mediumship of Florence Cook in London? After a few moments I again showed my face and said:' Of course it is, you stupid. The sensation was even greater than before. I again with drew. The lady medium remarked that 'spirits could not remain materialized but a few moments at a time; they had to retire into the cabinet to gather strength.' On my apI had been in London.' I replied. 'I attended a séance there to-day, you stupid,' and again retired.
Mr. H. suggested that I had said enough for the first time, nd I left the cabinet, passed through the bed room, upstairs my own room on the third floor."
Katie by degrees became accustomed to her part, and overcame much of the timidity of her first appearance; she found that the credulity of the average man was her safe protection; she at last permitted the faithful, especially Dr Child and Mr. Owen, to touch her and to converse with her She received many tokens of regard in the form of bouquets, letters, jewelry, and otherthings appropriate for a young lady, and in return she gave letters, locks of hair from her wig, and pretended pieces of her dress; to supply the great de mand for the latter, she carried in her pocket a roll of muslin from which she cut the pieces as they were called for. Those
who were so fortunate as to possess these bits of muslin
were generally willing to certify that they saw them cut from the dress, and that they saw the holes in the dress close p before their eyes; the dress had a reproducing power like that of the widow's cruise. As the show advanced in interest and popularity, the admission fee was raised from $\$ 1$ to $\$ 5$. The risk of discovery of the fraud was always a subject of ansiety with the mediums and Katie; with the mediums it was only a question of business, but Katie's conscience was con stantly in trouble. Various precautions against detection, besides those mentioned above, were resorted to. Care was taken that the inner circle, the visitors seated nearest the cabinet, should be composed of devotees. They knew that suspicion would be likely to be centered on the bogus partition, and they forearmed themselves. One morning they put sound board in the place of the dummy and had a committee of ten, including several experts, to make a thorough exami nation. This committee took down the cabinet, including the partition, piece by piece, and then conscientiously reported that the structure was of a substantial character and that there was nothing deceptive about it,and especially that the partition concealed no fraud and could not be used for Katie's entrances and exits. The report was printed and was made nto a very effective advertising circular. Katie's autobiography, as may be inferred perhaps from our brief account of it, furnishes very rich amusement as well as instruction; it is a kind of truth stranger and more readable than a first lass fiction; we regret that our limited space does not allow s to say much more about it.
But there is one extraordinary fact that has been developed in this matter, which justice to a leading spiritualist require us to publish. Dr. Henry T. Child, more than any other spir tualist, with perhaps the exception of the Hon. Robert Dale 0 wen, has given the most unqualified, enthusiastic, and public endorsement of the Holmes' pretensions. On the discovery of the fraud, and this is what is extraordinary, he publicly and unreservedly makes reparation for his error, course of conduct which is a novelty among spiritualists.
On January 8, 1875, Katie King, accompanied by Dr: Child and other friends, presented herself before the Hon William B. Hanna, Judge of the Orphans' Court, Philadel phia, and signed and made affidavit to the truth of her writte confessions as prepared for the Inquirer. Dr. Child then took the pen and wrote upon the document, below the affidavit of Katie and the certificate of Judge Hanna; the following Ihereby certify that I witnessed the signing of the above paper he confession of Katie King, and that it was signed, declared, an Irmed to be true by the person who appeared at the séances of
Ir. and Mrs. Nelson Holmes, No. 50 North 9th street and No. 82 North 10th street, as the materialized spirit of Katie King.

Henry T. Child, M. D., No 634 Race street.

## not the best way to sell a patent.

As soon as an invention is patented, the fact is published throughout the length and breadth of the land; and then the patentee begins to receive circulars and letters from agents of all kinds, suggesting to the inventor that they possess unequaled facilities for selling his patent. In some cases thes persons state that they have a customer willing to pay sev eral hundred dollars for the patent, and warning the paten tee not to negotiate with others till he hears from then gain ; this conveys the impression that they have a bona fide offer, and, more even than this, that a greater sum may be realized from the anxious purchaser. But before the letter closes, it states that a power of attorney and a fee of from $\$ 5$ to $\$ 25$ must be sent by early mail to pay for this preliminary negotiation, and that the balance of their commission will be taken out of the purchase money. By this mode, a number of persons in different parts of the country live on the credulity of patentees, without rendering them the least equivalent for their money. They get from the inventor power of attorney, and a small fee, and that is the last he hears from his agent. Tired of waiting for the mail to bring him the money he so confidently expects, he, after a while, writes to know how the sale is progressing. He receives no reply-he waits-then writes again; still no answer. Then he writes to us; and states what he has done, incloses the correspondence, and wishes us to investigate the matter, and tell him if he has been swindled; he asks if we know the parties, if they are reliable, etc. Sometimes a circular is inclosed, in which our names are used as references, etc.
Now we do not pronounce all dealers in patents to beswin dlers; but when such parties refer to us, it is without our authority, and they should be looked upon with suspicion. We advise every patentee to be on his guard against grant ing a power of attorney to sell his patent to any one whom he does not know, and under no circumstances to pay in advance any sum of money, however small, under the idea that this preliminary payment is necessary to the negotiation of the sale. When patentees receive letters or circulars exact ng such conditions, they will be wise in paying no attentio to them; but if they do reply, we would suggest that the tell their correspondent that it will be time for them to de duct the small fee required in advance when the sale is con summated.
Trees on Boundary Lines.-The New York Court of Appeals not long since decided that a man has no right to the fruit growing upon branches of a tree overhanging his land where the trunk of the tree stands wholly upon the land of his neighbor. But the law regards the overhanging branches as a nuisance, and they may be removed as such; or the owner of the land shaded may remove them if he is careful not to commit any wanton or unnecessary destruction in so doing. Where the trunk of a tree stands on the line, he owners of the adjoining land have a joint ownership in the tree and fruit, and neither one has the right to remov it without the consent of the other

Curiosities or ocular Spectra.
Spectra are not only the concomitant sequences of color sensations, says W . Cave Thomas in $A r t$, but of the sensations of black and white. A black spot will be succeeded by a white spectrum, a white spot by a black spectrum. Ocular spectra appear to change their places with relation to our bodies with every movement of the eyes, and, for an evident reason, are still seen in whatever direction we turn the retina.

The natural sequence of the ocular spectra after a momentary glance at any object would appear to be this: The original sensation persists as a spectrum for 0.32 to 0.35 of a second, as may be illus trated by the whirling of a light or other object. Then, if the original impression be not renewed, the reaction sets in ; this first spectrum is doubtless followed by feebler librations or oscilla tions, which, although too delicate to be perceived by the open and excited eye may, sometimes with closed eyes, be followed for a greater length of time.
If we view for a long time a black square on a white ground, and then di vert our eyes slightly to the right or left of the square object, or rather look more directly at its margin, a por tion of the spectrum which it has produced will appea free as a bright margin on white ground ; the remain der of the spectrum wil overlap the true image and appear as a gray space while a portion of the true image will be free and in tensely black. We hare then a free portion of the spectrum very bright, a middle portion, where the true image and the spectrum are coincident, gray, as if the two conditions of black and white were there ba lancing each other, and a free portion of the true im age intensely black. The usual explanation of the phenomenon is this: The sensation of white in the part of the retina which was previously the seat of the black image is more intense because that part of the sea of the retina was unexcited hence the bright margin. The part of the image where the true image and spectrum are coincident remains unchanged, while the portion of the true image which is left free appears darke left free appears darke than before, because it now falls upon a part of the retina which had previously received rays from the white ground, and has consequently lost part of its excitability. This, however, is far from being the exact truth, the entire explanation; for if the eyes be closed to all external influence, a white spectrum will appear in the place of the black spot, showing that a reaction in the retina has set in, producing thesensation of light, and that it is this libration which is the cause of the two coincident portions of image and spectrum appearing gray, and those beyond darker and lighter.

## Backing Up or Sewer Gases.

To prevent the backing up of sewer gases through the ordinary pipe traps into the apartments of dwellings, a remedy heretofore mentioned in our columns is to lead a gas escape pipe from the drain pipe to the kitchen chimney. The fire here generally kept burning produces an upward current favorable to the carrying off of the gases in question. A correspondent tells us of a case, within his own knowledge, where this method proved insufficient, as the pressure of sewer gas was so great that it found its way through the stove pipe holes in the chimney. It is of course necessary in all cases that the chimney shall be tight; and in those cases where the sewer gas pressure is very strong, the escape pipe should be extended to the roof of the building independent of the chimney. Some architects provide a small gas escape pipe leading from the top of the bend of the sewer pipe trap, to the water leader of the roof.

## New Style of Photo Portraits.

The pictures are made upon the white ferrotype plate, which is now being manufactured largely, and which combines with great beauty the most simple manipulations, and all the advantages of the porcelain picture, without any of its defects.
The plate being of a very pure white and properly prepared, all that is necessary is to pour on the collodio-chloride, dry it by a gentle heat, expose it to vapor of ammonia
for a short time, and then print very slightly deeper than it
is desired to be when finished. It is washed, toned, and fixed in a similar manner to the ordinary mode followed in mak ing porcelain pictures. The result is a picture of exceeding delicacy and durability.

IRRIGATION IN COLORADO.
The system of irrigation now quite extensively adopted in Colorado has worked a great change in the character of the soil, and transformed the once almost barren country into a magnificent wheat-growing region. From the large river
the world. One of the exhibits was a large microscope by R and J. Beck, in solid silver, fitted with every conceivabl ${ }^{\mathrm{e}}$ piece of apparatus, all in silver. This luxurious work $o^{y}$ art, intended for an American microscopist, and costing $\$ 2,500$, was of course the lion of the hour, and is perhaps the most costly microscope ever made. After mention of this, there is of course no furtheir space to allude in detail to the numerous humble brass microscopes in the room. Fortunately it is the observer who utilizes it, rather than the instrument itself, who can claim the credit of a beautiful display, and to whom our advance in knowledge is due. So here the attention was riveted by,many objects of unusual interest, upon each of which a long theme might be discoursed. Conspicuous among these was the exhibition of insect dissections by Mr. Loy. They were perfect marvels. Several showed the complete muscular system in certain large lepidopterous larvæ. Various slides illustrated salivary glands and other wonders of insect anatomy. All the specimens were stained in varions colors, mounted in fluid, in large cells, on slides 4 inches by 2. Mr. Guimarens had a very interesting series of preparations by Bourgogne, of Paris, illustrating the vine parasite in all its stages (phylloxera vastator). Near him Mr. Fitch was exhi. biting a mounted slide containing a harvest spider (phalangium), upon the back of which, and attacking the eyes, was a red parasitic mite, probably a young trombidium. Dr. Gray had a very curious slide on view. It was a piece of skin from the neck f a fom Ceylon, which was com pletely hidden from sight by a dense mass of fleas. The size of the specimen, only a small fragment of the original, was about one third of an inch square, and on it might be counted nearly one hundred fleas. Each of them had buried her lancets (I say her be cause only one or two males were among the crowd of fleas) deep in the skin. A remarkable series of models and specimens illustrated in a beautiful manner the structure of the cochlea of the ear in various animals. Mr. H. Lee exhibited, with Moginie's exhibited, with Moginie's
and streams, such as the Arkansas, the Platte, and the Bear rivers, long canals are dug, branching into smaller ditches, through which the fertilizing waters are conducted in every direction to the fields. Our engraving, for which we are indelted to Harpers' Weekly, shows two farmers opening a sluice of a main canal to let the water into a side ditch. These ditches form a regular network, as shown in the diagram.


The supply of water can be regulated at will. Towns are supplied with water on the same plan. At the head of each street is a sluice box for a lateral ditch running the whole length of the street, from which branch smaller ditches used for garden irrigation.
An Evening at the Royal Microscopical Society. At a recent meeting of the Royal Microscopical Society, held at King's College, an unusually interesting series of exhibits was shown, illustrating the progress of optical and mechanical ingenuity in the development of the instrument, which is rapidly becoming an indispensable article of furniwhich is rapidy becoming an indispensable article of furni-
ture in where intellectual culture is promoted, all over
portable binocular, the larval form of the crayfish, from the
Brighton Aquarium, a creature so unlike its parent that, till lately, it was considered a distinct species, and was known as the glass crab. It was a beautiful specimen. Among the vegetable preparations attracting notice was a charming slide of a fungus on wood, shown by Mr. Reeves, and named by him as a stcmonitis. Curious deposits from solutions of silica were shown by Mr. Slack.

## Sagacity of the Partridge.

Instances of the sagacity of the partridge, woodcock, and other birds have often been related. But the most singular illustration of the deception practiced by the first of those wily species to protect their young is given by Mr. Henshaw, of the Government Survey west of the one hundredth meridian. While riding through pine woods, a brood of partridges, containing the mother and eight or ten young of about a week old, was come upon so suddenly that the feet of the foremost mule almost trod on them. The young rose, flew a few yards, and, dropping down, were in an instant hid flew a few yards, and, dropping down, were in an instant hid
in the underbrush. The mother meanwhile began some very peculiar tactics. Rising up, she fell back again to the ground peculiar tactics. Rising up, she fell back again to the ground
as if perfectly helpless, and imitated the actions of a wounded bird so successfully that for a noment it was thought she had really been trodden upon. Several of the men, completely deceived, attempted to catch her, but she fluttered away, keeping just out of reach of their hands until they had been enticed ten or twelve yards off, when she rose and was off like a buillet. Her tactics had successfully covered the retreat of her young.

Compostion of Wool Grease.-According to Schulze and Vrich, the bulk of the natural wool grease of sheep consists of compound ethers. A part of alcohols and fatty acids re in a free condition

Of allmetals known, silver is the best electrical conductor

## IMPROVED WATER MOTOR

Another contribution to the various devices, which have lately appeared for supplying a cheap and readily available power for general usage, will be found in the novel water motor represented in the annexed illustration. Its object is to drive organ bellows, coffee mills, and sewing machines, and to perform a variety of light work ordinarily done by hand. In brief, its special adaptation is to operations requiring less than a single horse power, although the apparatus may be built to perform much heavier work.
'This device consists of a light but firmly constructed iron wheel, provided on its outer rim with buckets, and the whole enclosed in a watertight iron casing. Through the casing an ordinary water pipe is so inserted that a stream of water from the pipe, flowing downward, strikes the buckets at a right angle with the radius of the wheel. 'The aperture at the end of the pipe is comparatively small, and on this account the water is forced through and against the buckets with a percussion-like effect, thus imparting a rapid and steady motion to the wheel.
In the illustration, the motor is shown attached to an organ bellows, the belt rumning from a small pulley on the motor to a large wheel on a crank shaft, to which the pitman from each feeder is attached These feeders ar shown at various stages, working alternately. In the supply pipe are two valves, one under the control of the organist, to admit or shut off the water, while the other is a regulator and works automatically. 'Tostart the motor, the performer has only to pull up the lever which openthe throttle value. When the main bellow, are full, the upper side, in rising, strikes a lever which is connectert with the regulating valve by wire cords and bell cranks as shown, clus ing said valve and shutting off the water.
The inventor informs us that this araise ment is extremely sensitive, a mere toich on the keys of the instrument leing followed instantly by a few revolutions of the motor, for a period just sufficient to replace the air expended. From testimonials submitted to us, it appears that the employment of the invention upon organs has been successful, and that the amount of water used has been about one third the quantity necessitated by other devices. It is stated that there is no jerking or thumping, but an even, smooth, noiseless, steady motion ; while the apparatus is, besides, claimed to be simple, durable, and cheap, and to run for years without repairs. It is now in use on several organs of forty stops, doing the work with a pressure of water of twenty pounds per square inch, costing per annum, as we understand the inventor to assert, from $\$ 12$ to $\$ 1.5$ The invention is also adapted for driving sewing machines, and, we are informed, can be applied to a single machine for domestic use so as to run at a cost of from $\$ 2.50$ to $\$ 3$ per annum. By regulating the water supply through a foot treadle, any speed may be attained from one stitch per seeond to 1,000 per minute, as desired. The apparatus can be attached to the ordinary water pipes, and it is claimed that a stream no larger than the head of a pin is sufficient to drive a sewing machine. Generally, the device can le used where the pressure is from twelve pounds upwards.
Among other practical applications of the motor may be mentioned its use for printing presses, turning lathes, jewelers' lathes,opticians' and lapidaries' wheels, grinding coffee and spices, cutting sausage hoisting for stores and private residences, and, in fact, all light machinery requiring one horse power or less.

We understand that this motor is being used in Brooklyn and vicinity with much success, and at very cheap cost. Water sufficient for the purposes of a large organ can ordinarily be obtained for from $\$ 12$ to $\$ 15$ per year, or for a sewing machine for about $\$ 3.50$ for the same period.
The invention was by Mr. Oscar J. Backus, of Oakland, Cal. For further particulars address the manufacturers, Backus Bros., \& Co.. Wright street and Avenue A, Newark N. J.

## Progress in Spain.

A very practical sign of real progress and improvement in Spain is seen in the increased demand which is springing up there for scientific information. La, Gaceta Inelustrial of Madrid, formerly an insignificant publication, now comes to us enlarged to sixteen quarto pages, and is published twice a month, illustrated with engravings. It has reached its eleventh year. It is a handsome periodical and is ably edited. In the number before us the editor, Mr. Alcover, has a very excellent article upon the Centennial Exposition to be held uext year at Philadelphia. He urges the authorities to provide liberally for a Spanish representation on that occasion, which,he says, is to commemorate the glorious anniversary of American liberty. It is to be a demonstration, he thinks, of the achievements of true liberty and independence, that can only be realized by labor, which is the secret of the prosperity of nations, and which has given to the North Americans such an astonishing preponderance.

## Fourteen Thousand Miles of Ice.

The Hudson river ice crop for 1875 has now been harvested, and is one of the largest and finest ever gathered. The blocks average 14 inches in thickness, and the total quantity secured is about $2,000,000$ of tuns, or seventy millions of
cubic feet. If this mass of ice were arranged in a single distance. For very distant mountains, an adaptation of triline or beam, 12 inches square, it would have a total length linear surveying has been employed. From the station of of about fourteen thousand miles, and would reach more than the barometer, the angles between any three of the surroundhalf way around the world. To transport the entire quantity : ing peaks, whose positions I have before found trigonometriabove named simultaneously, in ice carts, each carrying two cally, are measured, and afterward, by three point problem tuns, drawn by two horses, driven by one man, would require (usually graphically upon the survey map) the distance is an army of a million men, two millions of horses, and a mil- obtainea and the proper allowance made for curvature and lion vehicles.
This enormous supply of ice will be chietly consumed detennined points throughout the region, the tri-linear mein the city of New York. It is brought down the Hud method is found not only the easiest, but the most acen son river from the great ice houses, which are lo- rate.
cated at the water's edge, in large barges, towed loy statim. The practical application of this method to the work of It is delivered directly from the barges inw the ice carts, the survey is well shown by the illustration, which repreand in them conveyced to the doors of private dwell- sents a survey party engaged in leveling observations with ings. For a quarter to halt a tum a month is a common sup- mountain barometers, at the levels of the different peaks ply for a small family. The price charged is from sio to seen in the distance. At $A$ is seen the transit, by whicht the


## BACKUS' IMPROVED WATER MOTOR.

\$30 a tun for families, according to the scarcity or abundance of the supply. Large consumers, such as market men and hotel
price.

## MEASURING MOUNTAINS.

Mr. Verplanck Colvin, in his report on the toporraphical urver of the Adirondack wilderness, elucidates some new

theories on the subject of mountain measurement, and describes one method as follows:

- For short distances, I carefully measure on the mountain side a base line with steel tape, and from its extremities take horizontal angular distances between three of the distant peaks are measured in order to obtain the data for correction for curvature and refraction. Below, on the same same mountain side, at $e, e$, and $e$, are stations of harometers at the apparent levels of the peaks by the lines of sight level.
At the foot of the mountain is the bark camp, and the assistant observing on barometer at lower station: a guide ncar be is cuttingr night wood for camp.
The sight lines, or lines of apparent level (e-to-e), are taken from points on the mountain side, which are really lower than the distant peaks; for, following to the left the curve of the earth from the harometer station (h.... to .... h), it will be seen to descend below the level of the peaks in proportion to their dis'ance-the true level of the distant peaks being the curved dotted line of equal hight-above sea level, evidently considerably higher than the stations of their apparent level. 'The effect of refraction is not shown in the illustration. In practice, the observer on barometer at the lower station takes observations upon his instrument and the attached and detached thermometers wery tive minutes; and (whenever possible) similar observations are taken on the summit of the peak above the intermediate leveling stations, afiording looth a lower and an upper station when weil determined. The observations, therefore, taken at any five minutes, will be synchronous with those taken on the mountain sides, at leveling stations, or on the peak above; they can then be computer: as usual, by the upper or lower station records, and, by the tri-linear measurement-. the proper corrections for curvature, etc. made, and the true light of the distant peak is found."


