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NEW YORK, AUGUST 23, 1873.

MANUFACTORE OF OIL OF VITRIOL by J. F. GESNER, M. A.

OME one has said that the world knows least of its greatest men. If this be so with reference to individuals who shape, for weal or for woe, the destinies of their kind, with how much more truth may it be asserted of the great material products, that minister so vastly to man's comfort and enjoyment! Few have any adequate idea of the importance in our arts and manufactures of the corrosive liquid, known in commerce as the oil of vitriol. So important is the subject of our article, and so various and numberless the products, necessa ry almost to our daily existence, depending upon its manufacture, that it has been said that the material prosperity of a country may be judged of very accurately by the amount of oil of vitriol it produces.
The chemist knows oil of vitriol as sulphuric acid, and writes it, in characters rather cabalistic to the uninitiated, as $\mathrm{H}_{2} \mathrm{SO}_{4}$. The characters, however, are easily understood. The capitals are merely the initials of the elements composing the compound, and the figures under them (1 being understond when no figure is written) denote the number of times each element enters into combination.
times each element en
And here comes in And here comes in
one of those great and one of those great and
comprehensive laws comprehensive laws
which it is the glory which it is the glory
of science to discover of science to discover
and apply. We have written sulphuric acid $\mathrm{H}_{2} \mathrm{SO}_{4}$, and we have not done so at haphazard. Our hydrog $\curvearrowleft \mathrm{n}$, oxygen, and sulphur behave, contrary often to our experience in - the case of individuals, with unvarying decision and consistency. For the sake of simplicity we may write our compound $\mathrm{SO}_{3}, \mathrm{H}_{2} \mathrm{O}$, bearing in mind that the second half of the symbol, $\mathrm{H}_{\mathrm{z}} \mathrm{O}$, indicates 1 part of water, $\mathrm{H}_{2} \mathrm{O}$ always meaning water in chemical language. The elements in the first part of the compound, $\mathrm{SO}_{3}$, are sulphur and oxygen, and phur and oxygen, and sulphur and 3 parts of sulphur and 3 parts of
oxygen. Now we canoxygen. Now we cannot change these relative proportions of sulphur and oxygen and retain the same compound. The instant we do so, a new chemical compound springs into existence. If we make, for instance, two parts of oxygen combine with one of sulphur, we
have no longer sulphuric acid, but the pungent suffocating odor of a burning sulphur match, due to sulphurous acid gas, a definite compound that cannot be formed with any other different proportions of the combining elements.
By investigation, chemists have discovered that the dif erent elements have certain and unfailing combining weights. For instance, the comlining weight of salphur is 32 , that of oxygen 16, that is, in the case of sulphurous acid, 32 grains, ounces, or pounds, etc., of sulphur, have combined with twice 16 grains, ounces, pounds, etc. (not twice any other number of grains, ounces, pounds, etc.) of oxygen to form $32+(16 \times 2)=64$ grains, ounces, or pounds of sulphurous acid. So that, in any number of grains, ounces, or pounds of sulphurous acid, we know that $\frac{32}{64}=\frac{1}{2}$ is sulphur and $\frac{32}{64}=$ $\frac{1}{2}$ is oxygen; in the same way $\mathrm{SO}_{3}$ denote that 32 grains, ounces, or pounds of sulphur, have combined with three times 16 grains, ounces, or pounds of oxygen, making up $32+(3 \times 16)=80$ grains, ounces, or pouyds of anhydrous sulphuric acid. In any number of equal parts, by weight,then, of $\mathrm{SO}_{3}$, we know that $\frac{32}{8 \cdot 0}=\frac{2}{5}$ parts are sulphur and $\frac{4}{8} \frac{8}{8}=\frac{3}{3}$,
parts are oxygen. In the case of $\mathrm{SO}_{3}$, we have a striking ex ample of the change a new entering element or compound can effect in a given substance. $\mathrm{SO}_{3}$, without its equivalent of water, which we have called anl:ydrous sulphuric acid, is a white, solid substance, and may be molded in the fingers iike wax, without danger if not pressed too hard. It has neither acid nor corrosive properties. Drop a quantity, however, into a little water, and there is a hissing noise, and an evolution of steam, as when you quench a red hot iron. So strong is the affinity of this inert harmless wax for the equal ly bland water and so violently do they combine that amount of heat will serve afterwards to separate, withou decomposition, the two, which make up the intensely acid liquid, oil of vitriol
Although sulphur was well known to the ancients, the were not acquainted with its compound with oxygen, the sub ject of our articie. Paracelsus, who died in 1541 , seems to have been the first who understood its composition. That sulphur, or brimstone, should have been known, centuries before its compound,. sulphuric acid, was recognized or ap plied to any use, is due not only to the limited knowledge possessed by the old alchemists, but to the fact that the acia rarely occurs in the free state. The affinities of sulphuric acid are so strong that, not content to exist alone, it must, as it were, have some intimate chemical companion with which to form a chemical alliance. And how different the com pound from the elements and compounds composing it!
tense heat, the salt known as green vitriol or copperas. The substance does not, as the term copperas would seem to im ply, contain any copper, but is simply a sulphate of irob known to the chemist as ferrous sulp iate. For some cen turies, this was the only known mode of making the acid, and its manufacture in this way is still carried on in Nordhausen, in Saxony, whence the name of the product, Nordhausen acid or fuming oil of vitriol.
The distillation of the ferrous sulphate is made in earth enware vessels, called, from their shape, long necks. These are set in a reverberatory furnace, with an earthenware receiver luted to each with clay. The product is a very strong fuming acid. From its oily appearance, and the fact of its being first derived from green vitriol, we have the ordinary commercial term oil of vitriol. This mode of manufacture was iound to pe too expensive, and inadequate to supply the increasing demand. To the French is due the next impor. tant step in the manufacture of sulphuric acid, namely, by the oxidation of sulphurous acid, which, as has been already remarked, contains one atom less of oxygen than sulphuric acid.
Now the production of sulphurous acid is a very cheap and easy matter. All we have to do is to burn sulphur in the air; and there are few of us in the habit of $u \cdot$ ing the ordinary sulphur match who are not fairly acquainted with its production on a small scale, and also with one of its properties when it has reached the nostrils.