## SCIENTIFIC AND PRACTICAL INFORMATION.

## NOT 1 " NEW JERUSALEM.

It may perhaps be unnecessary to assure our devouter reaclers that Virginia City, Nev., is not the much longed for "New Jerusalem, the city of the Saints," notwithstanding its streets are paved with precious metals. It is true, nevertheless, that the denizens of that unsaintly city boast that the very mud of their streets is rich in silver and gold. It happens that the principal streets of the city were macadamized with refuse ore taken from the mines in early days; and since then, they have been steadily dusted with rich ore sifted down upon them from passing ore wagons, making a surface so precious that an ounce or two of mud (taken from the wheel of a wagon to decide a wager) proved on assay to contain, to the tun, silver, $\$ 7.54$; gold, $\$ 2.32$; total $\$ 9.86$. "After this," exults the Enterprise of that richly paved city, " we may put on airs, even though our streets are villanous. If muddy occasionally, for the very mud on our boots rottains, both silver and gold."

New lise for mineral oms.
In a late number of the Australian Medical. alriall, Dr. John Day maintains that certain of the mineral oils, gasoline especially, are of great use as disinfectants, their value alepending, he believes, on the fact that they are rich in peroxide of lyydrogen. He employs the gasoline in various ways as a disinfectant, applying it to walls, to articles of furniture, and to clothing; also as a wash for the hands after treating infectious diseases, allowing the moistened hands to dry in the open air. A peculiar and valuable property of these oils as disinfectants is their continuous action, while they improve and gather force by exposure to the air.

## the maktial seas

M. Meunier has recently advanced the theory that the planet Mars is much older than the earth, because of the rarification of its atmosphere and the small extent of its seas. The form of the latter, he says, is exactly that which the terrestrial oceans would assume after partial absorption by the earth's crust. If, for example, the Atlantic were absorbed so that only that portion included in the contour made by the uniform depth of 12,000 feet were left, ihe shape would be exactly similar to that of some of the scas recognized in Mars.
lemor juice in dhitheria.
Dr. Revillout states that lemon juice, used as a gargle, is n efficacious specific against diphtheria and similar throat roubles. He has successfully thus employed it for over eighteen years.

By Whom are Inventions Made?
In the course of a paper at the Society of Arts recently, on the "Expediency of Protection for Inventions," Mr. Bram well, F. R. S., said: "The bulk, one might almost say the whole, of real substantive inventions have been made by persons not engaged in the particular pursuit to which those in ventions relate. Take a few instances. Watt was not a maker of steam engines, the fire engines of his day, but lie was a mathematical instrument maker; Arkwright, the in ventor of the 'water twist,' was a barber; Cartwright, the inventor of the power loom, was a parson; Neilson, the inventor of the hot blast, was wholly unconnected with smelt ing operations, he was the manager of gasworks; Wheatstone, who has done so much for electric telegraphs, was en gaged in the manufacture of musical instruments; and Ronalds, the very originator of the electric telegraph, had nothing to do with the visual telegraphs in use in his time; Bessemer, who has so enormously increased the manufacture of steel within the last quarter of a century, was in no way connected with that industry. The fish joint for railways, the greatest improvement in permanent way that has been made since railways were introduced, was the invention of a astablish position, that the preat substantive inventions are made by persons unconnected with the manufacture or art to which those inventions relate; and we can readily see why this should be. The person who has been brought up to pursue any particular manufacture has, even before he had sufficient knowledge to be able to appreciate the merits and the principle of the processes he was taught to follow, been trained in the belief that 'certain ends are to be obtained by particular means.' Under such circumstances, it is difficult for even a powerful mind to break through the trammels which have been imposed upon it, and to approach the consideration of the subject of the particular art with the same broadness of view and power of detecting and grasping the true principles upon which that art is based, as would be possessed by a mind devoting itself to the subject for the first time; and thus the man untaught and unprejudiced in the art is more likely to make a substantive invention than is one who has been trained in it from his youth. Improvements of detail such a person may make; but there, in all probubility, will be the limit of his inventions.
One can understand that a man who had been taught from his boyhood to make steel by the process of cementationthat is, by packing bars of wrought iron into brick boxes containing charcoal, and exposing the whole for several days to considerable heat, and thus carbonizing the iron and producing blistered steel-might, not unnaturally, devise some improvement by which this process could be expedited, though one can hardly imagine such a man breaking with the traditions of the industry, and casting away the whole process of cementation. But one bringing a totally fresh mind to the consideration of steel manufacture would, in all probability, study the question from the very beginning, and would say - What is steel? What is wrought iron? What is cast iron?' and when he discovered that steel was something between and when he discovered that steel was something between
cast iron and wrought, that is to say, it contained less carbon cast iron and wrought, that is to say, it contained less carbon
than the one and more than the other, and when he found that cast iron was a cheaper article than wrought iron (wrought iron being commonly produced from cast by practically abstracting the whole of its carbon), he would seek a means by which he might abstract from cast iron, not the whole of the carbon, to leave wrought iron, but so much of the carbon as would leave steel. To one brought up in the steel trade, the very word 'steel' would be associated with the addition of carbon, and it would be most unlikely that he should attempt the manufacture by a process which had for its object the taking away of carbon. Once concede that the great inventions are made by 'outsiders,' then it appears to me that, to continue this, the highest class of invention, protection is an absolute necessity. An inventor must nearly in every case make trials and experiments, and these, as a rule, can only be conveniently done in places where the manufacture is being exercised; but now we are assuming that the inventor is not engaged in the manufacture: he has therefore either to incur great expense to make his experiments-an expense in many cases prohibitory-or to forego the experiments altogether, or else he must seek the aid, and trust to the honor, of some manufacturer.
Imagine a country clergyman who has some knowledge of chemistry making an invention of an improvement in smelting iron ore. If he were a man of real ability, as I have supposed, he would appreciate the great complexity, and the many practical difficulties, of that process, and he would know that nothing short of a trial of his invention in the actual furnace could assure him that his method would not be frustrated by some such difficulty. What, without a patent frustrated by is that inventor to do? Forego the trial? Devote $\$ 25$,000 of the large property which usually belongs to a country clergyman to the erection of an experimental blast furnace; trust to the honor of a manufacturer ; or give up the invention? I think the probability is that he would pursue the last course, and that thus the invention would be lost to the community. But even supposing the preliminary difficulty of a practical trial not to exist. Assume, for example, that the invention be one such as that of the Giffard injector,
one of the most substantive of the present day. This might have been tried in private by its inventor vithout might have difficulty, even although he were wholly insuperable difficulty, even although he were wholly
unconnected with any of the mechanical arts, and he might unconnected with any of the mechanical arts, and he might
have perfected his invention in every detail. But when he have perfected his invention in every detail. But when he
had done this, what would have been his chance of reward? had done this, what would have been his chance of reward?
How would he have set about reaping the pecuniary benefit which he would desire, and which would be his reasonable due? Would he make up his mind to forego all his usual
habits of life, and to become a manufacturer? Say that he did so, and that, in spite of the difficulties to which I shall have to revert, he succeeded in making a certain number of the injectors for sale, and that then he knew enough of business to obtain purchasers for them, what would be the inevitable result? The very first mechanical engineer (a steam pump maker) into whose hands one of these injectors fell, would say: 'Here is an implement that seems likely to compete seriously with the use of steam pumps. Why should not I make it? At present I know it is being manufactured by the inventor only, a person who was not brought up to the trade, and who is living in a purely agricultural district ; it is a hard case if I cannot hold my own against him.' Thereupon the steam-pump maker goes to work, with all the advantages of an established factory, with its befitting plant, its staff of superintendents, its foremen, and its body of workmen, to produce injectors, and with a whole system of travellers and agents, and the advantage of a large connection, to dispose of the injectors when made What chance would the inventor have, in his capacity of manufacturer and seller, against such an organization as this? Obviously, none; therefore, as it seems to me (equally obviously), he (foreseeing this) would not have bestowed the thought necessary to invent, and even if he had, he would not have incurred the labor and expense of experimenting upon his invention."

## Useful Recipes for the Shop, the Household,

 and the Farm.Frosted glass, useful for screens, etc., is made by laying the sheets horizontally and covering them with a strong solution of sulphate of zinc. The salt crystallizes on drying.
A teaspoonful of powdered borax dissolved in a quart of
epid water is good for cleaning old black dresses of silk, cashmere, or alpaca.
Butter will remove tar spots. Soap and water will after wards take out the grease stain.
Black shoes may be bronzed by a strong solution of anilin ed in alcohol.
Four parts borax and three parts Epsom salts, mixed with three or four parts warm water to one part of the combined substances, is said to form an excellent fireproof wash for clothes. It should be used immediately after preparation.
Flaxseed and tallow are used in Germany as a stuffing for cushions. One part of tallow to ten parts of flaxseed are employed, the mobility of the greased seed rendering the cushion very soft and pliable.
Gold bronze for furniture is a mixture of copal varnish mixed with gold-colored bronze powder. The last is bisulphate of tin
The total number of strings in a piano, when properly stretched to produce the right tones, exert a pull of over ten tuns; this explains why good pianos must be durably and heavily built.
To prevent moths in carpets, wash the floor before laying them with spirits of turpentine or benzine.
Straw matting should be washed with a cloth dampened in salt water. Indian meal sprinkled over it and thoroughly swept out will also cleanse it finely.

In washing windows, a narrow-bladed wooden knife, sharply pointed, will take out the dust that hardens in the corners of the sash. Dry whiting will polish the glass, which should first be washed with weak black tea mixed with a little alcohol. Save the tea leaves for the purpose. Gray marble hearths can be rubbed with linseed oil, and no pots will show.
Sprigs of wintergreen or "ground ivy will drive away red ants; branches
black ants.
Papering an
Papering and painting are best done in cold weather, especially the latter, for the wood absorbs the oil of paint much more than in warm weather; while in cold weather the oil hardens on the outside, making a coat which will protec the wood instead of soaking into it.
Never paper a wall over old paper and paste. Always scrape down thoroughly. Old paper can be got off by damping with saleratus and water. Then go over all the cracks of the wall with plaster of Paris, and finally put on a wash of a weak solution of carbolic acid. The best paste is made out of rye flour, with two ounces of glue dissolved in each quart of paste; half an ounce of powdered borax improves he mixture.
An oaken color can be given to new pine floors and tables by washing them in a solution of copperas dissolved in strong lye, a pound of the former to a gallon of the latter. When dry, this should be oiled, and it will look well for a year or wo ; then renew the oiling.
Kerosene and powdered lime, whiting, or wood ashes will scour tins with the least labor.
Spots can be taken out of marble with finely powdered pumicestone mixed with verjuice. Cover the spots and al low the stuff to remain for twelve hours; then rub clean, dry, and rinse.
Soapstone hearths are first washed in pure water and then rubbed with powdered marble or soapstone, put on with a piece of the same stone.
A strong solution of hyposulphite of soda is said to be excellent for cleaning silver.
Two ounces of common tobacco boiled in a gallon of water s used by the Chatham street dealers for renovating old clothes. The stuff is rubbed on with a stiff brush. The goods are nicely cleaned, and, strange to add, n o tobacco smell
remains.
Never use wrought iron instead of steel simply because it it is more easily worked and cheaper than the latter; nor bras
nstead of gun metal in heavy machinery.

Shellac is the best cement for jet articles. Smoking the joint renders it black to match.
Barrels intended for alcohol may be rendered perfectly tight by applying inside a solution of 1 lb . leather scraps and 1 oz . oxalic acid in 2 lbs . water, afterwards diluted with 3 lbs. warm water.
A solution of chloride of iron will remove nitrate of silver stains from the hands.
Unslaked lime is excellent for cleaning small steel articles, such as jewelry, buckles, and the like.
Glass may be powdered to render it suitable for glass paper, for filtering varnishes, etc., by heating it red hot and then suddenly plunging it in water.
To remove old paint, cover with a wash of 3 parts quick stone lime, slaked in water to which 1 part pearlash is added. Allow the coating to remain for 16 hours, when the paint may be easily scraped off.

Seventeen years have passed since Deville first produced aluminum on a commercial scaie; but the expectations regarding this very interesting and meritorious invention of the distinguished French chemist have not as yet been fulfilled. Although many of those expectations were somewhat exaggerated, they were not so unreasonable as many poeple believed them to be; for a metal with so many valuable properties would be useful in many of the technical arts. Among these properties are a beautiful color that does not change in the air, nor yet in sulphurous exhalations, and further remarkable lightness, an agreeable reasonance, and a capability of being worked into any shape. Moreover, in the use or manipulation of aluminum, there have not hitherto been observed any deleterious effects.
It is generally conceded that the cost, and not the absence of properties which make other metals valuable, has prevented the more extensive application of aluminum; and the price, although it was considerably less than it was at first, has remained high for many years. The cost of production of this metal, which can only be extracted by the use of sodium, cannot possibly be the only cause of its high price; for the commercial manufacture of sodium may be considered as a solved problem ; and as soda ash is very cheap, sodium might be produced at a moderate cost if the demand were greater than it is. Large production is caused by large consumption, and the use of aluminum has been hitherto imited, mainly because custom and use have in a measure opposed the introduction of such a novelty, except for fancy rticles.
Stories have been told and written about poisoning by cooking vessels made of copper, by glazings containing lead and the formation of verdigris on spoons of (alloyed) silver but if people were only determined to produce these utensils from aluminum, all danger from poisoning would ${ }^{2}$ be removed, and they would have vessels, the appearance and du rability of which would leave scarcely anything to desire. They would be more convenient to handle than our light crockery ware, for they can be made as light, and, what is important, cannot be broken. Splendid pitchers, plates, gob lets, lamps, etc., might be manufactured from deadened and embossed aluminum; and the lightness of spoons of this metal would make them more convenient than those of silve now in use. In this case it is not the price, but only pre judice, which presents itself as a drawback, for the price is only half of that of good silver; beside, the difference in the specific weights of both metals and the consequent cheapness in the use of aluminum are so great that, for the value of one silver spoon, at least seven equally large aluminum spoons might be bought. True, aluminum is neither a rare nor a noble metal ; but it possesses, nevertheless, advantages over alloyed silver which give it a much finer appearance it does not get black, nor does it form verdigris, and what it acks in brilliancy and appearance is well compensated for in ts agreeable lightness. But, unfortunately, it has been found impossible to plate with aluminum, either by the lectro-galvanic or the foil method.

## Poisonous Magenta Colors.

Dr. Springmühl, the editor of the Musterzeitung, states that out of 25 specimens of magenta only one was found free from arsenic. In 14 the amount was sufficient for quantitative determination. In four samples the proportions were respectively $6 \cdot 5,5 \cdot 9,5 \cdot 9$ and $5 \cdot 1$ per cent. Such quali-
ties, of course, must prove dangerous if used for coloring ties, of course, must prove dangerous if used for coloring
liquors, confectionary, and toys. In dyeing, however, the amount of the poisonous matter which attaches itself to the wool is relatively trifling. This the author ascertained by an interesting experiment. In a beaker he dissolved 1.55 grains of the most poisonous sample in hoc water. The solution, of course, contained 0.093 grains of arsenic. In it a square foot of pure wool (woolen tissue) was dyed. It was then well rinsed in a second beaker of pure water, and again in a third. The dyed wool, the residual dye, and the wo wash waters therefore contained 0.093 grains of arsenic, and it remained to ascertain its distribution. In the dye bath were found 0.072 grains, in the first washing water 0.016 . In the second washing water, the amount was ton small to be determined. It, however, and the dyed wool must together contain the residue, $0 \cdot 005$. According to Marsh's test, the wool appeared to contain less than the second washing water. Hence a square inch of the woolen could contain scarcely 0.0003 of a grain of arsenic. If the proportion of arsenic is low, as in well purified magentas, the wool, when dyed, gives no indications by Marsh's process.
The two most frequent adulterants are oxalic acid and sugar. The author has found 21 per cent of the former, and
twenty-four per cent of the latter. Joly has detected sugar o the extent of 50 per cent.
Aniline violets are more liable to sophistication than magentas, from the fact that they are sold, not in well defined crystals, but in powder or in cakes. The author has detected gum in a Hofmann's violet to the amount of 12 per cent, and 8 per cent of finely ground charcoal in a common phenyl violet.
Of 32 samples of iodine green examined, 5 were unquestionably sophisticated. One contained 18 per cent of sugar. An English sample was cleverly sophisticated with a salt of lead, probably the picrate, and deflagrated when a portion was heated upon platinum foil. Metallic lead was found to the extent of 10 per cent, corresponding to 21 per cent of the picrate. Two other samples contained respectively 14 per cent of common salt and 26 per cent of magnesia. Oxide of chrome is also a possible adulteration.

The finest sample of iodine green examined was from the manufactory of H. Siegle, in Stuttgart. The author considers that in the production of this beautiful and costly color the Germans are superior to the English and the French.

## CCorregiondente.

## The High Lakes in the West.

To the Editor of the Scientific American:
In your issue of December 22, under the caption of "The Highest Lake in the United States," you claim for Lake Harkness, Plumas county, Cal., that distinction, accrediting it an altitude of but 7,330 feet.
We have in Clear Creek county, Col., two beautiful little lakes, each of about a mile in circumference, very deep; and the water, of dark bluish green, is extremely cold. There is no apparent source of supply, as the lakes are surrounded by high mountain walls of granite blocks, piled in magnificent confusion, and quite heavily timbered. They are at an
altitude of at least 9,000 feet, and are the source of the famous Clear Creek Cañon stream.'
Again, about six miles south of these lakes and at an altitude of fully 10,000 feet, as it is just above our timber line, is situated Chicago Lake, now widely known as the scene of Bierdstadt's "Storm.in the Rocky Mountains." It is a most picturesque sheet of clear, limpid water, but appears at a little distance to be almost black, owing to its great depth. The water is intensely cold, but contains an abundance of trout. The lake is about a half mile in diameter; and at the upper or northwest side, a perpetual bank of ice and snow creeps down to the water's edge. On the south, an imposing wall of smooth granite towers almost vertically to the hight of 2,000 feet; while on the west, there are a series of majestic terraces, like huge steps 300 to 400 feet high. The north wall slopes away at an angle of about $45^{\circ}$; and to the south and east, there is an easy, gradual slope down into Chicago Cañon. This lake would appear to have been the crater of some volcano. Yet there are no traces, that we could find, f any volcanic action.
C. R.

St. Louis, Mo.

## To the Editor of the Scientific American:

Your journal for December 22, 1874, states that a certain lake in California, having an elevation of 7,330 feet, is pro bably the highest in the United States.
There are hundreds of lakes in the Rocky Mountains hav ing a greater altitude than 7,330 feet. Prominent among these are the Twin Lakes, 8,700 feet, San Cristobel and Lake Mary in the San Juan county (somewhat higher), and Grand Lake in Middle Park. There are many smaller lakes in the region of the timber line, varying in elevation from 10,000 to 12,000 feet. These lakes are all along the snowy region in the National, Elk, Saguache, San Miguel, Uncompahgre, Sangre de Christo, and other ranges. In the National range which, according to Professor Hayden, " is by far the largest and grandest in the United States," there are several considerable lakes above 9,100 feet, and many smaller ones, from 10,000 to more than 12,000 feet, above the sea level.
West Hallock, Ill.

> Herbert R. Saunders.

## Hollow Bolts and Axles <br> ntific American;

For several years it has cost me five dollars a week to keep the bolts on my trip or cushioned hammer heads in repair, and, finding it to wear on my patience. I tried all kinds of iron, but to no use; break they would. I made the threads of a round or $U$ shape, which worked much better than the V ; but still they broke. I finally bored a hole, one third the diameter of the bolts ( $1 \frac{1}{4}$ inches), and put a $\frac{8}{8}$ of an inch hole down, some way below the thread, which formed a tube. I have now run them for three months, and they show no signs of giving out. The wrench used would break the other bolts easily; but it cannot do so with these. My work on spindles requires the dies to snap together about nine times in ten which tells very severely on the bolts; and I believe that the bolts broke because the severe strain on the nuts stretches
the outside grain of the iron by the concussion, so that there is a contention between the outside and inside strain.
I was apprenticed to William Fairbairn, in Manchester, England, and I have known his 8 inch axles on locomotive engines to break, owing probajly to the rails resting on stone sleepers. They had some 6 inch tubular axles made, with 2 inch holes; and they never broke one of them, to my know ledge.
Mansfield, Mass.
John Birkenhead.

## Bolting Reels.

## To the Editor of the Scientific American:

There is at present considerable interest manifested by millers as to the best method of constructing bolting reels and clothing the same, the best arrangement of the various numbers of cloths, etc. It is now almost universally conceded by the most intelligent millers that the less violently the meal is acted upon in the reel in the process of bolting, or, in other words, the nearer the motion of the meal is to a slide, the cleaner and whiter will be the flour. In endeavoring to attain this sliding principle, various plans of constructing and clothing bolting reels have been resorted to. Among some of the methods employed are putting the cloth on the inside of one riband on the outside of the adjacent one putting the cloth on the inside of all the ribs, using large reels and running them at a slow motion, also using the round form of reel. The writer has tried all the plans above mentioned, and more too, but finds the round reel much the most satisfactory, both on account of the improved color of the flour and the greater capacity of the reel.