The cheap produc tion of sulphurous acid, then, being taken for granted, means must be found, at once easy and economical, to oxydize it into sulphuric. The French endeavored first to effect this by burning sul. phur in glass globes, the interior surfaces of which were kent moistened with water; but the product of sulphuthe product of sulphuric acid was found to be very small. Sulphur, when burning even in pure oxygen, will not oxydize to sulphuric acid, except to a very limited extent, neither will free sulphurous acid take up any more oxygen from the air, although there may be plenty around it and to spare.
We are indebted to the English, though the suggestion is said to have been first made by two French chemists, Lefevre and Lemery, for the next great improvements on which the present 1 uanufacture of sulphuric acid is founded. Dr. Ward, of England, found that, by introducing niter or potassium nitrate into the burning sulphur, the product of acid was

Glauber's and Epsom salts are familiar in our mouth as house hold words; but who would recognize sulphuric acid and oda in the one, or oil of vitriol and magnesia in the other Plaster of Paris is a familiar substance, inert and harmless with no trace of our corrosive acid and the caustic lime com posing it. But notwithstanding this strong tendency to com bine with other bodies, sulphuric acid has been found in the free state. It is sometimes discovered free in the wate which drains from coal mines, evidently produced by the decomposition of the iron pyrites contained in the coal, as will be seen further on. Boussingault foupd it in a moun tain stream, called the Rio Vinagre, in the Andes, and cal culated that the waters of this torrent annually carried down to the sea 15,000 tuns of sulphuric acid. In the island of Java, it exists in the waters of a stream which has its source in the crater of an extinct volcano. In all ot these instance it has evidently been produced in the way $n$ which we shall presently see that it is now manufactured in the large scale, namely, from the oxidation of sulphur.
Sulphuric acid was first prepared by suthmitting, to an in-
product of acid was
largely increased. His apparatus consisted of large glass vessels holding from forty to \$fty gallons. These were placed in two rows in beds of sand, and a few pounds of water poured into each. Stoneware pots were first introwater poured into each. Sloneware pots were first introduced into the necks of these glass vessels, and afterwards a
red hot ladle, into which was thrown a mixture of sulphur and red hot ladle, into which was thrown a mixture of sulphur and
niter. placed in each pot. The necks were then closed with niter. placed in each pot. The necks were then closed with
wooden stoppers. The sulphurous acid from the burning sulwooden stoppers. The sulphurous acid from the burning sul-
phur was found to be oxydized by the nitrous fumes from the ignited saltpeter, and the resultant, sulphuric acid, was absorbed by the contained water at the bottom of each glass vessel. Sulphuric acid made in this way sold for from 30 to 50 cents per pound in our currency. Its price is now about one penny per pound in England, and with us ranges from $2 \frac{1}{3}$ to 2 cents. The great cost of the acid made by Ward's process, as compared with the price at the present time, was owing to the necessarily limited size of the apparatus, being made of glass, and the high price of the niter used.
It was not until Dr. Roebuck, of Birmingham, England, (Continued on page 114.)

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## that "dastardLy outrage" again.

We have been recently favored with a lengthy epistle from Mr. John Fehrenbatch, the author of a letter lately com mented upon by us, relating to alleged grievances of workmen in the works of Messrs. Stearns, Hill, and Co., of Erie, Pa . The present document is little more than a repetition of the personal difficulties between the above named employ. ers and their men, which, as we before remarked, is a subject interesting solely to the parties in the controversy and ject interesting solely to the parties in the controversy and
in no wise to the public. The circumstances have little or in no wise to the public. The circumstances have little or no bearing on the main question of the right of employers to resorting to outside dictation or advice.
Our correspondent mistakes the position we assume in regard to troubles of this nature, and evidently infers that we desire to champion the side of the employers as against the men in all cases and even in purely personal misunderstandings. We deal with these questions with reference to their effect upon one or the other of the great classes, employers or employed, impartially, and not with regard to any particular set of m̂en or any especial establishment. If a concern treats its workmen in a manner calcnlated to give a basis for the gererally unfounded assertions of trades' union demagogues, we endeavor by well meant advice to point out the fallacy and inexpediency of such a course; and similarly, on the oth $\epsilon$ hand, we do not hesitate to condemn any body of workmen who, by attempts at intimidation or dictation, cause employers generally to adopt stringent measures calculated to restrict their privileges or injure their interests.
The l-tter before us includes an extract from a speech of the President of the International Union, in which the employers in question are stigmatized as "pirates and robbers of the rights of labor." This is not the way to bring about the amicable adjustment of any trouble. In our opinion, a wiser course would be to counsel moderation and proper respect for the rights of others.

## SPONTANEOUS GENERATION.

All experiments thus far made with infusions of different substan ees for the purpose of producing infusorial animalculæ, appeared to prove that the access of air was necessary for their formation. Pasteur, who has extensively occupied himself with these investigations, found at last that the germs of these animalculæ could, under certain circumstances, resist a temperature of $212^{\circ}$ Fahr., as he obtained bacceria from solutions which had been previously boiled and afterward came only in contact with air which had beend
However, in 1869, Dr. H. Charlton Bastian took the matter up, and commenced trying if he could not produce animal life in a vacuum. He experimented with various fluids,
especially infusions of hay and turnips; he placed them in especially infusions of hay and turnips; he placed them in
one ounce flasks, having narrow drawn out necks, and heatone ounce flasks, having narrow drawn out necks, and heat-
ed the solutions in them rapidly till they commenced to boil over, so as to be sure that all air was expelled; then he kept them boiling for from a quarter to half an hour, while the steam was escaping with some force; then the neck was sealed up by meltirg the glass with a blowpipe flame, while at the same time the heat was withdrawn. In this way he produced after some practic $\ni$ a perfect vacuum, that is to say, one where air was excluded, and only watery vapor present. The proof of this was that the water hammer effect was quite obvious; this means that the water could be made to fall with a shock from one end of the tube to the other, without passing an atmospheric bubble, as is the case when air
is fresent. When the little flasks were thus prepared, they is present. When the little flasks were thus prepared, they
showed the development of bacteria and other minute showed the development of bacteria and other minute
moving organisms just as well as if they had not been aubmitted to great heat, and air had access. The time required
for this phenomenon varied from a few hours to several days. Even when the flasks, after being closed, were sub. mitted for several hours to boiling water, the organisms appeared; and Dr. Bastian went even so far as to submit them for four hours to a temperature of $300^{\circ}$, and about $6^{\circ}$ in excess, without preventing the subsequent development of the animalculæ. He reasoned then as follows: As the germs cannot come from the air and pass through the glass, only one of two conclusions is admissible. 1. That the invisible germs of the animalculæ are able to stand a heat of $306^{\circ}$ without being killed; or (2)
living matter.
The first conclusion is that of Pasteur, and is based on the
The first conclusion is that of Pasteur, and is based on the
assumption of the old maxim omne vivum ex ovo (all life assumption of the old maxim omne vivum ex ovo (all life
comes from an egg), deduced from the fact that it is known to be true for all the higher animals and plants, and that its extension to the lower forms of life, which are intermediate between animal and vegetable, is snpposed to be a legitimate deduction on the ground of natural law.
The second conclusion is that defended by Dr. Bastian; he maintains that the doctrine of evolution, now established by an overwhelming weight of evidence, absolutely requires that living matter must at some time have arisen from that which was not living, and that, in absence of any reason to the contrary, the uniformity of natural law should lead us to believe that the process continues to take place. He says that all analogy is against the possibility of the assumed germs retaining their life after being subjected to a heat of germs retaining their life after being subjected to a heat of
over $300^{\circ}$. No living being that we know of can endure over $300^{\circ}$. No living being that we know of can endure
the heat of boiling water, $212^{c}$, except a few seeds of the higher plants, which are protected by a very hard and nonconducting coat. Most animals and plants, indeed, perish at a much lower temperature. With regard to the bacteria themselves, they are mere specks of naked protoplasm; they are utterly destroyed at $140^{\circ}$, as sufficiently proved by the numerous experiments made by Pasteur, Bastian, and others. It is unlikely, therefore, that they should have germs capable of enduring $306^{\circ}$.
Experiments were also made by Dr. Bastian with fluids capable, after being boiled, of nourishing bacteria when any wére put into them, and of supnorting their copious reproduction, though not evolving them anew when enclosed in hermetically sealed vessels. The uniform result was that $140^{\circ}$ not only kills all living bacteria, but also prevents the
further development or reproduction of any germ which further development or reproduction of any germ which
might be supposed to exist. The natural conclusion is that might be supposed to exist. The natural conclusion is that
they do not exist, and therefore these experiments exploded the germ theory.
We hope that these inves'igations will continue so as to obtain uniform results; as only then can a full discussion of the possible explanations ensue. In the meant:me, Dr. Bastian's experiments are drawing the attention of the most eminent philosophical naturalists. For instance, Alfred R. Wallace ranks Bastian's book as equal in value to Darwin's "Origin of Species," or Spencer's "Principles of Biology," especially in regard to "curious and novel facts," "new and astounding views of the origin of life," "excellent reasoning," and "acute criticisms."
There is, however, one point to which we wish to draw attention; it is the assumption that these living organisms are evolved entirely from inorganic matter. This, we believe, is not strictly correct ; the infusions all have organic origin; they are organic compounds, and it is well known that the organic compounds are not decomposed into their inorganic elements, except by actual combustion. Starch, sugar, gelatin, etc., are not destroyed, as such, by a temperature of $300^{\circ}$, therefore, if we attempt to generate living organisms from inorganic matter, we must not commence by using organic substances, but must confine ourselves to ele ments, or their simple inorganic chemical comlinations.