It is the practice in many of the best mills in the Northwest to bolt the meal in the usual manner, and then rebolt the flour through a bolt of the round form, covered with a somewhat finer cloth, one round bolt of twenty feet long being of capacity sufficient to rebolt two hundred barrels of floup in twenty-four hours.
I would like to hear from brother millers as to what they consider the best style of dress for millstones for grinding spring wheat.
D. T. Choat.

Cedar Falls, Iowa

## [For the Sclentific American.] THE VOIGES OF ANIMALS. by professor James orton.

Aquatic animals are mute. A world of radiates, molluscs, and fishes, therefore, would be silent. Insects are about the only invertebrates capable of producing sounds. Their organs are usually external, while those of higher animals are internal. Insects of rapid flight generally make the most noise. In some the noise is produced by friction (stridulation); in others, by the passage of air through the spiracles (humming). The buzzing of flies and bees is caused in part by the vibrations of the wings; but it comes mainly from the spiracles of the thorax.
Snakes and lizards have no vocal cords, and can only hiss. Frogs croak, and crocodiles roar by the vibration of the glottis. The huge tortoise of the Galapagos Islands utters hoarse, bellowing noise.
The vocal apparatus in birds is situated at the lower end of the trachea, where it divides into the two bronchi. It consists mainly of a long drum with a cross bone, having a vertical membrane attached to its upper edge. Five pairs of muscles (in the songsters) adjust the length of the windpipe to the pitch of the glottis. The various notes are produced by differences in the blast of air, as well as by changes in the tension of the membrane. The range of notes is commonly within an octave. Birds of the same family have a similar voice. All the parrots have a harsh utterance; geese and ducks quack; crows, magpies, and jays caw; while the warblers differ in the quality rather than the kind of note.
Some species possess great compass of voice. The bell bird can be heard nearly three miles; and Livingston said he could distinguish the voices of the ostrich and lion only by knowing that the former roars by day and the latter by night.
The vocal organ of mammals, unlike that of birds, is in the upper part of the larynx. It consists of four cartilages, of which the largest (the thyroid) produces the prominence in the human throat known as Adam's apple, and two elastic bands, called vocal cords, just below the glottis or upper opening of the windpipe. The various tones are determined by the tension of these cords, which is effected by the raising or lowering of the thyroid prominence. The will cannot
influence the contraction of the vocalizing muscles, except in influence the contraction of the vocalizing muscles, except in
the very act of vocalization.
The vocal sounds produced by mammals may be distinguished into the ordinary voice, the cry, and the song. The second is the sound made by brutes. The whale, porpoise, armadillo, ant eater, porcupine, and giraffe are generally silent. The bat's voice is probably the shrillest sound audible to human ears. There is little modulation in brute utterance. The opossum purrs, the sloth and kangaroo moan, the hog grunts or squeals, the tapir whistles, the stag bellows, and the elephant gives a hoarse, trumpet sound from
its trunk and a deep groan from its throat. All sheep have its trunk and a deep groan from its throat. All sheep have
a guttural voice; all the cows low, from the bison to the musk ox; all the horses and donkeys neigh; all the cats miau, from the domestic animal to the lion; all the bears growl; and all the canine family( fox, wolf, and dog) bark howl, and whine. The howling monkeys and gorillas have a larger cavity or sac in the throat for resonance, enabling
them to utter a powerful voice; and one of the gibbons has the remarkable power of emitting a complete octave of musical notes. The human voice, taking the male and female together, has a range of nearly four octaves. Man's power
f speech, or the utterance of articulate sounds, is due to his of speech, or the utterance of articulate sounds, is due to his
intellectual development rather than to any structural dif. ference between him and the apes. Song is produced by the glottis, speech by the mouth.

To cement metal to glass, mix two parts powdered white litharge and one part dry white lead into a dough with woiled linseed oil and lac copal. The metal is to be coated with the cement and then pressed upon the glass.

RECENT RESEARCHES IN THE SPECTRA OF THE
Professor Vogel has recently published an important work on the above subject, in which are embodied the results of his latest observations. The light of each planet has been analyzed by the aid of the spectroscope, and from the luminous bands and rays the author translates the self-written history of the other worlds.
The principal rays of the spectrum of Mercury coincide bsolutely with those of the solar spectrum. Furthermore, certain bands which are not produced in the solar spectrum, except when the sun is very low in the horizon and when the absorption due to the atmosphere is considerable, appear permanently in the Mercurial spectrum. From this the exist. ence of a gaseous envelope about the planet may be concluded, which exercises on the solar rays an absorbing action equal to the maximum similar effect of our atmosphere. Generally the least refrangible portions of the Mercurial spectrum are more brilliant that those of greater refrangibility; trum are more brilliant that those of greater refrangibility;
but it is impossible to separate here the effect due to our atmosphere from that produced by the atmosphere of the planet. The light from Venus is also similar to that from the sun, with the addition of like absorption rays. It is concluded that the light is reflected from the cloud envelope which is known to encompass the planet. So far as the atmosphere of Venus is concerned, water must be present, so that one indispensable necessity for life there exists.
The spectrum of Mars gives a great number of the solar spectrum rays, beside, as in the two planets before referred to, others similar to the absorption lines of our atmosphere. It is concluded that Mars possesses an atmosphere not differing essentially from our own in composition, though richer in watery vapor. The red color of the planet seems to result from an absorption which takes place generally on the red and violet rays in their entirety. In the red, between C and $B$, lines appear which are peculiar to the Martial spectrum, but it has not been possible to fix' their position definitely, owing to their feeble luminous intensity.
M. Vogel's observations on the minor planets, Vesta and Flora, have not been very productive of results, owing to the dimness of the spectrum; though sufficient indications relative to the former planet have been obtained to point to the existence of an atmosphere about it.
The greater portion of the lines in the spectrum of Jupiter coincide with others in the solar spectrum; but the Jovial spectrum differs from that of the sun in the existence of dark bands in the least refrangible portion, among which one in the red may be especially noted. The length of the luminous wave to which it is due has been estimated at 0.00185353 of an inch. The other lines present, different from those of the solar spectrum, coincide with the telluric lines.
While bands are produced in the less refrangible portions of the spectrum, the radiations of the more refrangible blues and violets experience a uniform absorption. The gaseous envelope which surrounds Jupiter exercises, then, on the solar rays which traverse it, an action analogous to that of our atmosphere. Hence, the presence of water in the Jovial atmosphere may be inferred. With reference to the band above mentioned, it cannot be precisely determined whether the same is due to the presence of some body not found in our atmosphere, or to the gas composing the Jovial atmosphere being mixed in proportions different from that of air. sphere being mixed in proportions different from that of air.
It is possible that the composition of the two atmospheres may be the same, but that their action on the solar rays varies only through circumstances of temperature and pressure, quite different on Jupiter from those found on the earth. The spectra of the dark belts observed across the disk of Jupiter are especially characterized by a very marked, uniform absorption, which is undergone by the blue and violet rays. The new absorption bands, peculiar to the spectrum of the planet, never appear, but the lines are more marked and are larger than elsewhere. This proves clearly that the dark portions of the Jovial surface are deeper than the neighboring parts. The solar light penetrates more deeply into these portions of the planetary atmospheres, and thus is subjected to more marked alteration. The red color of the planet, and especially the more decided tint of the dark belts, is attributable to the uniform absorption exercised by its atmosphere upon the blue and violet rays.
In the spectrum of Saturn, the most marked rays of the solar spectrum are present. A few bands, especially in the red and orange, have no equivalent in the spectrum of the sun; but they coincide with some groups of spectral lines belonging to the terrestrial atmosphere. The greatest absorption of blue and violet rays takes place at the obscure equatorial zone. In general, it may be stated that the spectra of the body of Saturn and of Jupiter are very similar. The same is not the case with the rings of the former planet. The characteristic band in the red is absent or marked by a feeble trace: whence it may be concluded that the rings have no atmosphere, or are surrounded only by a gaseous envelope of very small density and thickness.
The feeble light of Uranus prevents the distinguishing of the Fraunhofer lines, except to a degree which might admit extensive errors in drawing deductions from their positions. It appears, however, that the absorption of the solar rays may be sufficiently recognized to infer the presence of an atmosphere about the planet; but the direct causes of the absorption it is not possible to determine. The Neptunian spectrum is essentially different from that of the sun, but, for the same reason as in the case of the planet last referred to, little can be definitely ascertained regarding it, except a general supposition that it closely resembles that of Uranus.

If gilt frames are varnished with copal varnish, they can be washed with cold water without injury.

## IMPROVED PLENUM AND VACUUM PUMP.

The novel form of pump herewith illustrated may be used either for a bellows to force an air blast, or as a pump for raising water. By producing a vacuum in one of its receivers, and compressing air into the other, both of the above capabilities may be utilized simultaneously, or both receivers may be maintained either in a state of continuous vacuum or filled with compressed air, as may be desired.
$A$ is a spiral tube coiled about (and the ends of which are in communication with) the hollow axial shaft, B. C C are hollow supports for the latter, and, at the same time, supply conduits, the water passing therefrom into shaft, B, by the inlet valves at D. E are the exhaust valves, and at F is a partition which divides shaft, B, into two compartments, so that, through its axis, there is no communication between the ends of the coiled tube, A. A portion of the coil is filled with mercury, as indicated by the broken-away section on the right, the hight of the column being equal to or greater than 28 inches, so as to overbalance atmospheric pressure.
When the coil is turned by the action of the belt pulley or by hand, in the direction of the arrow, the mercury, flowing along the spiral tube from one end to the other, will create a vacuum in its rear while compressing the air before it. In so doing, it will draw water or air through the valve, $D$, at one end of the shaft, and expel the air before it from the valve, $E$, at the opposite extremity. If the motion be reversed when the mercury has traversed the length of coil, A, the same takes place with the other pair of valves, while, of those first affected, the inlet valve now closes and the outlet valve opens. A moment's inspection of the arrangement of the valves in the diagram will show that a continuous suction and exhaust is thus maintained.
If the positions of the inlet and outlet valves be changed-valves, E, being inlet valves and D, outlet -the apparatus may be used as an air compresser, of they may be easily inserted into the recesses. On relaxing which the tubes, C, may be conduits to the reservoir. In the pressure, the elasticity of the springs carries the catches such case valves, E, which, as represented, open outside the shaft, would open inwardly, while valves, D, now opening inside the shaft," would open into the receivers.
It is claimed that, by this device, water may be raised 33 feet. The amount of compression attained is dependent upon the weight of the mercury column and the size of the machine. Air, however, it is stated, can be compressed five times, equal to a pressure of 60 pounds to the square inch. The receivers may be made of any desired size. The diameter of the tubes and number of coils may be increased at pleasure. The diameter of the coils may be from three to fifteen feet, and either hand or steam power may be utilized for their rotation.
Patented through the Scientific American Patent Agency, November 24, 1874, to Daniel L. Cameron. For further particulars regarding sale of rights, or of patent, etc., address the patentee at Madison Station, Madison county, Miss.

## a New sad iron.

Flat irons with fixed handles are fast becoming things of the past. They occupy too much room on top of the stove or range, cost more to manufacture, and, besides, require the

use of a holder, which is not always at hand when required. It is a much better arrangement to have the flat portion of the iron separate, with provisions made to accommodate a light handle, which may be inserted and removed at pleasure, one handle answering for a number of irons, and which, being detached while the iron is heating, keeps cool enough to manipulate without the interposing cloth holder or the liability of burnt fingers
An invention of this description is represented in our en graving, and is one of the simplest of the many that have
come under our notice. The sectional view, Fig. 2. shows that, in the stock part of the iron, two recesses, A, having lips, are formed. The handle consists of two spring braces, B, of steel, attached to each end of the wooden piece which receives the grasp. These, at their lower extremities, are provided with catches beveled and notched to fit the lips of the recesses of the stock. The side pieces are united by an arched brace. The fingers are inserted beneath the flattened upper portion of this last, pulling it upward, and so drawing the catches on the ends of the side pieces together, so that

$\qquad$

CAMERON'S PLENUM AND VACUUM PUMP. placed. Columbus, Ohio.
caliber. The usual make, however, is for paper or metallic cartridges for fowling pieces. The invention appears to us to be excellently calculated both for easy loading and for rapid firing, no matter in what position the wearer may be

For further particulars address the Hayden Belt Works,

## When to Get Up.

The Duke of Wellington always slept on an iron camp bedstead eighteen inches wide. "When a man wants to turn over," he said, "it is time for him to turn out." The Emperor Nicholas did the same, Mr. Owens says. The principle is well enough; but I think the detail is wrong. Sleep itself is far too important to be made uncomfortable. My old friend Ros. siter fixed his alarum so that, at the fore-or dained moment, the bed clothes were dragged from the bed, and Rossiter lay shivering. I have myself somewhere the drawings and specifications for a patent (which I have never applied for), which arranges a set of cams and wheelwork under the bedstead, which, at the moment appointed, lift the pillow end six feet, and deliver the sleeper on his feet on the now horizontal footboard. He is not apt to sleep long after that.
He is not apt to sleep long after that.
Rossiter found another contrivance which Rossiter found another contrivance which
worked better. The alarm clock struck a match, which lighted the lamp, which boiled the water for Rossiter's shaving. If Rossiter staid in bed too long, the water boiled over upon his razor, and clean shirt, and the prayer book his mother gave him, and Cole ridge's autograph, and his onen pocketbook, and all the other precious things he could put in a basin underneath when he went to bed; so he had to get up before that moment came.-Old and Ner.
a Good Lawn.
The first great requisite in making a lawn is to have good drainage, after which prepare the ground by deep plowing and also by subsoiling, the soil requiring to be well pulver ized and enriched, to expect any success in our hot climate. A good lawn is one of the most pleasant appeudages to a house; but to make it so, it requires to be well attended to, both in the formation and by keeping it mown every two weeks at farthest, using the most approved lawn mow By doing so you will soon have a lawn like a carpet. In By dorience and neglect have been the causes of numerous fail exper
ures.

## WELLMAN'S IMPROVED CAR SEAT.

The novel feature of the car seat, represented in the ac companying engraving, consists in the manner in which it is reversed. Instead of turning the back over, as is usually done, arrangements are provided whereby the back is slid from one side of the seat to the other, without being lifted or turned. To this end, fixed rods, $A$, are provided at the ends of the seat, over which slide the staples, B, which confine the three portions of the back. The latter consists of a center piece, C, which may be of wood or metal, or both, to the top of which are secured the outer parts, D. These last are each made in two portions, which spring out and in independently. The backs of each part, D, are of wood, and

springs or upholstery are inserted between them and the central portion, C, to give further elasticity.
It will readily be understood that the entire back is supported on the staples and rods, and hence, by the sliding of the former over the latter, is readily pushed from front to rear of the seat, or vice versa.
Patent pending through the Scientific American Patent Agency. For further particulars address the inventor, Mr. Edwin G. Wellman, Canandaigua, Ontario county, N I.

## A HAIRY FACED FAMILY.

Mr. W. B. Tegetmeier, a well known English naturalist, publishes in a contemporary the portraits of three members of a Burmese family, the whole of which, through several of a Burmese family, the whole of which, through several generations, have exhibited a
"The case," says Mr. Tegetmeier, " is one of the most interesting examples on record of the hereditary transmission of a singular and very abnormal natural variation through several generations. I feel bound, even at the risk of repeat ing, to some extent, the previous statements, to give, as far as practicable, the history of those singular people at length Nearly fifty years since, Mr. John Crawford, so well known to ethnologists for his researches into the history of languages of the inhabitants of the Malay peninsula and adjacent countries, described, in his 'Journal of an Embassy from the Governor General of India to the court of Ava,' a hairy man named Shwe-Maon, and his daughter, Maphoon. Mr. Crawford wrote: "We have heard much of a person said to be covered allover with hair, and who, it was insisted upon, more resembled an ape than a human beingan ape than aman beinga description, however, I anı
glad to say, which was by no glad to say, which was by no
means realized by his appearmeans realized by his appear-
ance. Having expressed a ance. Having expressed a
curiosity to see this individual, the king politely sent him over to our dwelling some days ago, and Dr. Wallich and I took down on the spot the following account of him. self and his history His self and his history. His name was Shwe:Maon, and he stated himself to be thirty years of age. Saubwa, as the chief of the eountry, presented him to the king as a curiosity when a child of five years of age, and he had remained in Ava ever since. His hight was 5 feet $3 \frac{1}{2}$ inches, which is about the ordinary stature of the Burmese nary stature of the Burmese. His form was slender, if compared with the usually robust make of the Hindoo-Chinese race, and his constitution was rather delicate. In his complexion there was nothing remarkable, although upon the whole he was rather fairer than theordinaryrun of Burmese. The color of his eyes was a dark brown, not so inwas a dark brown, not so intense as that of the ordinary
Burmese. The same thing Burmese. The same thing may be said of the hair of the head, which was also a little finer in texture and less copious. The whole forehead, the cheeks, the eyelids, the nose, including a portion of theinside, the chin-in short, the whole face, with the exception of the red portion of the lips-were covered with a fine hair. On the forehead a fine hair. On the forehead
and cheeks this was 8 inches and cheeks this was 8 inches
long, and on the nose and chin about 4 inches. In color it was of a silvery gray; its texture was silky, lank, and straight. The posterior and inferior surface of the ears, with the inside of the external ear, were completely corered with hair of the same description as that on the face, and about 8 inches long; it was this chiefly which contribuand about 8 inches long; it was this chiefly which contribu-
ted to give his whole appearance, at first sight, an unnatural and almost inhuman aspect. He may be strictly said to have neither eyelashes, eyebrows, nor beard, or at least they were supplanted by the samesilky hairwhich enveloped the whole face. He stated that when a child the whole of this singular covering was much fairer than at present. The whole body, with the exception of the hands and feet, was covered with hair of the same texture and color as that now described, but generally less abundant; it was most plentiful over the spine and shoulders, where it was 5 inches long; over the breast it was about 4 inches; it was most scanty on the bare arms, the legs, thighs, and abdomen. We thought it not improbable that this singular integument might be periodically or occasionally shed, and inquired, but there was no ground for this surmise-it was quite permanent.'
Twenty years since, these hairy people were seen and described by Capt. H. Youle, in his ' Narrative of the Mission sent by the Governor General of India to the Court of Ava.' By this time Shwe-Maon's child had grown into a woman of thirty, and the abnormal growth of hair had increased until it covered the whole body. Capt. Youle states:
'The whole of her face was more or less covered with hair. On a part of the cheek, and between the nose and mouth, this'was confined to a short down, but over all the rest of
|the face was a thick, silky hair of a brown color, paleing the back part of the gums presenting merely a hard ridge. about the nose and chin, four or five inches long. At the Still she chews pawn like her neighbors.'
alæ of the nose, under the eye, and on the cheek bone, this Six or seven years since, the family were again seen by was very fuliy developed; but it was in and on the ear that Capt. Haughton, and photographed. By this time Maphoon's it was most extraordinary. Except the upper tip, no part of youngest child was approaching manhood, and, the early inthe ear was visible. All the rest was filled and veiled with dications above alluded to having been fulfilled, he demona large mass of silky hair, growing apparently out of every strated the perpetuation of this singular variation through part of the external organ, and hanging a pendant lock to a three generations.
length of eight or ten inches. The hair over her forehead The investigation of monstrosities of the kind at present was brushed so as to blend with the hair of the head, the latter being dressed (as usual with her countrywomen) à $l a$ Chinoise. It was not so thick as to conceal her forehead.
'The nose densely covered with hair, as no animal's is that I know of, and with long locks curving out and pendant, like the wisps of a fine Skye terrier's coat, had a most strange


## THE HAIRY FACED BURMESE FAMILY.

soft and feminine, and her expression mild and not unpleasing, after the first instinctive repulsion was overcome. Her appearance rather suggested the idea of a pleasant-looking woman masquerading, than that of anything brutal. This discrimination was, however, very difficult to preserve in sketching her likeness.
' Her neck, bosom, and arms appeared to be covered with a fine pale down, scarcely visible in some lights. She made a move as if to take off her upper clothing, but reluctantly, and we prevented it. Her husband and two boys accompa nied her. The elder boy, about four or five years old, hadnothing abnormal about him. The youngest, who was fourteen months old, and still at the breast, was evidently taking after his mother. There was little hair on the head, but the child's ear was full of long silky floss, and it could boast a moustache and beard of pale silky down that would have cheered the heart of many a cornet. In fact, tLe appearance of the child agrees almost exactly with what Mr. Crawford says of Maphoon herself as an infant.
'This child is thus the third in descent exhibiting this strange peculiarity; and in this third generation, asain the two preceding, this peculiarity has appeared only in one individual.
' Maphoon has the same dental peculiarity also that her father had-the absence of the canine teeth and grinders,
under consideration has an interest beyond that of the gratification of mere vulgar curiosity. The hereditary transmission of accidental variations throws much light on the vexed question of the origin of species, and it is exceedingly interesting to note how readily variations, occurring naturally, are perpetuated in the offspring, while malformations or mutilations produced artificially never show any tendency to re production. The combs and wattles of game fowls have been production. The combs and wattles of game fowls have been
cut off for 150 generations, yet a game cock ready dubbed for the cockpit never issued from an egg. It would be indeed a sad condition of things if the mutilations of mankind were inherited by the unfortunate children. We know, unhappily, that the constitutional defects of the drunkard and the de bauchee descend to their offspring, and that in this man ner 'the sins of the father are visited on the children even unto the third and fourth generations;' but, fortunately, we are exempted from the inheritance of accidental mutilations and losses."