## RECENT GEOLOGICAL INVESTIGATIONS.

 M. Jules Marcou communicates some interesting geolog ical notes to the French Geographical Society, gathered from various eminent sources, while preparing a new geologicalmap of the globe, recently forwarded to the Vienna Esposition. In Spitzbergen, M. Nordenskjold has found (independ ent of the clystaline rocks) palæozoic, carboniferous, triassic
and tertiary formations. An important fact, from its bearing on the history of the earth, is the discovery of terres trial flora dating from the tertiary miocene epoch, which show that the entire arctic polar region must have been covered with vast forests similar to those which now exist in the northern hemisphere as far north as the borders of the tropic of Cancer. In Norway, peat deposits have been found in Andae Island, one of the Loffoden grounp, which, like similar beds in Yorkshire, England, are of the jurassic epoch. The existence, in Russia, of an enormous triassic formation has been determined; this had, heretofore, by Sir
Roderick Murchison and others, been attributed to the Permian system. In Syria and Egypt, continuous and extensive deposits of red sandstoneindicate the homogeneous nature of the rocks of Asia and Africa. On the other hand, the most recent geological studies, made in New Zealand, Australia, and some of the Pacific islands, prove that Madagascar, in
spite of its proximity to the African continent, appears to spite of its proximity to the African continent, appears to that of Now America, MM. Musters and Pourtalés have found a group and thet volcanoes between the Gallegos river, Ca
M. Marcou considers the classification of stratified rocks, as generally laid down in modern geological treatises, as very as generally laid down in modern geological treatises, as very
imperfect and not justified except in a portion of the north. ern temperate zone. In the West Indies and California, and on the Missouri river, he states that the difficulties of classifica-
tion augment in proportion as new discoveries are made. In the first mentioned part of the globe, for example, Dr. Waa gen has found, in beds of limestone a foot and a half thick forms of fossils which are generally distributed in very dif ferent deposits, and which are supposed to belong to carboniferous, triassic and jurassic rocks. These evidences are not accidental, but are multiplied in Nebraska, Illinois, California, Australia, and even in New Zealand