## Removing Snow by <br> \section*{Steam.}

Mr. William Edwards lately presented a paper on this subject before the New York Society of Practical Engineering, in which he gave a review of the various plans for melting snow in the streets to insure its removal. The system began in the use of a steam hose, furnished with a nozzle and titted to a stationary boiler, the ted to a stationary boiler, the
hose being extended to the hose being extended to the
sidewalk, and the steam jet, properly guided, rapidly melting the snow and ice, and leating the resulting water so that it quickly evaporated, leaving the flagstones dry. One of the earlier projects was to lay steam pipes along the gutters so that snow, brushed upon the pipes by a street sweeping machine would be melted and run off to the sewers.
Another step forward, at least theoretically, is the plan of a perambulating apparatus, constructed to act upon the snow by jets of steam, by blasts of hot air, or contact with metal plates. It is calculated that the combustion of one pound of coal would, theoretically, melt about 100 pounds of snow; in practice, perhaps three fourths of that quantity.

Within the past two years renewed attention has been given to the subject, and numerous novel inventions mad ${ }^{3}$. In one of these a hollow case is provided with a furnace, through which an air blast is forced by a blower. The hot air and gases from the furnace pass through a narrow horizontal opening at the front of the machine, and are directed forcibly downward against the snow and ice.
In another a portable engine operates a revolving shovel, made with a steam space, so that, when the snow is lifted by the shovel, it is melted therein.
In another a horizontal tank, supplied with steam from a boiler on wheels, is perforated at its under side, so that a shower of steam jets is thrown down upon the snow.
In still another a revolving brush swecps the snow into a double walled hopper; steam is conducted between the walls of the hopper and melts the snow.
In another the perforated steam tank is replaced by a perforated hot air tank and blowing devices that shower down streams of hot air instead of steam.
In another hot water, or steam and hot water together, are thrown upon the snow-covered surface, and in still another the steam is superheated before use.
In still another, movable plates are heated in a furnace and lowered in contact with the pavement.
These examples give some idea of the amount of ingenuity lavished upon the subject, but nothing yet done seems to afford
an adequate solution of the problem of how to cheaply and quickly remove snow from the streets. The mere cost of coal for melting would probably not prove an insuperable obstacle, but the freezing of water resulting from the operation would be a greater evil than that sought to be remedied. The writer believed that melting the snow would be more economical than carting it away ; but in order to do this, the snow must be swept from the street ways, either to the traveling! machine or to fixed pipes, previous to melting ; and the water must be conducted direct to the sewers to prevent the formation of ice in the streets. He knew of no means by which this could be accomplished, but expressed the opinion that improvements yet to be made will, in the future, make snow melting the
most satisfactory method of cleaning city streets in winter.

## Combustion

At a recent meeting of the Edinburgh and Leith Engineers' Society, a paper on "Combustion" was read by Mr. Wm Allan Carter, C. E. He remarked that an ordinary sample of anthracite coal is found to contain the following constituents in something like the following proportions:-Carbon, 86.32 per cent; oxygen, $7 \cdot 21$ per cent; hydrogen, 3.75 per cent; nitrogen, 0.41 per cent. ; ash, $2 \cdot 21$ per cent; sulphur, $0 \cdot 10$ per cent. Butin ordinary bituminous coal, such as from Edinburgh, Glasgow, Newcastle, Lancashire, or Durham, we find the carbon ranging from 74 to 88 per cent, and the hydrogen from 5 to 6 per cent; and in bituminous coal, the amount of hydrogen is an important feature, as itis from this gas that flame is produced during combustion.

We will suppose some time has elapsed since fresh fuel has been thrown on the fire, and we find that the fuel on the bars presents to our view a glowing, incandescent mass,
with no appearance of smoke and no flame, and we will suppose that the only access for the air necessary for supporting combustion is through the fire bars from the ashpit, through the incandescent fuel and finally away to the chimney; and it need scarcely be said that the supposed case is one of very common occurrence
The moment the air comes in contact with the incandescent fuel it is resolved into its constituents, nitrogen and oxygen, the nitrogen passes on to the chimney with no further change than increase of volume from increase of temperature; the oxygen, however, is arrested, and each atom of carbon seizes two atoms of it, and one atom or equivalent of carbonic acid is formed. If this carbonic acid got away to the chimney, nothing further could be desired, and complete combustion of the coke would be effected. But it is not destined to escape in this manner, for before the atom of carbonic acid has struggled through the mass of fuel and got free from it, it has taken up another atom of carbon, and now, instead of being carbonic acid, $\mathrm{CO}_{2}$, it has been converted into $\mathrm{C}_{2} \mathrm{O}_{2}$, or two equivalents of carbonic oxide, and it is this gas which
escapes to the chimney. Experiment has proved that carescapes to the chimney. Experiment has proved that car-
bonic acid is not combustible, but that carbonic oxide is, and it stands to reason, if anything of a combustible nature is escaping from the chimney, we cannot be having complete combustion in the furnace; but there are very few practical men who have any idea whatever as to the magnitude of the loss of heat when carbonic oxide is the result of combustion instead of carbonic acid; for we find from calorimetrical experiments that, in the former case, we only get three tenths of the evaporative power produced in the latter. Now in order to burn this carbonic oxide, we must supply each atom of carbon in it with another atom of oxygen while the carbon is at a sufficiently high temperature; if the combination is effected, then our carbonic oxide is reconverted into carbonic acid, and has given out during its reconversion the seven tenths of heat which we noted were deficient in the formation of the oxide.
The next point considered was the gaseous portion of the coal, and it was pointed out how fuel might be lost, either by the.gas escaping wholly or by being only partially burned, the latter alternative causing the formation of smoke and soot. Mr. Carter showed how this latter alternative was generally attributable to the want of a proper supply of air admitted above the fire, or to the flame being brought into contact with the metal plates of the boiler, and so cooled down below the temperature necessary for ignition of the gas, and mentioned the following instance:

Last winter I had a little stove in one of the rooms of my house; it is one of those commonly known as a gill stove; the whole of the air supporting the fire had to pass from beneath through the bars, and consequently through incandescent fuel, before reaching the flue. I was greatly disappointed with the performance of this little stove, as far as its heating power was concerned; eventually I took off the
door and drilled a number of small holes in it so as to admit jets of air above the fire; the fire inside has been as bright and as lively again since this surgical operation, and the quantity of soot collecting in the flue, which before proved a instance of how easily a remedy may sometimes be applied." After going through various calculations to show the quantity of air required above and below the fire for certain quantities of coal, and how smoke and soot were formed, M Carter concluded in the following terms :
'So long as popular errors prevail amongst that class of men who have the direct control of furnaces of all descrip-tions-I allude to the practical managers or foremen in manufacturing works-little will be done to prevent waste of fuel; and as a rule, when you begin to speak to them about carbonic acid and carbonic oxide, they look at you with an ncredulous smile, you at once lose caste with them and fall from the high position of a practical man to the pitiable
status of a mere theorist. But I maintain that this is not status of a mere theorist. But I maintain that this is not
simply a matter of theory, but that the principles involved
are of an eminently practical nature, and if applied in prac tice may be turned to good account. We must impress on the practical man that air is required in certain quantities and delivered in certain methods; we must combat the idea that gas is smoke, or that gas and smoke are synonymous terms. We must point out that volumes of black smoke do not constitute the only indication of waste of fuel, for, as I have shown, the waste may be enormous although no vestige of smoke is to be seen. We must challenge the idea that a furnace can consume its own smoke, that is simply impossible; we can construct a furnace to prevent the formation of smoke, but let smoke once be formed, and it cannot be consumed in the same furnace, its presence indicating that the furnace is wanting in those conditions essential for the completion of combustion

## OCEAN TELEGRAPHY.-THE FOREIGN CONNECTIONS OF NEW YORK CITY AND THE EXISTING RATES OF CHARGES

Telegraphic communication between the United States and the West Indies is maintained over the following routes From Punta Rassa, Florida, via Key West to Havana by ca bles, thence by land lines to Batabano; thence by cable to Santiago de Cuba; thence by cable to Kingston, Jamaica. From Kingston a series of cables extend to Demarara, South America, touching at Porto Rico, St. Thomas, St. Kitt's, Antigua, Guadaloupe, Dominica, Martinique, St. Lucia, St. Vincent, Barbadoes, Grenada, and Trinidad. A cable also extends from Jamaica to Aspinwall on the Isthmus of Panama.
A cable steamer is now on her way to Trinidad to lay a ca ble from Port of Spain, Trinidad, to Ponce, Porto Rico touching at St. Croix, after which she will proceed to lay a cable between Cienfuegos, Cnba, to Jamaica! When these are completed, the United States and West Indies will be substantially united by a double series of cables, so that, in case of failure of any one of them, communication will not be interrupted. The shore ends of a cable to extend from Demarara, South America, to Cayenne, South America, were laid last month, and the cable steamer Hooper is now on her way this link is laid, there will be a cable to Demarara. Whe this link is laid, there will be a complete line of telegraphic communication between the United States and Rio Janeiro, South America; and when another link is laid between Rio Grande do Sul and Maldonado, Uruguay, the United States will be in telegraphic communication with all of South America, bordering on the Atlantic ocean, north of Buenos Ayres, and with Chili on the Pacific. A singular fatality has thus far attended the laying of the cable between Rio Grande do Sul and Moldonado. The telegraph steamer Gamas was first wrecked in attempting to lay it, and more recently the La Plata was chartered to pursue the work and was wrecked in the Bay of Biscay, the cable and all persons on board being lost.
Unt
Until the cable is laid down between Cayenne and Demerara, communication between the United States and other ble between Lisbon, Prtural nishing the cnly means of telegraphic intercourse.
Communication between the United States and England is maintained by land lines to Sydney, Cape Breton, thence by cables, to Placenta, Newfoundland, thence by land lines to Hearts Content, Newfoundland, thence by three cables to Valentia, Ireland, thence by land lines to Wexford, Ireland,
thence by cable to Haverfordwest, England, thence by thence by cable to
land lines to London.
Communication between the United States and France is maintained by cable from Duxbury, Mass., to St. Pierre, and thence by cable to Brest, France. Communication between Great Britain and the various continental states is ransmitted over two cables to Denmark; two to Germany; two to Holland; two to Belgium; one to Norway; one
to Portugal; two to Spain; and six to France. There is one cable between France and Denmark; one be-
tween France and Spain; two between France and Algeria; tween France and Spain; two between France and Algeria;
two between Portugal and Gibraltar; one between Gibraltar and Malta; one between Algeria and Malta; two between Sicily and Gibraltar; one between Malta and Alexandria; and Candia; one cable between Russia and Turkey, through the Black Sea; one between Norway and Denmark; one between Denmark and Sweden; one between Sweden and Russia; one between Denmark and Russia; one between Sweden and Germany ; one between Egypt and India, through the Red Sea and Indian Ocean, touching at Aden; one between
Persia and India, through the Persian Gulf, touching at Gwadar in Beloochistan; one from Madras, India, to Penang in the Strait of Malacca; one from Penang to Singapore: one
from Singapore to Saigon, Cochin China; one from Saigon to Hong Kong and Shanghai, China; one from Shanghai to Nagasaki, Japan : one from Nagasaki to Hiogo and Yokohama, Japan; one from Nagasaki to Wladivastok, Asiatic Russia; one from Singapore to Batavia, Java; one from Java to Aus tralia; one from Australia to Tasmania or Van Diemen' Land. The following cables are projected: From Australia to New Zealand; Ceylon to Australia; Singapore to Borneo;
Borneo to Luzon; Luzon to Hong Kong; Yokahama to Hokodadi; Siberia, mouth of the Amoor, to Kamtchatka; Calcutta to Penang; Hong Kong, China, to San Francisco, touching at the Sandwich Islands; Havana to Vera Cruz; Aspinwall, Isthmus of Panama, to Carthagena, South America; Panama o Buenaventura, New Grenada; Buenaventura to Callao, Lima; Callao to Valparaiso, Chili; England to Virginia ouching at the Azores and Bermudas; Portugal to New
York, touching at the Azores; Scotland to Labrador, touchYork, touching at the Azores; Scotland to Labrador, touch-
ing at the Faroe Islands, Iceland, and Greenland.

Communication between England and India is mainly con fined to the following routes: First, from Penzance on the southeastern coast of England to Lisbon, Portugal ; thence to Gibraltar; thence to Malta; thence to Alexandria, Egypt; thence by land line to Suez, and thence by cable to Aden and Bombay. Second, by cable from Lowestoft, England, to Emden, Germany, thence by land line, via Berlin, Germany, Warsaw, Jitomer, Odessa, Kertsch and Tiflis, Russia; Teheran, Bushire, Henjaum, and Jask, Persia; Gwadar, Beloochistan, and Kurrachee, India. This is known as the special Indo-European line, and is worked in one circuit from London to Teheran, a distance of six thousand miles. From Kurrachee and Bombay, land lines extend to Calcutta, Madras, and Paumben. From Paumben a cable extends to the Island of Ceylon. From Madras a cable extends to Penang and Singapore. From Singapore cables extend to Saigon, Cochin China, and thence to Hong Kong and Shanghai in China and Nagasaki, Hiogo, and Yokohama, in Japan. From Nagasaki a cable extends to Wladivostok, the terminus of the Russian land lines in Siberia. From Singapore a cable extends to Batavia in the Dutch island of Java; from Java a cable extends to Port Darwin, Australia, and there connects with a land line extending to Victoria, Australia; from Victoria a cable connects with Tasmania or Van Diemens Land. Telegraphic communication exists between Victoria, British Columbia, and Hobart Town, Tasmania, embracing 273 degrees of longitude, and thus lacking but 87 degrees of encircling the globe; and when the projected cable from San Francisco to China is laid, the circle will be completed. When this latter enterprise is carried out, the telegraphic correspondence between North and South America and the West of Europe, with China, Japan, and Australia, will take this route, as it will be the shortest, cheapest, and most ex. peditious.
The telegraphs of the world, aerial and submarine, embrace 385,872 miles of line, 871,417 miles of wire, and 30,150 stations. The annual traffic amounts to about $80,000,000$ messages.
The tariff upon telegraphic despatches from New York to other countries is as follows: Great Britain and Ireland $\$ 1$ per word, France $\$ 10$ for 10 words or less, Cuba $\$ 5.40$ for 10 words or less, Jamaica $\$ 7.75$, Porto Rico $\$ 11.50$, St. Thomas $\$ 11.88$, St. Kitt's $\$ 12.75$, Antigua $\$ 13.00$, Guadaloupe $\$ 13.38$, Dominica $\$ 13.75$, Martinique $\$ 14$, St. Lucia $\$ 14.25$, St. Vincent $\$ 14.50$, Grenada $\$ 15.00$, Barbadoes $\$ 15.13$, Trinidad $\$ 15.50$, Demarara $\$ 17.50$, Berbice $\$ 17.50$, Aspinwall $\$ 12.75$, Panama $\$ 13.75$, Aden, Arabia, $\$ 20.00$, Port Darwin, Austra lia, $\$ 56.62$, New South Wales $\$ 57.88$, South Australia $\$ 56.62$, Victoria, Australia, $\$ 57.12$, Tasmania and Queensland $\$ 59.12$ Austria and Hungary $\$ 11.50$, Baden $\$ 11.50$, Belgium $\$ 10.84$, Channel Islands $\$ 11.66$, Denmark $\$ 11.40$, Germany $\$ 11.10$, Holland $\$ 11$, Norway $\$ 11.80$, Portugal $\$ 12$, Roumania $\$ 11.88$, Russia in Europe $\$ 12.50$, Servia $\$ 11.88$, Spain $\$ 12$, Sweden $\$ 11.75$, Switzerland $\$ 11.75$, Turkey in Europe $\$ 12.25$, Wurtemberg $\$ 11.50$.
Beloochistan \$18, Bushire, Persia, $\$ 16.12$, Ceylon $\$ 20.50$, Hong Kong, Amoy, and Shanghai, China, \$40, Saigon, Cochin China, $\$ 38.50$, Corfu $\$ 12.50$, Egypt $\$ 15.30$, Gibraltar $\$ 12.75$, Greece $\$ 12.75$, India $\$ 20$, Japan $\$ 50.38$ to Nagasaki and $\$ 52.62$ to Hiogo, Osaka, Simonosaki, Yeddo, or Yokohama. Java $\$ 40.62$ Madeira Islands $\$ 15.38$, Malta $\$ 12.50$, Penang $\$ 33.50$, Persia $\$ 16.12$, Russia in Asia from $\$ 13.12$ to $\$ 19.16$, Cape de Verde Islands $\$ 24.38$, Singapore $\$ 37.50$, South
America: Buenos Ayres $\$ 68.75$, Chili $\$ 68.75$, Montevide America: Buenos Ayres $\$ 68.75$, Chili $\$ 68.75$, Montevideo Janeiro $\$ 56.50$, Santos $\$ 62.25$, Rio Grande do Sul $\$ 63.25$.

## Machine Belts.

In a recent paper read by John W. Sutton, M. E., before the New York Society of Practical Engineers, the author made the following observations:
Although the use of belts for the transmission of power is not, strictly speaking, an American invention, the great improvements made in this country have caused it to be known in Europe as the American system. In Europe the greater part of the power is transmitted by cog wheels, but in this country 99 per cent is transmitted by belting. The atter is used everywhere, from the sewing machine to the 500 horse power engine of the largest factory. Belts can be run in any way, at any angle, of any length, and at any speed, and can be put up by any one of ordinary skill. They can be made of any flexible material-leather, rubber gutt percha, cloth, paper, raw hide, cord, or wire-and they may be either round or flat; and the last novelty is a sheet iron belt, and it is said to work well. Every one uses them.
While so handy and so popular, they have one fault. They While so handy and so popular, they have one fault. They
are not positive. If you start from the motor with a certain are not positive. If you start from the motor with a certain belt used. This is the only fault of the system. It is noise ess, yielding, and regular. but, unlike cog wheels, it is not positive. Thenumber of revolutions that are lost may, and do, vary continually by changes of the load or of the atmos phere. It is upon these peculiar changes of our favorite sys em that I propose to speak to night. Belts derive their power to transmit motion from the friction between the sur-
face of the belt and the pulley, and from nothing else, and are governed by the same laws as friction between flat sur faces. The friction increases regularly with the pressure. The lecturer then gave the results of some experiments with belts and pulleys to prove this. He found that there was a great difference in the friction of belts, and it was due to their elasticity of surface, that is, the more elastic the surface, the greater the friction. He made experiments with a pulley and belt. moved by a lever and spring balance, to show the difference in the actual friction between the
grain and flesh sides of a leather belt in contact with a
smooth cast iron pulley. He said that the old rule, "that the number of inches in contact, multiplied by one half the velocity of the belt in feet per minute, and divided by 33,000 , would give the horse power," might give it once in a hundred times, but not oftener. The rule is that a belt holds upon a pulley as the tension (pressure) and as the square of the degrees of wrap. A belt wrapped one quarter around a pulley has only one fourth the power of a belt wrapped one half around the same pulley with the same tension.
A line around a post will give a good illustration of this. One half a turn, and a man's weight is doubled: while a full turn, and his weight is nearly enough to stop a heavy boat, and two turns and his weight will stop the boat, or the line will part.
Belts always run to the high part of a pulley when the shafts are parallel; but when they are not, the belt will always run toward the ends of the shafts that are nearest together, and this tendency is much stronger than to run to the highest part of the pulley. If you have a belt that gives trouble in this way, you can see if it is the fault of your shafting by drawing a line across the edges of the two pulleys. Sometimes the bearings may be in line; but the tension of your belt is so great as to spring the shaft, so as to throw the pulleys out of line. A stiffer shaft or another bearing is the remedy. Leather and rubber belts each have
their advocates, and each party say theirs is very much better; but each kind is better in its place. Where the belt is clear, a rubber belt will transmit 20 per cent more power with the same tension, and will last as long and run perfectly straight. It can be made of any length or width, of exactly the same thickness in every part, perfectly smooth on its surface; and when in use,every part will come in contact with the face of the pulley. The greater tractile power ber belt is due to its surface elasticity.
Leather belts have to be made from pieces, and, as the leather is not perfectly flat, a perfectly flat belt cannot be made from it. If a belt is cut from the back of a hide, the edges are not so firm as the center, and upon a crowned pulley they will not hug as well as if they were of the same firmness as the center. If the belt is cut from one side of the back, then one edge will be less firm than the other,and the belt will be crooked, and one side will have more tension than the other. Leather belts are usuallyfriveted at the joints. Now, if a rivet head touches the pulley, the friction is less than if the leather touched. If the head is above the surface of the belt,then a portion of the belt is not in contact with the pulley; and if the head is below the surface of the pulley; then of course there is no contact. Now every rivet in a belt is in one or the other of those positions, and leather belts would be improved by using something else in their place. Double leather belts are used more than single ones; but it is clearly a mistake, as a single leather one will transmit more of the power than a double one. If you look at the face of a leather belt, you will see when it has been used for a time, the face has a mottled appearance, light and dark, showing how much of the surface of the belt has been in contact with the pulley. If an average of one inch of width has not touched, then you have paid for one inch of belt that is of no use, but is really a detriment. Double leather belts run straighter than single ones, as the flank side of one part can be put against the back of the others. A double belt will stand a greater tension than a single one, but a single one will stand all that should be put upon any belt.

The cost of belting isincreasing every year,and it is well to look out for the belt of the future. My impression is that it will be made of low steel of great tensile strength,and will run upon pulleys, with an elastic surface to give greater friction. The instance I mentioned, of a sheet iron belt running upon cast iron pulleys, is, I believe, in Pittsburgh. But we have a hundred instances of the steel belt upon an elastic surface pulley in this city, in the band saw, and one of a large sawmill sawing logs with a band saw about three inches wide. Now a band saw is a belt, and the power to do work is all derived from the friction between the band saw and the lower pulley. In the case of the sawmill spoken of, it amounts to from 10 to 15 horse power, and this is all transmitted by the saw itself. It may be said that we cannot get belts
of steel wide enough to take the place of our large belts. Whenever such belts are wanted, they will be made of any width and length asked for.
Belts of the present make are run with a strain of one fifth their strength; and as the strength of low steels is over 100,000 pounds to the square inch, a belt one foot wide and one eighth of an inch thick would have a strength of 150,000 pounds or more. One fifth of that would give us 30,000 pounds ; this strain, upon an elastic surface pulley of, say, 16 feet,running at a speed of 2,000 feet perminute, would give us a belt with the power to transmit over 1,800 horse power. If the belt were one sixteenth of an inch thick, it
would be able to transmit 900 horse power. We have no belts now capable of anything like this. How will this belt be joined? When the band saw first came out, that was looked upon as the stumbling block in its way, but to-day they are joined without a thought, and in about the same time that it would take to join a belt of leather. The steel belt would be joined in the same way. Whether this steel belt is the belt of the future or not, there will be wanted a better and cheaper one than we now have, and it is to the practical engineers that we are to look for it.

## Encke's Comet.

The return of Encke's comet to our heavens has been for some time expected, but its immense distance $(182,000,000$ miles) rendered all search with ordinary instruments useless.
The large equatorial at the Naval Observatory, Washington,
D. C., was recently put into service, and the comet was seen through this superb instrument by Professor Holden and
Paymaster Tuttle of the U. S. N. Its distance rendered the use of the micrometer impossible, and it will scarcely be observable under ordinary conditions for several weeks.
It is known to our readers that the equatorial telescope above mentioned is one of the finest in the world. It is Alvan Clark's masterpiece, and has an objective 26 inches in diameter. Its power is now demonstrated in a remarkable manner

## THE POST OFFICE A CARRIER OF MERCHANDISE.

Since the adoption of postal cards for cheap communica tion by mail, there has been no modification of our postal laws which so greatly accommodates the public as the one permitting the sending through the mails of nearly all classes of merchandise, in packages not exceeding four pounds in weight, at the low price of one cent for every two ounces. The following are some of the articles officially named as belonging to the class of merchandise that can be mailed at this low rate
We copy from the Post Offce Guide, which gives this provion of the law
Rates of postage on third class matter: Mailable matter of the third class embraces all pamphlets, occasional publica-
tions, transient newspapers, magazines, handbills, posters tions, transient newspapers, magazines, handbills, posters, unsealed circulars, prospectuses, books, book manuscript, ings, blanks, flexible patterns, articles of merchandise sample cards, phonographic paper, letter envelopes, postal envelopes and wrappers, cards, plain and ornamental paper photographic representations of different types, seeds, cuttings, bulbs, roots, scions, and all other articles not above the weight prescribed by law, which are not, from their form or nature, liable to destroy, deface, or otherwise injure the contents of the mail bag or the person of any one enaged in the postal service.
All packages of matter of the third class must be wrapped may be readily and thoroughly examined by postmasters without destroying the wrappers; but seeds and other ar-
ticles liable, from their form or nature to loss or damage unless specially protected, may or nature, to loss or damage unboxes which can readily be opened for examination of the contents and reclosed; or closed bags, made of material sufficiently transparent to show the con
opening, may be used for such matter
opening, may be used for such matter
their wrappers or envelopes, except the of this class, or tion. Any other writing in or upon any package or article of this class will subject it to letter rates of postage.
Matter of the third class inclosed in sealed envelopes notched at the ends or side, or with the corners cut off, cannot be mailed except at letter postage rates.
The foliowing, and some other articles unnecessary to specify, are unmailable: Packages containing liquids, poisons, glass, explosive chemicals, live animals, sharp pointed instruments, sugar, flour, or any other matter liable to deface or destroy the contents of the mail,
any one connected with the service
ny one connected with the service
Persons living at a distance can send small models much cheaper by mail than by any other means; and if properly packed, they usually arrive at their destination in good condition. We receive a number of models from various parts of the country by every mail; and the only trouble we have with packages so sent arises from the sender not following the official rule, which requires that the package shall not be sealed, and shall not contain any writing; and that the full postage on the package shall be prepaid. When the sender does not observe these requirements, we are obliged to pay full letter postage, which makes the cost by mail greater han by express.
By observing the law's requirement, inventors can avail themselves of the mail, for transmitting their models from distant places to this office, to great advantage. But one
thing which we would forcibly impress upon our clients is hat, by the same mail in which they forward the model they should announce the sending in a separate letter, giving description of the invention, time of sending model, name of post office and State, and full name of inventor. Observprompt answer to the save

## Spiritualism to be Medically Considered.

Dr.. G. M. Beard lately read before the Medical Society of the County of New York an extensive paper on "The Relation of the Medical Profession to Popular Delusions, Spirit ualism, Mind-Reading, Clairvoyance and Animal Magnetism." He reviewed the many delusions which have ap peared in this country on this subject. He looked upon them as a species of epidewics which from time to time immemori al have periodically made their appearance.
A committee of five, consisting of the following gentlemen, Dr. J. C. Peters, Dr. Fordyce Barker, Dr. Ellsworth Eliot, Dr. Austin Flint, and Dr. A. B. Crosby, was appointed to consider, and report on, the following questions:

1. Is the state or condition of mind known generally as he mesmeric state a reality or a deception?
2. If it is a real physiological state, what are the condi tions necessary to its production, and what the phenomena attending it?
3. Is it a state to which one mind can subject another, or does it depend on some conditions voluntarily submitted to by the individual?
4. Is it possible, while in this so-called mesmeric trance, or at any other time, or in any other condition known to manin his mundane experience, for one person to divine what i passing in the mind of another, except through the medium f signs?
5. Is there any such faculty known to our race as perceiv

1
places far beyond the reach of ordinary human vision, or what is written on a paper when an opaque object lies beween it and the person attempting to read?
6. Is there any evidence that the well known law of grav itation is ever overcome by a force hitherto unrecognized by scientists?

The members of the committee are all of them eminent physicians in this city, and will doubtless be glad to receive ply such information

In no case in general practice should the pressure, on even the slowest moving journals, be allowed to exceed 1,000 pounds per square inch of longitudinal section with steel journals, or about 600 on iron, in well-worn boxes.
Apples should be stored in cellars where there is a thor ough circulation of air.
decisions of the patent office.
new patext relz concorking rejected cases.





incap
ntaf
Rnate
Rome

come | pate |
| :--- |
| chate |
| cat |
| this |
| tion | pe

an
ne
an suce
Rut
dist
ata $\underset{\substack{\mathrm{d} t \\ \text { a } \\ \mathrm{C}}}{ }$ $\substack{\text { Oom } \\ \text { ha } \\ \text { Ra }}$ nor
dict $\xrightarrow{\text { Co }}$

 | ord |
| :---: |
| be |
| an |

pate
and
fits
and


## NEW BOOKS AND PUBLICATIONS.

digest of patents relating to beegch Loading and magatine Smail Arms (except Revolvers, granted in the United States from 1836 to 1873 , inclusive, Classified according to the Movements for opening and closing the Breech. By V. D. Stock-
bridge, Examiner in the U. S. Patent Office (Class of Fire bridge, Examiner in the U. S. Pate
Arms). Price $\$ 25$. Washington, D. C.
The author, in undertaking a work requiring very laborlous and patien
research, has done good service to a large class of inventors. Over 700 patents are here fully described and illustrated, forming a complete history of the art during nearly 40 years. The illustrations are very clear and elabo. rate, and the work is sure to be much referred to by inventors and patent so icitors. The author states, with apparent justice, that the high price of $h$ work is justied by the limlted sale whin
Wilderness for the Year 1873. By Verplanck Colvin. Al bany, N. Y.: Weed, Parsons, \& Co.
The important survey of the Adirondack region covers nearly 5,000 square miles, and was commenced by Mr. Colvin at his own evpense; but it was and continuation of the work. It is not possible here to describe the scene grandeur and the pleturesque traveled, or the many valuable results in cteorology and topography achleved, by the investigators; but if any of repay them for the trouble of perusal.
The British Journal Photographic Almanac and Photo Grapher's Daily Companion. Edited by J. Traill Taylor New York city : E. \& H. T. Anthony \& Co., 591 Broadway.
much pleasure, and cordally recommend it to the profession
The American Sportsman, west Meriden, Conn.
The is
The issue for January 30 has been received. It
nterest both to the naturalist and the sportsman.
Princtples of Metallic Mining. By J. H. Collins, F. G. S., Honorary Secretary of the Minerss Association of Cornw
Devon, Author of "A First Book of Mineralogy," etc.
Elements of Magnetism and Electriciry, with Practical Instructions for the Performance of Experiments, etc. By Jo
Ingell, Science Master of the Manchester Grammar School. These two excellent little treatikes are issued by Messrs. G. P. Putnam's
Sous, Fourth arenue and 23d street, New York, at 75 cents each. They are Sous, Fourth arenue and 23 street, New York, at 75 cent
Included in the publishers.' $\cdot$ Elementary Science Serics.'
Inventions Patented in England by Americans. [Compiled from the Commissioners of Patents, Journal.]
From December 28 , 18i4, to Jausery From December 28, 1874, to January 1 ,
FAstener.-D. Heaton, Providence, R. Button Fastener.-D. Heaton, Providence, R. I.
 Clasp or blecrie.-C. J. Weldon, San José, Cal.
Crimping Apparatts.-A. H. Lowerre et cl., Newark, N. .J. Cutring Plave.-R. E. Lowe. Kane, III.
Drawers. -J. J. Fitzpatrick, Philadelphia, Pa
Drawers.-J. J. Filzpatrick, Philadelphia, Pa.
Enameling Pipe, etc.-American Enamel Co., r
Enaneling Pipe, etc.-Amercan Ence,
Fire Arm.-J. Lee, Milwauke, Wis.

G.as Lightiva ind Heating.-L. 1

Hamer.-C. Parker, Meriden, Comn.
hat Making Machine.-J. W. Corey, Newark, N.
Kinding Fires.-D.s. Silcox, Charleston, S. C.
Knirtiva Hars, Etc.-A. Reed et all, New York
Life Matriess.-J. F. Peck, springheld, Mass.
Litholycite.-H. W. Bradford, Randolph, Mass.
Loom.-C. H. Chapman, Shirley, Mass.
Loos.-G. Crompton, Worcester, Mas.
Makise Horse shors.-J. Russell, New York elty
Metal Cartridge.-A. C. Hobhset inl, Bridgepurt, Comp
Mcaical nstrcient.-M. J. Mathews, Boston, Mass.
Mcsical hetrement.-M. J. Matthews, Boston, Mass.
Packing Material.-W. S. Fibh (of Mystic, Conn.), Glasgow, scotlad.
Pianororte.-W. R. Miller, Batimore, Md. Pinveting Machinery. - M. Bray, Buston,
Rotary Peddler.-W. Sellers, Philladelphia, Pa., et ch School Telching Apparates.-M. McVicar, Potsdam, N. Y., et et.
siabpencag Twist Drills.-C. Van Hagen, Philadelphia, Pa. sharpentig Twist Drills.-C. Van Hage,
slide Valve.-S. F. Dodge, Detroit, Mich.
steam or Air Encine.-G. J. Wardwell, R

## zerent americam and forrign equtents.

## Improved Self-Discharging Hay Rake.

S. G. Hurlbut, South Union, Ky.-This invention consists of pivoted parallel rake heads, mounted on a rockshaft, for the purpose of
dumping or raising the teeth off the ground when the rake is being transported from place to place. The wheels are smaller than usual, and the heads extend over and beyond them on either side.
The teeth, which are hinged at their connection with the head by The teeth, which are hinged at their connection with the head by
meens of a hinge plate, are so controlled that they can be set at an argle receding one from the other, to the right or left, for the purangle receding one from the other, to the right or left, for the pur-
pose of discharging the hay at cither side of the rake in one continuous windrow without lifting them tiom the ground, thereby making a continuous raking, discharging the hay as fast as gathered
from the side in a neat, light manner, leaving it in good condition from the side in a n
for further curing.

## Improved Coffee Roaster.

Michael W. Fry, Guyandotte, W. Va.-This invention relates to
certain improvents in coffee roasters, and it consists in the comcertain improvements in coffee roasters, and it consists in the combination, with a rotary moving cylinder, of an angular projecting
air chamber upon the inside of said cylinder, which causes the cofair chamber upon the inside of said cylinder, which causes the cof-
fee, when passing from one side of the cylinder to the other, to fee, when passing from one side of the cylinder to the other, to
leave the hot periphery of the cylinder and fall over the shelf formed by the air chamber, by means of which the coffiee is roasted uniby the air chamber, by means of which the coffee is roasted uni-
formly and prevented from burning. It also consists in combination with the air chamber of a stop pin or plate attached to the cylinder, and ledges or flanges upon the framework, which limit the reciprocating motion of the cylinder to a semi-revolution.

## Improved Hay Derrick.

George W. Martin and James C. Moor, Brookston, Ind.-This in-
vention relates to certain improvements in hay derricks. It consists in two A-shaped frames, connected at the top by a wire cable, and held slightly inclined toward each other by guy ropes attached two sheaves, one running upon the cable and the other supporting two sheaves, one running upon the cable and the other supporting the rope attached to the hay fork. This movable frame engages
with a latching catch at one end of the cable to hold it stationary with a latching catch at one end of the cable to hold it stationary to pass laterally to the desired position, the movable frame being
restored to its original position by a weight suspended upon a pulrestored to its original position
ley running on the guy rope.

## Improved Shutter Fastening.

 box that allows the notched locking bar or rod to pass through slots thereof, while the bolt and spring are fully protected, and yet easily operated by the thumb piece.Improved Lamp Hurner.
Airon C. Vaughan, Rainsburgh, Pa.-The invention consists in
neans whereby a stronger light may be obtained without the conmeans whereby a stronger light may be obtained without the con-
sumption of additional oil, the same being accomplished by a more sumption of additional oil, the same being accomplished by a more perfect supply of oxygen and
partially combusted carbon.

## Improved Car Coupling.

Menasseh Pettengill, Minneapolis, Minn.-The invention is an imsiding head of the buffer with a series of parallel, horizontal, semicircular grooves or cavities to receive the curved end of the link, the construction being such that the latter may be held or supported horizontally at various angles, or readily changed from one groove to another without withdrawing the coupling pin

Improved Lamp Stove
Edward A. Rippingille, Holborn, Middlesex county, Eng.-The object of this invention is to provide a combined store and lamp in which the heating properties of a lamp are utilized to form a small
cooking stove, and the lamp still allowed to perform its function of lighting the room. It consists in a tlat lamp of peculiar construc tion which slides into the stove frame, which latter is provided with reflectors and a glass door.

Improved Car Coupling.
Benjamin Slusser, Sidney, Ohio.-The invention consists in novel means whereby cars may be conveniently coupled, securely held
together, and easily uncoupled, while a car that switches off the track will at once become disengaged, and those whose drawbar are of unequal hight are coupled with the same facility. It is
without a coupling pin or other device susceptible of being lost or without a coupling pin or other device susceptible of being lost or
r eadily stolen.

Thomas H. Logan, Foved Croquet Mallet.
Thomas H. Logan, Fort Leavenworth, Kan.-The invention cona handle, and held by clamp screws.

## Improved Smoke Stack.

Darerick Allard, St. Albans, Vt.-This invention relates to certain
improvements in smoke stacks for locomotives, etc, and it consists improvements in smoke stacks for locomotives, etc, and it consists
in an adjustable discharge pipe for the cinders and sparks contained inside the smoke stack, and terminating above in a funnel-shaped mouth, in combination and concentric with an inverted conical
plate provided with spiral grooves, an annular cap for directing the current down the interior of said plate, and an inverted conical
cage of gauze wire ; whereby the draft of the smoke stack is regulated and the sparks and cinders eliminated and carried off.

Improved Funnel for Barrels.
August Pforr, Baltimore, Md.-The invention relates to fumnels
through which liquids are run into barrels, casks, and other pack through which liquids are run into barrels, casks, and other pack-
ages, and consists in a novel indicator by which it will always be promptly shown when the package is full, and by which all waste is effectually prevented.

Improved Box for Car Axles.
John M. Brosius, Richmond, Va.-The invention relates to axle boxes generally, but particularly to the middle boxes of trucks
adapted to changeable gages, and consists in the several features of adapted to changeable gages, and consists in the several features of
improvement wherebythe axle box is rendered more easily removaimprovement wherebythe axle box is rendered more easily remova-
ble, the lubricant more readily injected upon the ends of the journals, and each axle to certainly follow the other in turning off upon switches.

Improved Design for Graves.
Isaac G. Lunday and C. G. Anglin, Hickory Flat, Ala.-The invencessively smaller, until the highest is reachod, when a monument, cessively smaller, until the highest
shaft, or column surmounts them all.

## Improved Railroad Car Truck.

John M. Brosius, Richmond, Va.-Tbe invention consists in cer-
ain novel features of invention by which tain novel features of invention by which car trucks may be
adapted to use on railroads of different gages, spacing the wheels adapted to use on railroads of diferent gages, spacing the wheels
automatically to suit each change of gage, and thus rendering entirely unnecessary the breaking of bulk in the freight, or the transfer of passengers from one road to another.

## Improved Car Coupling.

George W. Call, Nashua, N. H.-On the approach of cars, link-
supporting lever frames are first brought in contact, and are supporting lever frames are first brought in contact, and are gradually swung below their respective drawheads, while the link enters
at the same time into the cavity of the drawhead to be coupled. at the same time into the cavity of the drawhead to be coupled.
The concussion of the drawheads carries both in backward direction, and releases thereby latch levers from their seats, dropping
thereby pin guide frame and pin, and coupling the cars.

## Improved Cotton Press.

William T. Crenshaw and Robert J. Carothers, Burton, Tex.-The invention relates to a perforated hopper into which the cotton is ers into the press; also, to locking the revolving press box to a fixed base, and thereby relieving its pivot bearings of the strain due to he action of the screw which operates the follower.
mproved Car Coupling.
Henry Dutcher, Port Jervis, N. Y.-As the cars are run together and heads formed upon the coupling bars catch upon each other,
the downwardly projecting parts of the upper head straddle the the downwardly projecting parts of the upper head stradde the
body of the lower head, which prevents the coupling from being uncoupled by thelateral movement of the cars.

Improved Toy Bubble Pipe.
F. Wright Pease, Metuchen, N. J.-This invention consists in the combination, with a flexible stem and suitable mouth piece, of a
bowl provided upon the edges of its mouth with ledges, projections, bowl provided upon the edges of its mouth with ledges, projections,
or grooves, which, by retaining a portion of the soap solution, ena ble the operator to blow a much larger bubble.