## THE BASE LINE OF ASTRONOMY.

When a land surveyor wishes to find the distance between two points, separated by an obstacle to direct measurement say an impassable swamp or a sheet of water, he resorts to triangulation. To the right or left of the line to be determined, he lays off another line, from the extremities of which he takes the compass bearings of the points whose distance from each other he wants to learn. The angles thus found, together with the length of the measured line, are all the data needed for calculating the length of the required line. In extensive surveys, this principle of triangulation is used almost exclusively. A single base line is measured with great accuracy, and all the other distances in the survey are calculated by means of a series of triangles erected ou it. The correctness of the entire work deperds, consequently, on the exact determination of the length of the piimary line. If there be an error in this, the utmost care in all subsequent observations and calculations cannot prevent the survey from going wrong. Hence the minute precautions always taken in choosing the site and determining the exact posi tion of the base line, in reducing it to a perfect level and in finding its length to the minutest fraction, precautions in volving the utmost niceness of instrumental construstion, the utmost care and patience in observation and calculation, and repeated measurement, occupying months of time.
If the exact survey of a State or a strip of coast line is worthy of so much preiminary care and cost, how much more so is the survey of the universe! In surveying the earth, it is possible at any time to test the correctness of the work by measuring a new line and comparing its length thus found with the length obtained by calculation. In the survey of our Atlantic coast, for example, such a test line was measured on an island in Chesapeake Bay, the original base line lying on Mount Desert Island off the coast of Maine ; the result proved the substantial accuracy of the entire work of triangulation covering the larger part of seven or eight States. In astronomy, there is no such ever present means of testing results and ensuring ccrrectness. Everything hinges on the determination of the primary base line, so that any error in it inevitably vitiates the estimate made of every other astro nomical distance. And still more, the dimensions and weights of all the heavenly bodies beyond the moon, not less than their distances from the earth and from each other, are determined by calculations which involve the astronomical base line as a known element. It is the foundation, in fact of all mathematical astronomy. Hence the importance of its determination with the utmost possible accuracy
The base line in question is the sun's distance from the earth. The measurement of this distance with all attainable exactness, and the determination of the maximum limit of unavoidable error, constitute the most important problem now engaging the attention of the astronomical world. The rare opportunity which will be afforded by the approaching transits of Venus for attacking this fundamental problem, under the most favorable conditions and with all the improvements in means and methods attained by modern science and mechanical skill, very naturally raises those F henomena to the highest rank among the astronomical nccurrences of the century. They cannot pass without furrishing data for greatly reducing the known inaccuracy of the current estimate of the sun's distance, and consequently for a more correct determination of all other astronomical magnitudes. "Known inaccuracy!" some may exclaim, especially those whose ideas of heavenly bodies and spaces have been gained from ordinary text books, with their positive statements and professed precisicn. "Is not astronomy an exact science And are not the magnitudes it deals with known with math ematical exactness?" If they were, the coming transits of Venus, instead of being scientifically the most momentous events of the age. would be matters of comparatively small account. A few astronomers might make a note of them, but they would hardly engage the attention of all the governments of the civilized world, or give occasion for costly expeditions to the remotest parts of the globe. The figures of astronomy are, and must ever be, approximations to the trath. The question is how small can the margin of error be made.
At present the limits of error, in the measurement of the line on which all other astronomical measures depend, are so far apart that sixty worlds like ours, standing side by side, would not be sufficient to fill the gap. As a consequence, there is an uncertainty of at least four thousand miles in the exactest estimate of the sun's diameter, or some hundreds of millions of cubic miles in lis calculated volume; and every other magnitude beyond the moon is proportionately indeterminate.
Ten years ago the accepted figures were very much farther from the truth. For forty years, Encke's estimate of the sun's mern distance, deduced from the observations of the transit of Venus in 1761 and 1779, that is, in round numbers $95,000,000$ miles, had held its ground; but so many lines of evidence converged to prove those figures too great that astronomers could not refrain from making the enormous reduction which took the general public so much by surprise about a decade ago. Noticing this astronomical change of base, Sir John Herschel wrote: "The supericial reader
creditable to science to have erred by nearly four millions of miles ip estimating the sun's distance. But such may be reminded that the error of $0 \cdot 33^{\prime \prime}$ (thirty-two hundredths of a second) in the sun's parallax, on which the correction turns, corresponds to the apparent breadth of a human hair at 125 feet, or of a sovereign at 8 miles off."
It is on such minute measurements that the approximate exactness of astronomy depends. The limit of probable error in the latest and most satisfactory determination of the sun's distance is somewhere about half a million miles, say one eighth part of the last correction. We may leave it to the reader to calculate how extremely dolicate the observations of the coming transits must be to effect any consid er rble reduction in this apparently great but relatively minute inexactness.