## Improved Eaves Trough Hanger.

Edward Kirk, Jr., Sheridan, Ill.-This consists of a lateral brace, with forked ends or prongs, whlch are driven in horizontal direction
through the gutter near its inner edge into the frame of the roof. The prongs are bolted to a metallic band, arranged to embrace with one end the outer rim of the same, while the upwardly inclined rear part is attached to the shingles and roof frame

## Improved Range

Edwin 0 . Brinckerhoff, New York city.-The space between the bottoms of the inner and outer cases is occupied by a drawer, the vision plate. The side parts of the drawer are divided into flues by vertical division plates, extending from the ends of said drawer
valater nearly to the central division plate. The rear division plates are placed a little in front of the rear wall of the inner case. The spaces between the inner ends of the rear division plates and the central division plate are provided with dampers, which are raised and low-
ered, to close and open said spaces. The flue for conducting the ered, to close and open said spaces. The flue for conducting the
products of combustion from the range to the chimney projects in products of combustion from the range to the chimney projects in
the rear of the middle part of the back of the outer case, and fits the rear of the middle part of the back of the outer case, and fits
into a recess formed to receive it in the brick work inclosing the rear part of the range. The flue is divided into two equal parts ly a vertical division plate, openings into the flue being formed through
the lower middle part of the back wall of the outer case, and in line the lower middle part of the back wall of the outer case, and in line
with the spaces at the sides of the central division plate of the drawer.

## Improved Horse Power

Reuben Stiles, East roy, Pa.- Wis invention is an improved arse power for operating a churn, and for other purposes, which
so constructed that its rear end may be conveniently raised and lowered to give the endless chain any required inclination, and the endiess chain may be conveniently tightened or slackened, as may be desired. To the front parts of the frame of tre machine. at a suitable distance from their lower ends, are attached bearing's in
which a shaft revolves. To one end of the shaft is attached a crank wheel, from which motion is given to the machinery to be driven, and which is made heavy, to adapt it to serve as a fly wheel. To the middle part of the shaft, at a suitable distance apart, are attached two wheels, the rims of which are notched to receive rods, which are connected to each other by straps to form an endless chain, and to
which are attached the cross bars or planks, :upon which the horse which are attached the cross bars or planks, ¿pon which the horse
or other animal walks, to give motion to the machine. The inventor or other animal walks, to give motion to the machinc. The inventor
is willing to negotiate for the sale of territory or to manufacture on royalty, and can furnish patterns and directions for the use of in tending manufacturers.

## Improved Harrow.

Peter S. Carkart, Collamer, N. Y.-The bars of which the beams are composed are champed toge by bolts with teeth, and bars or metal plates between them, elther one or both being notched to recontrived with extensions inclined front and back, above in one direction and below in the other, and the teeth are pivoted, so that when the harrow is drawn in one direction the teeth will be vertical, and when drawn in another direction they will be inclined. The
tooth shifts according to the way the harrow is drawn, but at the same time is held tight.
sath

Mmproved Cheese Knife.
George E. S. Phillipy and William A. Young, Be
knife is made of such a length as to reach from the center to The edge of the cheese, and the ends are attached to a semicircular bar so that it has a slight longitudinal rock. The outer end of the knife and bar are held down by a spring, the free end of which rests upon the outer end of the curved bar, so that the knife may operate with
a sliding cut, cutting the cloth first. A suitable construction enasliding cut, cutting the cloth first. A suitable construction enaments to be swung out of the way to enable a cover to be placed over the cheese.

## Improved Pump.

Leorre Harrison Laub, West Lebanon, Ind.-'The invention relates to the means whereby the lower valve is detachably connected to the side of the inclosing cylinders, and the seat for suid valve is round it requires to be washed out of the cylinder.

## Improved Bouquet Holder.

Jurias (i. Dreher, Pine Grove, Pa.-This invention is an inproved bouquet holder, simple in construction and convenient in use,
which will keep the stems of the tlowers noist, and thus keep the which will keep the stems of the Howers moist, and thus keep the
flowers fresh for a long time, and which may be carried about flowers fresh for a long time, and which may be calried about
without spilling the water. It consists in the combination of a slotted tube, conical flange or cup, gum elastic case, and sponge with each other and with at row which twos, a rubber plate, a flanged tube, and a spring bolt, which together form a well arranged device for the stated purpose, adapt
well as for carrying in the button hole, etc.

Improved Beer Hegulator.
John Obrecht. Tell City, Ind.-For the purpose of broviding a simple apparatus for regulating and preserving beer, a larger water rean ne is conectec, by intermetliate inamch pipe with a check valve and stopeock, to the gas-distributins pipes, with stopeocks and water indicators, and then to the kegs containing the beer for the action of the gas thereon. The water tub is connected by a pump
with the faucets of the empty lege, for pumping water therein, and so as to force, by the distributing, ford pumping water therein, and the liberated gas back to the reservoir for being applied to the next keyr to be tapped.
Improved Process of colorims Photographs.
Jeremiah Gurner, New York city:-The photographs are retouched
ned colored on the front side in the usual mamner, and the reu dered transparent by the application of a suitable mixture of white wax and kerosene. The colors are thus already fastened to some extent to the front side of the picture. A thin coat of glycerin isthen applied to the front side of the picture, for fixing the colors and protecting them completely arainst the action of the gelatin,
into which the picture is immersed, and then, facedownward, placed into which the picture is immersed, and then, facedownward, placed
on the collodionized plate glass. The gelatin or binding substance on the collodionized plate glass. The gelatin or binding substance forms the connection of the photograph and the collodionized sur-
face. The excess of gelatin is then gently presed out and the face. The excess of gelatin is then gently pressed out and the coloring on the back of the picture. Is the picture is transparent, it may be worked up with equal facility as on the front side, without the risk of losing the likeness, while the colors appear with an exquisite sottness and delicate timsh. One or more thicknesses of card-
board soaked in warm gelatin are next placed on the back of the board soaked in warm gelatin are next placed on the back of the
picture and the whole dried gagain, to be then cut around the edges picture and the whole dried gain, to be then cut around the edges
for taking it, with the enameled surface. off the glass plate, the for taking it, with the enameled surface off the glass plate, the: the same.

## Improved Car Propeller.

Casper Devilbiss. Shellsburg, Iowa.--A series of posts is set in the the ranroad. in order to support wheels havng a high flange on the outside. These wheels may have each a
separate shaft, but it is preferred to hang them on the ends of shaft which span the road. The bars of the car frame are made to run between the flanges of wheels and on their peripheries. A guide and
friction bar is elevated over the middle of track, and friction rolls friction bar is elevated over the middle of track, and friction rolls
are provided, between which the bar is passed. The upper roll is attached to a sliding gate and made adjustable, so as to increase or
diminish the friction, according, to the load. The lower roll is counected with and worked by the engine. which is arranged on the car nected with and worked by the engine, which is arranged on the cal-
in any convenient position. 13 turning the crank the rolls are turned so as to then bite upon the bar, thereby drawing the car over the wheels.

Improved Sawing Machine.
George $W$. Bell, Orange, Tex.--In this device sleeve boxes for the shatt which drives the saw are employed in consequence of the great weight of the saw and swing frame, to relieve the shaft, by being push bar, for feeding the saw to the log, is jointed to the swing frame at one end, and works between friction feed rollers, one of which is arranged in fixed bearings, and the other in sliding bearings, which he to set it in motion by the hand, and raised to throw it off to stop which is so comnected with the swing frame by a cord that, when the feedrollers are thrown out, the weight will, by tuming thepulley and winding a rope upon it, swing the saw back.
lmproved Macline for Melting Snow.
Charles f. Waterbury, New Yow city-The esential feature of this invention consists of a series of hurners for hydrocarbon oils, a retort and suitable pipe connections for supplying the oils or
vapors to the burners. The arrangement is such that when vapors vapors to the burners. The arramement is such that when vapors
are burned ther will be diseharged into the burners with the requisite force by means of presure in the retort, to drive the flame down on the snow and ice to be melted with great force. The invention also consists of the combination. with the above, of a steam boiler
and pipes, for discharging stean jets into the burners, or below them, to combine with the vapors or oils, lyoth for impelling the tlame and for increasing the heat. Another feature of the invention consists of runner plates attachecito the sides of the machine for closing in the space under the machine to the ground, for contining
the heat, the said plates being capable of rising and falling, as rethe heat, the said plates being capable of rising and falling, as re-
quired by irregularity of the surtace, and for lifting them off the ground when the machine is to be turneal around. There is also a horizontal revolving brush of steel wires. closing in the under space that way, and to be used for stirring and breaking up and throwing the particles of snow into the flames behind.
Improved combined Baby Jumper and swing.
Clara Jane Haney and Sarah Amn Coleman, Edwardsburg, Mich.-
A bracket supports, by means of a strap, a framemadeof two vertical rods and two cross bars. The vertical rods pass through a sliding cross piece, beneath which are spiral springs. The straps for holding the child are connected with the cross piece.

Improved Almond Grater.
Julius Levy, San Francisco, Cal.-This is a roughened porous cylalso roughened, and conform with the roundness of the cylinder near its base. This insures the almonds beingthoroughlygrated betore passing into the receptacle below.

## Wusintss and extsonal.

 The Charge for Insertion under this head is $\$ 1$ a Line. Magic Lanterns, stereoptions of all sizes and
prices, for Parror Enterainment and Public Exhbibtions.

 page 93. Trump Bro's, Manufacturers, Wilmington, Del. Wanted-A situation by a first class Tool Maker,
to work on Tools or Model Work. Would prefer situation with some one Experimenting. Also competent to take
charge of men. Address P. O. Box 601, Stamford, Comn. charge of men. Address P. O. Box 601, Stamford, Comin.
Steam and Water Gauge and Gauge Cocks Com-
bined, requiring only two holes in the Boiner, used by all
boiler makers who have seen it, $\$ 15$. T. Holland, 57 Gold bined, requiring
boiler makers wh
St., New York.
St., New York.
Nickel Platers Complete Set-Nickel Anodes, all
Salts, \&c. L. Feuchtwanger \& Co., 180 Fulton St., N. Y. A Manufacturing Co., having unemployed ma-
chinery and capital, would like to purchase an established business, or secure the right to make some useful imple-
ment-in the hardware line-protected by a patent. Ad-
dress Manufacturer, Box 3, i6f, P. 0 ., New York. dress Manufacturer, Box 3, i6n, P. O., New York.
For Sale, Cheap-The patent right for the best
Broiler and Cake Baker out. NAdress Clay ton Denn,
Yrankford, Pa. Send for Circular of a very Superior Boiler Feed
Pump. D. Frisbie \& Co., New Haven, Conn, Pump. D. Frishel \& Co., New Haven, Conn,
Geo. P. Rowell \& Co.-The suceess of this firm has
been something unparalied in the history of the busi-
ness. Wee lately heard an ness. We lately heard an anecdore relared of a traveling
representative of a well-known patent medicine flrm who representative of a well-known patent medicine flrm who
was endeavoring to contract with the publicher of a lead-
ing Western paper. "I am impressea, said he, "with
your establishment; it reminds me of that of Geo. P. your establishment; ; it reminds me of that of Geo. P.
Rowell \& Co., of New York, with only this distinction: you ask a great deal of money for a little advertising, and
they give a great deal of advertising for a little money,",
This is the impression that many ohtain and not without they give a great deal of advertising for a little money.',
This is the impression that many ohtain and not without
Justice, for although Messrs. Gen. P. Rowell \& Co. have never claimed to lo a able to insert advertisements in. news-
papers at lower prices than the publishers would accept
from equally responsible advertisers, who furnish a simifrom equally responsible advertisers, who furnish a simi-
lar amount of patronage, yet in this last clause lies
much of thir success. muc!1 of thoir success. For some years they have been
the largest customers of most of the newspapers pub-
lished in the United States.- New York Standard, Octo-

## lished in the U ber 20th, $18 \%$.

"Book-Keeping Simplitied." The whole system
briefly and clearly explained. (Complete instruction.
 The Whitmore Engine, 4,5 and 10 H . P. Vertica ${ }_{1}$. Ver Tubular Boilers, all sizes
$\&$ Co., Philadelphia, Pa.
$\$ 2,0,000$, more or less, as needed, with services, will
he furnished by a person of experience in business, for an he furnished by a person of experience in business, for an
interest in a tirst class established and profitable Manu-
facturing Co. Adress " Capital," Box No. 130, N. Y.
Steel Springs tempered or made after pattern.
J. F. Dubber, 48 Hicks St., Brooklyn, N. Y. Every Metal Worker should have a Universal Hand
Planer. Address J. E. Suitterlin, 60 Duane St., New York. Circulars addressed and stamped ready for owner
to inail. Lists of all trades, very complete. H. Walsh,
Copyist. 6 Gold St., New York, up stairs. Scientific Books. Send stamp for Illustrated
Catalogue. E. \& F. N. Spon, 446 Broome St., New York. Petroleum Gas Works-J. D. Patton, Trevorton,
Northumberland County, a. References: Sunbury (Pa.) Gas Light Co.; Mahanoy City (Pa.) Gas Light Co.; Ash-
land (Pa.) Gas Lielt Co.; Philadelphia \& Reading RR.
Co., Reading, Pa.; Bloomsburg (Pa.) Gas Light Co.; Shamokin (Pa.) Gas JIight Co.; ; Shenandoah (Pa.) Gas
Light Co.; Col. W. R. Murphy, Trenton, N.J. Screw Cutting Index \& Fthle for Compound Gear-
ing, Price 10c. Address E. Lyman, C. E., New Haven, Ct. Wanted-A second hand 15 or 18 inch turbine
wheel. For information, address W . W. Shepherd, Fay-
etterille, N . C . Soap Stone Packing, in large or small quantit
Greene, Tweed \& Co., 18 Park Place, New York. The Mystic Puzzle, or the Yankee's Dream. Sent
by mail. Address. with 25 cts., W. F. \& J. Barnes, Box Extension Engine Lathe, the best Jobbing Lathe
built. Send for cut to E. Harrington and Son, North1 15 th and Pennsylvania A venue, Philadelphia, Pa.
Engines, 2 to 8 H. P. N. Twiss, New Haven, Ct. Baltimore Steel Hoe Works, Manufacturers of
the "Lockwood Hoe. " Send for Sample and Price List. Peck's Patent Drop Press. Still the best in use.
Address Milo Peck, New Haven, Conn. To Inventors-A responsible finn wishes the right
to manufacture some useful article in Cast Iron or Mato manufacture some useful article in Cast Iron or Mi
chinery, as a specialty. Address, giving description
article, "Machinist," Station B, Philadelphia, Pa. Our Taper-Sleeve Belt Pulleys fasten securely,
using no Eeys, Set-Screws or Bolts. Our Dead-Pulleys, stop all loose-pulleys and belts, attached to machine
not in actual use. Cold- Rolled Shafting, Collins' Coup-
lings, best Hangers. A. B. Cook \& Co., Erie. Pa. Ings, hest Hangers. A. B. Cook \&Co., Erie, Pa.
Hand Fire Engines. Liftand Force Pumps for fire
and all other purposes. Address Rumsey \& Co., Seneca
 Millstone Dressing Diamond Machines-Simple,
effective, economical and durable, giving universal satis-
tetion. J. Dickinson, ot Nassau St., New York. action. J. Dickinson, bt Nassau St., New York.
Warlus Leather Wheels, for polishing Iron, Steel,
and all fine Metals. Greene, Tweed \& Co., 18 Park Place, New York.
For small size Screw Cutting Engine Lathes and
Drill Lathes, address Star Tool Co., Providence, R. I. Drill Lathes, address Star Tool Co., Providence, R. I.
Inventors of Electrical and Telegraphic arrangements are invited to communicate with the Electro-Mag-
netic M'f's Co., 36 Broad St., P. O. Box 1804, New York. Wanted, by Manufactory of Steam Engines and
Standard Articles, $\$ 20,000$. Address John, 1802 Olive St., St. Louls, Mo.
Spining Rings of a Superior Quality-Whitins-
ville Spinning Ring Co., Whitinsville, Mass. Send for Ville Spinning Ring
sample and price list.
Mining, Wrecking, Pumping. Drainage, or Irriga-
ing Machinery, for sale or rent. See advertisement. Andrews' Patent, inside page.
Faught's Patent Round Braided Belting-Ther
Faught's Patent Round Braided Belting-The
Best thing out-Manufactured only by C. W.. Arny, 301
303 Cherry St., Philadelphia, Pa. Send for Circular.
Temples and Oilcans. Draper, Hopedale, Mass.

The "Scientific American" OOfice, New York, is
Atted with the Miniature Electric Telegraph. By touching atted with the Miniature Electric Telegrapb. By touching
ittle buttons on the desks of the managers signals are sent co persons in the various departments of the establish-
nent. Cheap and eftective. Splendid for shops, oflces,

For best Presses, Dies, and Fruit Can Tools, Bliss
e Williams, cor. of Plymouth and Jay, Brooklyn, N. Y . Engines and Boilers a Specialty-list class; new
patterns; late patents; reduced prices. Plain and Cut.oft
 Curbine; and the best Saw Mill in the market. Large
stock always on hand. Hampson, Whitehill \& Co, $3 \sharp$ Cortlandt St., New York. Works at Newburgh,
Buy Boult's Paneling, Moulding, and Dove

Small Tools and Gear Wheels for Models. List
Pree. Gooonnow W Wightman, 23 Cornhill, Boston, Mass. Blake's Belt Studs are the most reliable fastening
for Rubber or Leather Belts. Greene, Tweed \& Co., 18 Park Pace, Mew iork.
For Sale-One "Cotrell \& Babcock" Water
Wheel Regulator, In good order-by D.Arthur Brown \& For Surface Planers, small size, and for Box
corner Grooving Machines, send to A. Davis, Lowell,
Planing Mill Machinery Wanted-Address, price
ind terms, Hunter \& Tilley, Berkley, Norfolk, Va. Hotchkiss Air Spring Forge Hammer, best in the
narket. Prices 1 Iow. D . Fribbe \& Co., New Haven, Ct. Price only $\$ 3.50$. . The Tom Thumb Electric
Telegraph. $A$ compact workling felegraph $A$ pparatus, ior sending messages, making magnets, the electric light,
iving alarms, and various other purposes firling larms, and various other purposes. Can be put in
peration by any lad. Includes battery, key, and wires Seatly pecked and dent to alllparts of the world on reeecipt
fo price. F. C. Beach $\&$ Co., 263 Broad way, New York. For Solid Wrought-iron Beams, etc., see adver-
tisement. Address E nion Iron Mills, Pittsburgh, Pa., for

Fairy Electric Engines, with battery com-
leete, 86 , without battery,
 Cast Iron Sinks, Wash Stands, Drain Pipe and
sewer traps.
send for Price List. Balley, Farrell
Co., Fitsburgh.
For Solid Emery Wheels and Machinery, send to
he Union Stone $C_{0} .$, Boston, Mass., for circuiar Mechanical Expert in Patent Cases. T.D. Stetson, all Fruit-can Tools, Ferracute, Bridgeton, N.J.
 Brown' Coalyard Quarry and Contractor's Appa-
-atus for holsting and conveying materials by fron cable. W. D. Andrews \& Bro., 414 Water St. . New York.

## 

R. can mold rubber by the process described n p. 303, vol. 30.-F. wil: find a description of har-
ness oil on p 264, vol. 30. Black ink is described on ness oil on p. 264, vol. 30. Black ink is described on
p. 203, vol. 29 ; it may be made copyable by the ad-
dition of a little refined sugar.-R. H. will find full dition of a little refined sugar.-R. H. will find full
directions for modeling in clay on p. 58 , vol. 2t.directions for modeling in clay on p. 58, vol. 24.-
W. F. should consult a physician.-T. F. W. will nd directions for removing ink stains on $p .43$,
(1) E. H. asks: 1. What was the name of
he firststeamship that crossed the Atlantic Ocean from west to east? A. The Savannah, in 1818. 2 What was the first steamship that crossed from east to west? A. The Savannah returned in the same year.
(2) J. P. L. asks: How can I tint tracing cloth
so that the tinted places will not wrinkle? A.Common tracing cloth will wrinkle at the first touch of moisture; but there is an oiled or varnished cloth
that can be tinted with water color. (3) J. A. K. asks: How can I cement amber! A. Take 4 ozs. orange shellac and 3 ozs . strongest rectified alcohol. Digest in a warm place.
When of the consistence of molasses, it is ready
(4) G. F. asks: If a man takes a pistol
oaded with ball, and shoots straight up in the air, standing so that the bullet should happen to hit him, would it not kill him? A. We think not, as the resistance of the air would affect its velocity. We
would not care to try the experiment, however.
(5) F. H. asks: Which is the hardest, 14, 16 , or 18 carat gold? A. 14 carat is the hardest of the three.
How long
How long are the days on the equator? A. The days and nights at the equator, meaning by day,
the time the sun is above the horizon, are equal. (6) E. asks: 1. Can copper be tempered? If so, to what degree, and what is the process? A.
It can be hardened by hammering or rolling, but the temper cannot be drawn as in the case of steel 2. Did the ancients know of a process by which A. The very hard ancient tools and weapons were made from an alloy of copper with other metals. (7) N. N. asks: What action will frost have
on cast iron pipe $1 / 8$ inch in thickness, about 20 inches under the street paving, with the water all out? A part of the pipe is flanged and bolted
together; the other is common socket soil pipe with leaded joints. $\quad$. It would cause the pipe to contract somewhat in length; but if prov
made for this, it would give no trouble.

1. I am about to build some sprinkling tubs of
900 gallons capacity. Can you give me an idea of the best shape to make them, to get the widest spread of water? A. It makes little difference about the shape of the tub, as the spread of water is usually obtained by the use of a sprinkling pipe
of suitable form. 2. Is fresh or salt water used for sprinkling the streets in New York city? A. Fresh water. 2. Is fresh water considered unhealthy? A. We do not consider it so. There are some per-
sons. however, who do.
(8) E. H. asks: What is the radius of the
harpest curve that a train can safely turn? sharpest curve that a train can safely turn? Is there any difference whether the train be long or
short? Is there any difference whether it be an short? Is there any difference whete A. We doubt whether any one can answer these questions, as ew years ago were declared to be impossible. They are not desirable features, however, and
most engineers make the curvesas large as circummost engineers mak
tances will permit
(9) F. W. asks: How can I cut a design in iron, as on a watch case? A. The designs on watch
cases are usually cut by a tool, either by hand or cases are usually cut by a tool, either by hand or
machine. machine.
How can I polish iron and brass? A. Use emery
cloth for iron, after it has been filed or turned, loth for iron, after it has
and polishing brick for brass
What power can I get out
cylinder, $31 / 8$ inches bore by 6 in an engine with a 30 lbs. of steam? A. From $21 / 2$ to 3 horse power.
(10) W. D. asks: What kind of cement is when they are put together? A. A mixture of alum, the dust of the stones, and water, or mo(11) M. V. O. says : A question has arisen affected by raising or lowering thelink. One party contends that the lead is greatest when the reversing lever is in full gear, either forward or back, and is least as the lever is hooked up nearer the center of the quadrant. Another party thinks that the
lead is increased by hooking up. How is it? A. Both parties may be right, since the lead increases by hooking up if the forward eccentric works the top of the link, and diminishes if the contrary is he case.
(12) W. S. W. arks: How can I set the
valves of a locomotive? Can it be done without valves of a locomotive? Can it be done without equire a treatise to answer your question. Consult Auchincloss on "Link and Valve Motions." (13) R. C. asks: What are the ingredients
and what their proportion for enameling iron pots, sauce pans, etc.? A. A paste is made by fusing to gether 100 parts by weight of calcined ground
fints, and 50 parts calcined borax, grinding the froduct, mixing it with 20 parts potter's clay, and enough water to give it the proper consistence. The pot is lined with this paste, which a 10 a 125 parts white glass, 25 parts borax, 20 parts soda. Pulverize the compound; and make it into a paste with 4 lbs. of soda and a sufficient quantity of hot water.
Coverthe lining of the pot with the paste, and heat Coverthe lining of the pot with the paste, and heat
it in a muffle until the glazing is fuzed. it in a muffle until the glazing is fuzed.
(14) P. W. D. says: My friend says that
the same power that will run a circular saw the same power that will run a circular saw
through a log with a feed of $1 / 2$ inch to revolution through a loy with a feed of $1 / 2$ inch to revolution,
will start the saw when standing in the middle of the log, with the same feed choking the teeth of the saw. I say thatit will not. Who is right? A
Judging from the general practice of sawyers,who back the carriage when a saw stops in the cut, we the difference of the two cases could only be de termined by experiment.
(15) L. G. asks: What chemical preparation will purify or improve strong and rancid butter? Inoticed recently an account of experiments (by
Sonstadt) with iodate of calcium, which kept butter for three weeks,and rancid butter was improved by it ; also that stale herring, immersed in a weak
solution, came out perfectly fresh, etc. I sent for some of the iodate and received iodide of calcium. salts: A. What youce in the effect of the two salt, being a compound of calcium with iodine, whereas the salt employed for this purpose is a
compound of calcium with iodic acid. The characteristic properties of the two are widely different.
(16) J. M. R. asks: 1. Would a shot gun o not think it would be per fectly safe. 2. Is not decarbonized steel a fancy name for common iron? A. Probably.
(17) L. S. C. says: In a recent issue you ing power than a small one, which is apparent, th number of revolutions per minute being the same with both saws: but will it require more power to
drive a sixty inch saw, through a piece of timber drive a sixty inch saw, through a piece of timber,
than a thirty inch saw, time employed being the same and size of timber the same in both cases I claim that the larger saw will require only half to the teeth as the smaller, and that the same power will do the same work in the two cases. A. You appear to have the correct idea. As we re-
collect the former question, however, it was supposed that both saws made the same number of revolutions per minute
passing from the boiling ice exposed to an atmosphere of will a piece of cold as the atmosphere, or as cold as any other object exposed in same atmosphere, or does it remain at same temperature as when changed from
water to ice? A. Yes. 3. Does it expand in pa.aswater to ice? A. Yes. 3. Does it expand in pass-
(18) E. E. K. asks: 1. Would a receptac having an internal hydraulic pressure sufficient to show an exteraal moisture cause the castiron re ceptacle to break? A. Not necessarily. It would
depend upon the strength of the receptacle or casting. 2 . If such moisture should appear
would the internal pressure be reduced? $\mathrm{A} . \mathrm{W}$ think not. 3. Would a constant pressure produc ing such a moisture eventually fracture a casting A. Not necessarily.
(19) P. \& W. ask: 1. How are burglar dwelling house? A. Strips of metal are attached to the doors and windows, and to the frames, in
such a manner that the raising of a window or the
opening of the door will close a circuit and ring opening of the door will close a circuit and ring a
bell. 2. What kind of a battery is best ? bell. 2. What kind of a battery is best ? A. A
Callaud, Smee, or Lecianché battery wll furnish a cheap and constant electromotive force, and all are equally good.
(20) R. asks: How can india rubber be
rdened ? A. Take 30 parts sulphur pure rubber cut fine, mix thoroughly, putinto mold; keep under pressure of about 12 lbs. to the inch in a heat of $315^{\circ}$ Fah. for 2 hours.
(21) G. C. P. Jr. asks: How can I make black 302 s ., indigo and Prussian blue together $1^{11}$ ozs., Indian red $3 / 4 \mathrm{oz}$., yellow turpentine soap (dry) 3 ozs. Grind to an impalpable smoothness.
(22) W. H. H. asks: Can you give me a reA. Take tartaric acid $1 / 4 \mathrm{lb}$., alum $1 / 2 \mathrm{lb}$., bicarbo nate of soda $3 / 4 \mathrm{lb}$., farina 1 lb .; powder them all, dry, mix, and add 3 ozs sesquicarbonate of ammo-
nia in powder. Keep closely packed or in a stopnia in powder.
(23) J. J. asks: How can I solder brass? A. Mix copper and zinc in equal proportions, cove
the surfaces to be joined with a paste of borax the surfaces to be joined with a paste of borax
and water, put in the alloy in powder, lute to and water, put in the alloy in powder, lute
gether, and hold in a flame till the solder melts.
(24) C. A. R. asks: How can I soften old utty on window frames? A. Pass a red hot irou
ver it, near the surface of the putty.
(20) F. M. H. asks: What materials are sed in making a nickel solution for plating with . Dissolve the nickel in nitric acid; add cyanide of potassium to precipitate the metal. Wash the precipitate, and then dissolve it by the addition of precipitate the nitrate solution with carbonate of potash. This should be well washed, and then dis olved in cyanide of potassium. This method o preparing the nickel-plating solution is simple and good. The electrotyping is done by a process an
alogous to that of silver plating. Of course you ust use an electrode of nickel.
(26) W. H. F. asks: 1. Given the resistance of a line, how shall I determine the electromotive
force necessary to operate it? A. You require bout one volt for each 80 ohms, or about one cell Daniell or gravity battery for each two miles of
wire. 2. Can you give me the average resistance of No. 23 copper wire, B. W. G., at $60^{\circ}$ Fah.? A. It is $83 \cdot 16$ ohms. 3. What is the electromotive force of the ordinary Hill gravity battery compared with the electropoion cell? A. Calling the electropoion
100 , the electromotive force of the Hill, Callaud, gravity, Minotti, Eagles, or any other modification of the Daniell battery, is 56 .
(27) A. M. says : I would often make use of theelectric light if the Grove and Bunsen batteric battery praised as the most powerful of conant batteries. Could I produce, with such a batcry, an electric ligat equal to one produced by 511
Groves (the platinum being 6 by $21 / 2$ inches), and what number of cells would be required for this purpose? A. Yes. It would require 100 cells.
(28) C. C. asks : 1. In electrotyping, must ing a way impression? No Brush them over with black lead. 2. How is the electro deposit removed from the wax (after it is taken out of the battery) so as to be perfectly true and level? A. Melt the wax by dipping the plates in hot wat What is the metal backing composed of
Lead. 4 . How long must it remain in the batt receive a sufficient coat of copper for ordinary printing? A. About 24 hours. 5. What battery ould be necessary for electrotyping an engraving
inches square? A. Two cells of a Daniell or Callaud battery.
(29) C. E. C. asks: What are the best treatIetallurgy," by Alfred Smee ; "A Manual of El -ctro-Metallurgy," by James Napier; Walker's "Electrotype Manipulation ;" Sturgeon's "Art of
Electrotyping," and How's "Manual of ElectroMetallurgy.'
(30) E. T. 'T. says: A friend and myself ave a couple of telegraph instruments, with a
arge wire between them. We tried to use a ground but we could not close the circuit. Our houses re only about 200 feet apart, and we had 4 cups of attery. I then bought enough of No. 18 copper ire for another main wire; and it worked splendidy and has never troubled us since. At what distance will a certain number of cups close a
ground : At what distance will they close a double wire circuit? A. Different substances conduct electricity with more or less freedom. according to their composition. Dry earth conducts very poor-
ly. It is the moisture in the earth which gives it ly. It is the moisture in the earth which gives it
most of its conductive capacity, but water itself is most of its conductive capacity, but water itself is many million times a poorer conductor than cop-
per; hence, in order to conduct as well as a copper wire, the volume of water must be many million times as great as the wire. If the two ends of your wire had beensoldered to a water pipe which
was buried for a considerable distance in wet earth, it would have worked; or if you had buried copperplates twelve feet square in wet earth at
each end of your line, and attached the ends of your whe to them, it would have served your purpose. The cheapest plan for you, however, was to
rif another wire, and make a metallic circuit
(31) J. N. G. asks : How many Callaud cells copper wire of half a mile long, wire No.17? A Four.
(32) E.A. F. T. asks: 1. Will an engine, boiler 18 bore $x$ inches stroke, with a conica and 12 inches at bottom, of $\frac{1}{6}$ inch iron, be large enough to run a 6 inch swinging lathe for ordinary
work, or an 18 inch grindstone? A. Yes. 2. Could

I run such a boiler safely for two hours with one
flling? A. Yes. 3. Why is it that engines for the flling? A. Yes. 3. Why is it that engines for the
above purpose are not more extensively used in small shops, as it hardly costs anything to run ters that we receive on the subject that they are in extensive use.
think gunpowder thengines in use any in the marke
Minerals, etc.-Specimens have been re ceived from the following correspondents,and examined, with the results stated:
F. D. L. says: I enclose you a specimen of de the water and covering the flues of several boilers in this vicinity. It works over into the cylinders of the engines, stopping up the cylinder cocks,and in one instance caused the breaking of the fly wheel, by so closing the cocks that, upon th steam being let on (the water not escaping from ished. What is it? ished. What is it? A. It consists of silica, sili of lime, along with a little vegetable matter heating to whiteness, the latter is burnt off, and the powder becomes quite white. The difficulty lie in the excessive fineness of the particles of the fine specks and needies, microscope, look like float upon the surface. They would subside if al lowed to stand in a settling reservoir for a very of the sponge or other filters now in use--E B. -It is a lead ore containing 85.5 per cent of lead the remainder being sulphur, iron, and a trace of silver.-R. G.-This is similar to a great many other pieces recently sent to us, and consists of quart and decomposed mica. It contains no lead, and is of no pecuniary value.-R. C. H.-It is a very impure coal, containing a large amount of ash. It radiated limonite, which is a brown hydrated ses quioxide of iron. Send the specimens, but not too small ones, in which case satisfactory analysis and determination are often impossible.
Some of our correspondents who send mineral specimens in powder are so careless in doing up the packages that they come to us in a leaky condition, solling desks and papers, and other article upon which they are laid. All such packages ar ination. In sending specimens of soft or powdery substances, care should be taken to enclose th same so that the packages will not leak.
G. E. K asks: What can I mix with ordi nary printer's ink to make it indelible ?-P. S. H says: I have heard that on old Christmas night be, the elder bushes would sprout, and leaves put forth, where previouslynot a sign of any was vis ible. I supposed it to be mere tradition; but this year I saw it demonstrated, and saw elder leave an inch long gathered, there being no sign of any on the previous day. The weather was exceeding ly cold, and the leaves were frozen stiff. How is thataccounted for?-O. B. asks: Supposing a fly to
be on the rim of a locomotive wheel, of 8 feet dibe on the rim of a locomotive wheel, of 8 feet di-
ameter, through what space would the insect travel while the locomotive travels 50 miles?-F. C. says he wants to make linseed oil varnish, and wants to know what kind of a vessel to use to heat the oil to $600^{\circ}$ Fah., how to secure the thermometer bar to conduct a vessel to be fllled an
emptied, capable of making 25 to 30 gallons a
$\qquad$

## COMMUNICATIONS RECEIVED

 The Editor of the scientiric Ammrican ac iginal papers and contributions upon the following subjects:On Meteorological Observations. By J. B. W. On a Match under the Microscope. By H. A. On Railroads on Ice. By C. E. T. On Experiments with Honey. By J. H. M. On a Cheap Galvanic Battery. By W. H. S On Mill Dams. By J. On the American Institute Fair. By J. W. B. On Meteorology. By L. W
On Heating Horse Cars. By B. F. L.
On Amalgam Fillings. By D. W. C.
On Heat as a Mode of Motion. By X
On Spiritualism. By H. W
On the late Dr. Sarphati. By M. C
On a Flying Machine. By D. J.
On Transportation. By I. I. S.
On Transportation. By I. I. S.
On the Glacial Theory. By D. B.
Also enquiries and answers from the following
C. H. B. - W. M. H.-R. G. S.-J. K. L.-J. B. R.
N. M. V. $\rightarrow$ A.J. т.

## HINTS TO CORRESPONDENTS

Correspondents whose inquiries fail to appear should repeat them. If not then published, the clines them. The address of the writer should a
ways be given.
Enquiries relating to patents, or to the patenta bility of inventions, asaignments, etc., will not b published here. All such questions, when initial only are given, are thrown into the waste basket, a but we generally take pleasure in answering briefly by mail, if the writer's address is given.
Hundreds of enquiries analogous to the followin are sent: "Who makes automatic fountains Who sells ferns, rock work, fish, etc., for aquaria, Who sells the best churn? Who publighes a book on tanning? Who makes steam, water, and me chanical elevators? Who makes a knife sharpene and glass cutter? Who makes steel or iron fer small engines ( $3 \times 6$ inches cylinders, and less) adver tise in the Scientific American?" All such personal enquiries are printed, as will be observed, in
specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way
expeditiously obtaine
[OFFICIAL.]
INDEX OF INVENTIONS
Letters Patent of the United States we
Granted in the week ending January 19, 1875,
AND EACH BEARING THAT DATE.
[Those marked (r) are relssued patents. $\rceil$

## cid, concentrating sulphuric, Fauré \& Kessler.. 158,924

## larm, burglar, A. C. Taylor

Auger, cotton, A. O. Schultz.
Auger, earth, Davis and Mills.
Baby tender, E. Post.....
Bag holder, U. E. Lem
Bales, hay and other,
Barrel, R. W. Baylor
Barrels, coating for oil, M. W. Quic
Bath attachment, T. D. Woolsey..........
Bedstead, Invalild, Cosobs zand MeGovern..
Bedstead, tofle stand, Scwartz and wood Bedstead, tollet stand,
Bee hive, A. B. Bowen
Bnder, temporary, Guicheteau and Per
blacking, waterproof liquid, E.
Blanket, horse, G. V. Shepard
Boiler for heating, E. and W. B. Mayer
Bolt bearing, king, G. J. Orr..
Boom, sheer, w. B. Culbertson
Boot crimping inachine, Farnsworth \& Barrett
Boot heels, forming rands for, T. Bullock.
Boot soles, flanging, F. D. Ballou..
Boot jack, H. N. Conklin
Boring machine, z. c. Phillips.
rick laying machine, C. Frank
Bridle, w. s. Mitchell.
Brush, C. A. Hussey.
Brush, C. A. Hussey.
Buckle, T. L. Wiswell
Burner, argand gas, T. Clough
Butter worker, Yaw and Mitchel
Calculator, mechanical, H. B. Martin
alf weaner, w. Sutton.
Can and measure, fluld. G. W. A
Cane juice, trating, F. Randon.
Car brake, air and steam, J. M. Conn
Car coupling, c. Billmeyer
Car coupling, A. Coulter..
ar coupling, w. o. Guncke
Car coupling, J,
Car coupling,
ar coupling, Petree and Henslee
Car wheel, J. Leland..
Carpet stretcher, G. H. Ford.
Carriage jump seat, J. R. Patte
Cartridge, lubricating, J. V. Meigs
Celling, metallic, H. Adler
Chair, rocking, C. Streit.
Chimney cap, A. B. Husse
Chopper, meat, D. Peters (r)...................158,942 6,237
$\begin{array}{ll}\text { Cloth, etc., guiding knife in cutting, J. Lacmann } & \text { 158,801 }\end{array}$
Coal box, J. Forster...
Coal box, J. L. Holldey
Comb, M. Dittenhoeffe
Cooler, milk, Haddock and Pierce.... Corn shelier, J. N. Wolfe................ Damper, H. A. White ....................
Dental engine hand piece, J. W. Gilbert Dental plugger, J. W. Baxter .. ..............
Dental plugger, pneumatic, G. W. Nichols. Dental plugger, pneumatic, G. W. Nichols.
Dentist's chair, G. w. Archer............ Digger, potato, L. A. Brockett
Door hanger, Herald and Rumsey................
Drill, countersink and planer, w. McCrosson. Egg carrier, Barnett and Ga.
Egg carrier, $\mathbf{A}$.
H. Bryant..
Egg carrier, $\boldsymbol{\Lambda}$. . H. Bryant...................
Electroplating, rack for, H. E. Osborn..
Elevating packages, sling for, G. D. Stev
Elevator, hydraulic, Lane and Smith......
Engine bed plate, steam, J. D. Richardson.
Engine, oscillating, G. W. H.
Engine, road, R. R. Doan...
qualizer, spring,
Fare box, T. Keech
Fare boxes, R. M. Robinson....................................
Faucet, w. C. Bussey..............
Faucet, flitering, G. w wilson.
Fence, farm, L. E. Hogue... Fire arm, M. Sellen.
Fire arm, breech loading, J. Broughton
Fire arm, revolving, w. Mason.
Fire kIndler, J. D. Husbands, Jr. (r).
Forms, cutting irregular, G. A. Hal
Fountain sprinkler, C. A. Buttles...
racture apparatus, arm, D. Bissel
Fracture box for legs, D. Bliss
Friction drum, J. S. Mundy
Frutt jars. wire fastener for, c. Wrigh
Furnace, hydrocarbon, c. M. Gearing
Furnace, reverberating, J. Nkicholson, J
Gage and square, sliding, Iske and Baum
Gage and square, sliding, Iske
Game apparatus, F. W. Smith.........
Gas flames, etc., lighting, L. Baumeister.
Gas lighting, electro
Glue cup, H. Meyer
Gridiron, J. H. Mitchell..
Gun cleaner, W. H. Mansir...... Hame attachment, Myers and Spice Harvess tree, W. P. Wolfing Harvester, T. P. Benton
Harvester, G. H. Clark