## EFFLUX OF STEAM.

If a fluid issues thrrugh an opening, without friction, the velocity of its flow will be the same as it would acquire in falling through a hight due to its pressure. For instance, suppose that steam at aimospheric pressure flows into a vacuum. Steam at atmospheric pressure, or 14.7 pounds per square inch, will have a pressure of $14.7 \times 144=21168$ pounds on the square foot. A cubic foot of steam, at this pressure, weighs about 00064 prod this column of steam, necessary to produce this pressure per
square foot, would be $2116.3 \div 0.0364=58153$ feet. The velocity acquired by a body in falling through this space is found by extracting the square root of $64: 32 \times 58153$. Tbis found by extracting the square root of $6432 \times 58153$. Tbis
gives 1934 as the velocity in feet per second with which gives 1934 as the velocity in feet per second with which
steam at atmospheric pressure will flow into a vacuum, if steam at atmospheric pressure will flow into a vacuum, if
there be no frictional resistance. In practice, it is found that. when a fluid is discharged through an orifice or tube, the actual velocity is less than the theoretical, so that a co-fficient of correstion is ne sessary in using the theoretical formula Numerous experiments have been made upon the velocity of discharge of water, air and steam, those upon water being the most extended and reliable. It is difficult, when experimenting with steam, to maintain a constant pressure, and the velocity is so great that it is not easy to makn an exact $\mathrm{m} \cdot$-asurement. For these reasons, the results of different experimenters vary greatly. In this article, we shall endeavor perimenters vary greatly. In this article, we shall ended.
to give the most accurate results that have been obtained.
There is one case, in the flow of water, in which the actual There is one case, in the flow of water, in which the actual
velocity of discharge varies but little from the theretical. velocity of discharge varies but little from the theoretical.
We refer to that in which the water flows through a moutb We refer to that in which the water flows through a moutb
piece shaped to the form of the contracted vein. This piece shaped to the form of the contracted vein. This
mouthpiece has a length about equal to the diameter, and is constructed with a bell shaped month, its diameter being de creased at the middle of its length to atout eight tenths of its original size. Experiments with this kind of mouth piece ia the case of steam, however, show varying corfficients of velocity for discharges under different pressures. The table given below will illustrate this.
table of coefficients of the velocity of discharge of steam into the atmospliere, through a mouthpiece having the form of the contracted vein
Pressure in pounds per square
inch above atmosphere. $\begin{gathered}\text { Weight per cubic } \\ \text { foot. }\end{gathered}$ Coeffleient.

| foot. |  |  |
| :---: | :---: | :---: |
| 1 | 00396 | 0.93 |
| 5 | 0.0510 | 085 |
| 10 | 0.0598 | 0.78 |
| 20 | 00815 | 0.71 |
| 30 | 0.1025 | 069 |
| 40 | 0.1232 | 0.68 |
| 50 | 0.1436 | 0.67 |
| 60 | 0.1636 | 0.66 |
| 70 | 0.1833 | 0.65 |
| 80 | 0.2030 | 0.64 |
| 90 | 0.2241 | 0.63 |
| 100 | 0.2410 | 0.62 |