Harvester, clover, C. R. Hardy.................. Harvester, hemp, W. F.
Hinge, gate, S. L. Selden
Hogs, watering tank for, G. A. Carter..
Hoisting apparatus, Opperman and Black Hoisting apparatus, Pfantz and sternberge Horse blanket or lap robe, G
Horse detacher, P. Arnold. Horse power, T. G.Palmer.........
Horse power, mounted, F. D. Coy Horseshoe machine, F. Supple....
Horseshoe machine, J. williams.. Horseshoe machine, J. Williams.
Indicator, station, J. w. Bryan... Insulating compound, I. Smith .. Iron beam, compound, W. S. Samps
Ironing board, A. Iske........ Kindling material, w..............
Knife, shoe, A. L. Butale. Knife, shoe, A. L. Butterworth
Ladder, fre esca pe, D. Sanford Lamp chimney, Wright and Kenney. Leather tapering machine, J. and G. W. Settle Lightning rod, S. R. Whmot.. Loom picking mechanism, Bean \& Farnham Lubricating marine propellers, F. G. Fowle Matches, cutting splints for, W. B. Nielsen.
Metal coating composition, E. J. W. Burras Meter and motor, liquid and gas, J. A. Stenber Mill, fulling, s. Hussey.. Monument, M. A. Richards Mortising tool, G. Erinn
 Nut lock washer, J. Miller, Jr.....
Ore crushing machine, S. R. Krom Ore crushing machine, S. R. Krom..
Oven, baker's, Crumbie and Donald. Packing, piston, J. Bole.
Paper bag machine, C. H. Kellogg
Paper box machine, F. Gates (r)..
Paper cutting machine, s. w. Soule
Pegs, compressing points on, B. F. Sturtevant
Photographic plate holder, Taber \& Boyd.. Pipes, Joint for wrought iron, G. Lauder
Pipes, tin-lining metallic, J. Ferguson... Planters, wheel scraper for, J. C. Barlow Pocket book, c. Lieb.
Press, baling, L. Dodge (r).....
Press, cotton, T. J. M. Jewell
Press, hay and cotton, w. C. Banks
Printer's shooting stick, J. H. Frey.
Prisons, construction of, A. B. Mullett. Pump cylinders, lining for, J. W. Douglas.
Purifer, middulings, G. T. Smith............. Purifer, middings, G. T. Smit
Reflector, w. R. Gardner Reflector, W. R. Gardner...
Rein holder, B. R. Hamilto
Rein holder, check, Wood \& Drago.. Rings, die for making hollow, S. Cottl
Sad iron holder, M. E. Hildreth....... Sash fastener, J. Christle... Sash holder, F. R. Glascock.
Sash opening and closing mec Satç̄el, knitting, C. M
Saw, hand, H. Disston
Saw sharpener, gin, Mizell \& Revell
Scraper, road, W T. Nichols.
Screw driver, W. F. Patterson.
Sewing machine, D . williamso
Sewing machine cutting attachment, W.A.Springe
Sewing machine needles, grooving, S. C. Sewing machine needles, grooving, S. C. Ki
Sewing machines, operating, B. C. Young. Sewing machine ruffer, G. W. Darby
Sewing machine, wax thread, F. D. B Shafting, safety box for, M. R. Jone Sheet metal, etc., beading, J. De Butt......
Shingles, machine for dressing, S. M. King. Shirt bosom, A. Small...........
Shoe knife, A. L. Buterworth. Shoe uppers, , itting, W. J. B. Mill s (r)
Show cases, corner for, M. Anderson Shutter fastener, J. Christie
Sifter, coal, J. S. Pearce
Sifter, coal, J. S. Pearce.......
Signal, switch, J. A. T. Bird.
Sled brake, J. York...
Spark arrester, Summers \& Fa
Spring, door, J. B. Cottom ..................
Soles to uppers, uniting, B. F. Sturrevant
Stage scenery, gulde for, C. Higbee.
Stair rod securer, T. W. Gardner...
Stove, base burning, s. H. La Rue. Telegraph apparatus, T. Yates... Telegraph apparatus, T. $\Lambda$. Edison....................
Telegraphs, Are, Channing et al. (r)...6,239, 6,240, Telegraphlc apparatus. M. Gall
Thill coupling, N. P. Ingalls... Toe calks, making, L. S. Wrigh Toy, automatic, R. J. Clay..
Toy confectionery, making Toy gun, Wiedemann \& Lin Trap, animal, H. C. Burk
Umbrella, U. G. Stefnmet
Uterine supporter, Bennett \& Parsons
Vegetable slicer, E. Moneus
Vehicle axle, J. McCurdy..
Vehlce axie, J. . E. Davis.
Vehicle seat and body, E.
Vehicle side spring, D. M.
vehicle wheel, J. B. Fink.
Vehicle wheel hub, H. A. Payne
Vent clearer for washbowls, etc., J. S. Hawley..
Warming and ventilating, A. B. Mullett.......
Washing machine, J. F. Bassett..
Washing machine, J. c. Case
Washing machine, J. C. Chase....
Washing machine, M. Commerce.
Washing machine, Niermann et al.
Water closet, E. O. Brinckerhoff.
Water wheels, case for turbine, E. R. ...........
Watering tank for hogs, G. A. Carter
Watering tank for hogs, G. A. Carte
Wells, making artesian and

DESIGNS PATENTED.
Carhart, washing
ton, D.C.
8,009.-Cooking Ranges.-L. W. Harwood, Troy, N. Y.
8,010.-STREET LA
8,010.-Street lantern, ertc.-R. B. Hewitt, Phila., Pa
8,011.-InKstand Base.-J. H. Johnson, Newark, N. J.
$8,012 .-C$ Coos Stoves.-N. S. Vedder et al., Troy, N. Y.
8,013 to 8,017 inclusive.-Censter Pieces.-S. Kellett, Sa
8,013 to 8,017 inclusive.-C
Lowell, Mass

## TRADE MARKS REGISTERED

2,172. - Perrfume. - Miller Bro's, New York city. 2,172.-PERFEME.-Miller Bro's, New York city.
$2,173 .-$ CAPRET WARP. - H. E. Vogell, New York city.
$2,174 \& 2,175 .-$ CorFers. $2,174 \& 2,175$. - Cofrerss.-Barkley et al., Baltimore, Md.
2,176 to 2,188.-PUMPs. - W. \& B.Douglas, Middletown Ct 2,179.-PERFUMRRY, ETC.-Eddy Bro's, New York city 2,181.-Firm Kinderrs, etc.-J. D. Husbands, Jr., St
Louis, Louis, Mo.
2,182.-SAJCE.-Lewis \& Co., Chicago, Ill.
2.183.-CigARs.-J. F. Miles, Boston, Mass.
,184.-PILE CURE. - Montgomery \& Co., Philadelphia,Pa
SCHEDULE OF PATENT FEES.
On each Caveat.........
On each Trade mark..
On fling each applicati
On issuing each original Patent.
On appeal to Examiners-In. Chtef
on appeal to Commissioner of Patent
On application for Retssue
On an application for Design (3y/y yea
On application for Design (7 years)
n application for Design (7 years).
On application for Design (14 years)


## CANADIAN PATENTS.

List of Patents Granted in Canada,
Jandary 21 to January 25, 1874.
s82.-F. H. Wilson, Chicago, Ill., U. S. Improvements

on cans for olls, called "Wilson's Oil Can." Jan. 21, | on ca |
| :--- |
| 1875. |

U S. Improwman, Morrow, Warren county, Oho, Clamplon Dryements in dryers, called
Jon. 11, isis.
iod.-J. B. White, Fort Wayne, Allen county, Ind. U. S. Improvements on
Omnibus." Jan. 21, 1875.
provements on apparatus for steaming and treating lumber, called "Taylor's Lumber Steamer." Jan. 21, 4,2875.-E.
provements in flexible shanks for yoots and shos. Improvements in flexible shanks for boots and shoes,called 21, 1875. Improvements on baling plasterIng hair, called "'King's Improvement in Baling Plastering Hair." Jan. 21,
1875 . 4,288.-Wm. Ascough, Buffalo, Erie county, N. Y., U:
Improvements on a combined bevel square, try squar protector, level, slope level, and compasses, cal
cough's Combination Square." Jan. 21, 1875.
Improvement on floating vessels for storing grain, Improvement on floating vessels for storing grain,
called "Improved Grain Storage Boat.," .Jan. 21, 1875.
$4,290-\mathrm{H}$. ,290-H. Ryder, Somerville, Mass., U. S. Improve-
ments on grates for furnaces, called "The Ryder Grate." Jan. 21, 1875
In lamps, called "Rhind's Safety Lamp.,' Jan. 21,1875. 4,292.-R. C. Brooks and A. J. Van Winkle, San Francis. co, San Franclsco county, Cal., U. S. Improvements
on a process and apparatus from distilling alcohol ex-
tract from wort so free from fusel oill, called "Brooks' Improved Distilling Apparatus." Jan. 22, 1875.
,293.-J. K. Feick, Berlin, Waterloo countr, Ont. Im"Fetck's Improved Last for Making Seamless Boots, 4,294.-W. S. Wisner, Brantford, Brant county, Ont., as.
signee of C. P. Brown, Manc: ester, Ontario county signee of C. P. Brown, Manci. ester, Ontario county,
N. Y., U. S. Improvements on seed sowing machine, called "Valve for Grain Drill Double 23, 1875 . C. Moore, Elizabeth, Union county, N. J., U. S.
4,295.-C.
Improvements in pencli holders for slate frames, called Improvements in pencil holders for slate frames, called
"Moore's Pencil Holder for Slate Frames." Jan. 23 4875.-J. O. Peacock, Finsbury Park Row, Middlesex county, Eng. Improved form of stove and apparatu
connected therewith, called ' Peacock's Dlatiermis Gas and Fuel stove.,' Jan. 23, 1875.
4,297.-D. D. Cattanach, Providence, F
4,297.-D. D. Cattanach, Providence, Providence county
R. I., U. S. Improvements R. I., U. S. Improvements on treating oll for p
called "Cattanach's Onl Process." Jan. 23, 1875 4,298.-M. Hutchinson, Norfolk, St. Lawrence, N. Y.
U. S . Improvements on heating drums, called : M . Hutchlnson's Heating Drum.' Jan. 23, 1875.
,239.-T. A. Edison, Newark, Essex county, 4,239.-T. A. Edison, Newark, Essex county, N. J., U. S
Improvements in electric telegraphs, called "Edison's Improvements in electric telegraph
Domestic Telegraph." Jan. 23, 1875. 4,300--T.and J.C. Peacock, Finsbury Park Row, Middle-
sex county, Eng. Improvements in gas cooking appa.
ratus, called "Peacock's Thermostatic Gas Roaster." ratus, called
Jan. $23,1855$.
U. S. Improvements on wagon seats, called "Lamb's Seat Fastener.", Jan. ${ }^{23,1875 .}$
302.-M. Goldman, Syracuse,
ment on a pocket candlestick, calle " C. S. Improvetachable Candlestick "' Jan. 23,1875 .
ty, Wis., U. S. Improvements in varnishes for coating photographs, negatives, and glasses, called "Morgen.; meter's Gro
Jan. 23.1875.
ill, Detroit, Wayne county, Mich. Im. provement in the process of making wood gas, called
"Ramsdell's wood Gas Generator." Jan. 23,1875 . ,305.-J. J. Higgins. New York city, N. Y., U. S. 1 st.
extension of No. 4,151, on " Higgins' Automatic Um. extension of No. 4,151, on "High
brella Runner." JJan. 23, 1872.
,306.-J. J. HIggins, New York city, N. Y., U. S. 2 d
extension of No. 4,151, on "HIggy,
brella Runner." Jan. 25,1875 , extension of No. 4,151, on "H.
brella Runner." Jan. 25, 1875.

## Zaduettisements.

## 

Enoravings may head advertisements at the same rote per line, by measurement, as the letter press. Adverearly as Fridaymorning to appear in next issue.

夢
$=5$

## Fleetwood Scroll Saw， <br>        Ornaments TRUP BROS．， Mannfacturers． 

，dible geEDS BY MAIL． Our new Seed Catalogue，with a revised
and enarged Lidit of Hovelise and Spe．
cialties，is reasy for distribution，and
 W ELLS EVERY MAN HIS OWN LAWYER






 There is no class of the community，male or female，wh

 on fine paper，handsomely bounding
Addreess
Adabinet Library Binding．
JOHN $\qquad$ NIAGARA STEAM P P UMP，
 Hububarturd \＆oolel Aller． Engines and Boilers， Pulleys，Sha fting and Hanger

## ColD ROLLED



 Gumell，Bram \＆Watas， WOOD．WORKING MACHINERY

Planing Mills，Car Shops，and Sash and Door Factories， 1507 Pennsylvania Avenue， philadelphia，pa．


## MACHINERY

IRON \＆WOOD WORKING MACHINERY OF EVERY DESCRIPTION．
Cold Rolled Shafting．
\＆HaNGers，PULEYS，CoUPLINGS，BELTING，\＆o GEORGE PLACE \＆CO．， 121 Chambers $\& 103$ Reade Sts，Níx．Citz

Corrugated Iron，



New and Important Work on Paints． A Practical Treatise on the Manufacture of Colors for Painting：
orproising the origln，Defnitition，and Classification of the Treatment of the Raw Materilit the best
Formule；and the ne west P Pocesses for the Pre




patent
Planing \＆Matching

LUDIOW VATVERS，

 Andrews Patents．





## pUNCHING






haplef Ranine，

 Iron nud Wood Work

 $\mathrm{V}^{\text {ances pruning kifor }}$ NG Kilfe sate on roratrr．
s．J．VANEE，Palmyra，Il．

E 5New Variety Moulding Machine， At Prices that Defy Competition． Send for Prices and Descriptive Circular．

 Second Hand Mngines and Boilers，

 AGENTS WANTED

GFO．W．READ \＆CO． AND VENEER－CUTTING MI Hard－Wood Lumber The AND CHOCE FIGURED VENEERST， －EACIETY ：The Lowest Prices：
 OTIS＇${ }^{\prime}$ max minatery OTIS，BROS．\＆CO

## TWO MIITION

FIVE HUNDRED THOUSAND DOL工ARS Will be distributed，in 20,000 Cash Gifts，at t
Last Gift Concert in aid of the Pandic Library of Kentrocky，

FERRUARY 27， 1875. Positively no Postponement． A DRAWING ON 27 Tr, OR喓 Money Refunded． POSITIVELY LAST CHANCE．
Pablic Library of Kentrocky．
Death of Gov．Bramlette．－Action of the Trustees－A Successor Appointed－No More Postponements－Drawing Cer tain February 27th． Esq．＇，who under the late Hon resolved that C．M．Briggs， real business manager of the＇gift concerts already given In aid of the Public Library of Kentucky，be and he is death of said Bramlette，in the management of the af－ airs of the fifth and last gift concert，and that the draw－
ing announced for February 27,1875 ，shall positively and unequivocally take place on that day without any furthe R．T．DURRETT，Pre
R
Hereafter all communications relating to the 5th Con－ ertshould be addressed to the undersigned，and I pledge that eve $y$ dollar paid for tickets shall be returned． C．M．BRIGGS，Agent and Manager，Room 4，Public rary Building，Louisville，Ky
Whole Tickets $850:$ Halves $225 ;$ Tenths $\$ 5$.
Apply to THOS． E ．BRAMLETTE，Agent
Or THOS．H．HAYS \＆CO．． 609 Broadway．N． Y ．
E．M．MAYOS PATNENT BOLT CUTTER：
景


Model Engines．
Complete sets of
or making small


## Iadies at Fome


MAGNETS－Permanent Steel Magnets

P int ha max siman Evaines，CoMbIN




## STPET STAMPS．

$\mathrm{B}^{\text {ANKRUPTS SALE OF HORIZONTAI }}$


$\mathrm{G}_{\text {Botites，}}^{\text {LASS }}$ Mink ins，for Fruit Jars，Lamps


The Bigelow Engine， Price at Works． .$\$ 475$
5405
8005
800

To Electro－Platers．







SHINGLE \＆BARREL MACHINERY

 $\mathrm{R}_{\text {Manuacturers of the latest improved Pate }}^{\text {ICHAR }}$


 EAGLE FOOT LATHES，



Planing \＆Matching，
 Free to Sewing Machine Agents．






Water Wheels．




 Seeds and Bulbs．
 FOR 1875 NCow READY
sent，with a peectmen copof The American Garden，
new



REESE＇S ADJUSTABLE STENCIL LETTERS


Asbestos ${ }^{\text {Feliting Co．}}$
gatuertisements.
Rack Page
Hafide Pave
\$1.00 a line
Emgravings may head advertisements at the same rate
per line, by measurement, as the letter press. Advertisements must be received at publication offlee as HOUGHTON'S AUTOMATIC HOUSE PUMP,


Read This Once-Once! Then Read it Again-Again WALTHAM WATCHES,
 that is w.
TIMIE.
For this purpose every one should own a Waltham
Watch, and to meet THE MEANS OF ALL CLASSES, they are made of various grades, so that every taste
and purse can be suited. A SUBSTANTIAI. ACCU RATE WATCH, in a Solid silver Case, can be bough
for $\$ 17$,and an EXCELLENT SMALL SIZE GOLD WA TCH, for Ladies, for $\$ 50$. From these prices they nud WEIGHT AND PATTERN OF CASES. Special qualities are made for hanlroad use and Travellers.
The STEM-WINDING ATTACHMENT is now to be had with watches of any size or grade, and in cases of
any weight or pattern. To buy one, ryy the following

 post-paid. It is a look of 16 pages, and in it are described TIES of Walthanf Natches, fronn which you cannot fail dircetions in the Price List, and WE WILI. SEND THE WATCH by express, with the bill to collect on Agut to allow the purchaser to OPEN THE PACK. It is not in every way satisfactory you need not take it,
but het it COME BACK AT OUR EXPENSE;
even after you have taken and paid for it, if it does FUND TIIE MONEY at any time within a year. Writing, as the farther you are THE MORE ADVAN


 IM PORTANT TO INVENTORS.
 To Users of Steam.



 The " Stilwell Patents," are believed to effectually
cover and dewien for heating and purif Yigg feed water for
steam boilers. in which is used a s series of heating and


## TPants Stitetilier

The only yevice that will effectually do
away with kne forms and kep the
in proper shape. To be had in all frst
 ordering goods on collection ert solicitting
the agency must enclose their business
card.
Prioks-Nickeled ........ Ioss- Nickeled.
Japanned.
JWeights. P. DEL VALEE HALSEXY, Mriviling Stories.



ASBESTOS MATHRIATS

 Patentoo

## MACHINIST TOOLS

For Sale Cheap.


 Mill FurnishingWorks

 TER PULSOMETER.


Excelsior Do Your 0wn Printing







Rope.

Portland Cement



REYNOLDS \& \& CO.,



## Working Models



## 

PASCAT IRON WORISS. PFITIADEIPFIA, TASKER IRON WORKS, NEWCASTLE, DELAW ARE.

 Esppecial attention to our Pateant Vulcanized Rnhbpr-conted Thbe.


Mman \& Co.s Patant Oficess.
Established 1846.
The Oldest Agency for Soliciting Patents in the United States.



TANNATE OF SODA,
SCALE PREVENTIVE


 HARTFORD
STEAM BOILER Inspection \& Insuranco COMPANY.
w, e. Franklin, V. P't. J. M. Allen, Preal. Todd \& Rafferty Machine Co. The celebrated Greene Variable Cut-Off Engne; Lowe s
Patent Tubular and Flue Boolers Plain Slide Valve Sta.
tionary, Hoisting, and Portable Engines. Boilers of ail





## PERFECT

## NEWSPAPER FILE.




Address
Publishers "Scientific Amerrican."


## VISES.

## 



## Machinists' Tools.




${ }^{C O U V E R I T A G}$


MmeryWheis ( TANITTE) EmeryGinders
 STANDARD BRICK MACHINE.


## Milerope <br>  <br> IRON PLANPRS. <br> 

## MROM (4

SCIENTIFIC ${ }^{\circ \rho}$ AMERICAN, THE MOST POPOLAR SCIENTIFIC PAPER IN THE WORLD. THIRTIETH FEAR.
VOLUME XXXII.-NEW SERIES. The publishers of the SCIENTIFIC AMERICAN 1875 , a new volume commenced. It will continue to be the aim of the publishers to render the con tents of the new volume more attractive and use ful than any of its predecessors.

To the Mechanic and Manufacturer
No person engaged in any of the meohanical pur-
suits should think of doing without the ScIENTEFIC suits should think of doing without the ScIENTIFIC Angrican. Every number contains from six to ten
engravings of new machines and inventions which cannot be found in any other publication. The SCIENTIFIC AMERICAN is devoted to the interests of Popular Science, the Mechanic Arts and the industrial pursuits generally; and it is val uable and instructive not only in the Workshop and Manufactory, but also in the Household, the Ljbrary, and the Reading Room.
By the new law, the postage must be paid in advance in New York, by the publishers; and the charge. TERMS.
One copy, one year (postage included).
One copy, six months (postage included) $\$ 3.20$
1.60 One copy, three months (postage included).. 1.00 One copy of Scientific American for one
year, and one copy of engraving, "Men
of Progress".............................. 1
year, and one copy of "Science Record"
Remit by postal order, draft, or express. 5.50
Address all letters and make all Post Office or-
MUNNI \& CO.,