These coefficients have been determined experimentally for orifices varying from four tenths of an inch in diameter up to one and a balf inches. We will now explain how to use them, illustrating by an example.
The expression for the theoretical velocity is $v=\sqrt{2 g h}$, or the velocity of discharge in feet per second is equal to the square root of twice the acceleration due to gravity multi plied by the hight due to the effective pressure. The actual vesocity is equal to the theoretical velocity multiplied by the proper coefficient.
Example: With what velocity will steam at a pressure of 50 pounds by steam gage issue into the atmosphere through a mouthpiece having the form of the contractrd vein? Answer: $50 \times 144=7200$ pounds pressure per square foot. 7200 $\div 0 \cdot 1436=50139$ feet $=$ hight du to pressure. $V 64 \times 50 \times 5$ $\times 0.67 \times 1203=$ velocity of efflux in feet per second. Cor rections can be applied to the coefficients given in the preceding tails, to adapt them to other cases than that in which the stram issues through a mouthpiece having the form of the contracted vein
For a tube haviug rounded edges, and a length equal to once and a half the diameter, deduct $0.03 \mathrm{fr}, \mathrm{m}$ the coefficient for any given pressure. For a tube with square edges, and a length from once and a quarter to twice and a half the diameter, deduct $0 \cdot 13$ from the coefficient. For a plain tube whose length is 12 times the diameter, deduct 0.24 from the coefficient. When the length of the tube is 24 times the diameter, d + duct 0.28 from the coefficient.
To find the velocity of efflux through an orifice in a thin plate, the thickness of the plate being not more than one tenth the diameter of the orifice, correct the coefficients given in the table as follows: Deduct $0 \cdot 36$, when the pressure does not exceed half a pound per square inch. Deduct 0.21 when the pressure is equal to one atmosphere.
illustres cases, as it will illustrate the method of proseeding for all: Suppose steam
of 40 pounds pressure per gage issues through a pipe one
inch in diametrar and twenty-four inches long, what is its velocity? Answer: $40 \times 144=5760$ pounds pressure per square foot, and $5760 \div 0 \cdot 1232=46753$ feet, hight due to pressure.
$\sqrt{6232 \times 46753} \times(0.68-0.28)=694$, velocity of efflux in feet per second. The preceding constants were determined experimentally by Mr. George Wilson, of England. It will be observed that they apply to orifices from four tenths of an inch to ose and a half inches in diameter, and having lengths from oue ten:h to twenty-four times the diameter, the experiments having been made on the efflux of steam through orifices varying within these limits. Approximate formulas. for general use, have been established by the late Professor Raュkine, and we will give these, illustrating them by examples.
Case 1: When the pressure of the medium into which the steam flows is less than three fifthis of the pressure in the reservoir, the number of pounds of steam discharged through a pipe or orifice is found by multiplying the area of the pipe (in square inches) by the pressure of steara in the res ervoir, and dividing the product by 70. Example: How phere, through a 3 inch pipe, the pressure per gage being 15 pounds? Answer: Here the absolute pressure in the boilc is $15+14 \cdot \%=29 \cdot 7$ pounds per square inch, and the area o the pipe is 707 square inches. Hence the quantity of steam discharged per second will be $(29 \cdot 7 \times 7.07) \div 70=2.99$ p ounds. The volume of this steam will be $2.99 \div 00707=42 \cdot 4$ cubic The volume of this steam will be $2 \cdot 99 \div 00707=42.4$ cubic
feet, and the velocity of discharge in feet per second will be feet, and the velocity of discharge in feet per second will be
found by dividing the volume by the area of the pipe in square feet. This gives the velocity : $42 \cdot 4 \div 0 \cdot 0492=864$ feet per second.
Case 2. When the pressure of the medium into which the steam is discharged is more than three fifths of the pressure in the reservoir, the number of pounds of steam discharged per second is found as follows: Multiply the area of the pipe (in square inches) by the product of the external pres sure divided by 42 and the square root of the difference o the internal and external pressures divid +d by two thirds of the external pressure. Example: Steam of 5 pounds press ure, per gage, is discharged through a 2 inch pipe into the $=19 \cdot 7$. Absolute pressure of steam in boiler $=5+14 \cdot 7$ $=19 \cdot 7$ pounds (absolute external pressure $=14 \cdot 7$ pounds).
Area of pipe $=3 \cdot 1416$ square inches. Applying the rule, we Area of pipe $=3 \cdot 1416$ square inches. Applying the rule, we
find the quantity of steam discharged per second $=3.1416 \times$ $(14 \cdot 7 \div 42) \times \sqrt{(19 \cdot 7-14 \cdot 7) \div\left(\frac{2}{8} \times 14 \cdot 7\right)}=0.785$ pounds. The volume of this steam is $0.785 \div 0.0487=16 \cdot 1$ cubic feet, and the velocity of discharge is $16 \cdot 1 \div 00218=739$ feet per and, 00218 being the area of the pipe in square feet.
With the formulas given r.bove, our readers will be able to solve nearly any question that may arise regarding the efflux of steam, with sufficient accuracy for most practical purposes.

## EZEKIEL PAGE

We regret to hear of the demise of Ezrkiel Page, formerly of Boston, Mass., inventor of the machine for turning oars. Mr. Page's name has been associated with this particular branch of industry for more than a generation; and at one time he possessed the only factory in the world wherein oars were made by machinery. Indeed at the present day the chief business connected with the oar trade in this country remains in the hands of the Page family. The manufacture
has been so perfected that little chance remains for improve ment. It is difficult to obtain a poor article from any concern where the Page machinery is used, because the mechanism never slights its work, bat imparts true and exact pro portions to every piere of lumber. Clumsy ill-shaped oars must be lonked for in shops where the labor is done by hand. Ezekiel Page's first improvement in this line was patented in 1842, for a new method of sawing out the oar lumber. The old method was to saw the logs into square sticks equal in size to the wilth of the oar blade, ona oar being cut from one stick. By giving a peculiar movement to the carriage of the saw machinery, Page was enabled to get two oars out of the same block. He p:oduced two blades where only one before was made. This gave him the oar monopoly and entitled him to rank as a benefactor of the race. His name will be for ever honcred by every loyal boatman
Page's next improvement, patented in 1845, was a mech. anism for producing the swell on the oar handle. This he accomplished by means of a contrivance for moving the slide rest of the lathe, in such a manner as to compel the cutters to shape the wood to the exact form required.
Ezekiel Page, at the age of 62 years, res ${ }^{+s}$ from his labors. He never made much noise in the world, ald yet he contrib uted, for the use of his felow men, a discovery of immense economical importance. Think of the milliuns cf oars now used in all parts of the world, and then remember that he taught us
of wond.
There is one other legacy thathe has left us, more precious There is one other legacy that he has ieft us, more precious
ven than his useful inventions. It is the record of a geneven than his useful inventions. It is the record of a gen-
erous, upright, amiable and well-spent life. Ezekiel Page was an honest man

Friction of Water in Pipes.:
In our article on this subject, on page 48 of the current
volume, the formulas should have been printed as follows 1. Prony's formula:
$\mathrm{h}=0.00040085 \times(\mathrm{L} \div \mathrm{d}) \times\left[(\mathrm{v}+0.15412)^{2}-0.02375\right]$.
2. Brooklyn Water Comm'ssioners' formula:
$\mathrm{h}=0.00046749 \times(\mathrm{L} \div \mathrm{d}) \times\left(\mathrm{v}+0.39{ }^{2}\right)^{2}$.
8. Lane's formula:
$h=0.000625 \times(L \div d) \times \nabla^{2}$
We republish them, as, separated from the verbal expla

SCLENTIFIC AND PRACTICAL INFORMATION
black varnish for zinc.
Professor Böttger pr-pares a black coating for zinc by dis solving 2 parts nitrate of copper and 3 parts crystallized chloride of copper in 64 parts of water, and adding 8 parts of nitric acid of specific gravity. This, however, is quite expensive; and in some places, the copper salts are difficult to obtain. On this account Puscher prepares black pairt or varnish with the following simple ingredients: Equal parts of chlorate of potash and blue vitriol are dissolved in 36 times as much warm water, and the solution lefi to cool. If the sulphate of copper used contains iron, it is precipitated as a hydrated oxide and can be removed by decantation o filtration. The zinc castings are then immereed for a few seconds in the solution until quite black, rinsed off with wa seconds in the solution until quite black, rinsed off with wa
ter, and dried. Even before it is dry, the black coating ad heres to the object so that it may ba wiped d'y with a cloth A more economical method, since a much smaller quantity of the salt solution is required, is to apply it repeatedjy with a sponge. If copper colored spots appear during the copera tion, the solution is applied to them a second tinie, and after a while they turn black. As soon as the object becomes equally black a 1 over, it is washed with water and dried On rubbing, the coating acquires a glittering appearance like indigo, which disappears on applying a few drops of linseed oil varnish or "wax milk," and the zinc then las a deep black color and gloss. The wax milk just mentioned is pre pared by boiling 1 part of yellow soap and 3 parts Japanese wax in 21 parts of water, until the soay dissolves. When cold, it has the consistency of salve, and will kiep in closed ressels as long as desired. It can be used for polinh ing carved wood work and for waxing ballroom Hloors, as i is cheaper than the solution of wax in turpentine, and does not stick or smell so disagieeable as the latter. A permanent black ink for zinc labuls is pr pared by dissolving equal parts of chlorate of potash and sulphate of cupper in 18 parts of water, and adding some gum arabic solution. The black polish above described is $\mathbf{r}$ commended as permanent and ca pable of resisting quite a high temperature.
manufacture of chlorate of potash
To manufacture chlorate of potash on a large scale, it bas been recommended by $W$. Hunt to adopt the following method: Milk of lime is made to trickle down over bricks, placed in a tower where it comes in contact with a continuous current of chlorine gas. CLlorate of lime is the chief product, and, by treating this with chloride of potassium, ch'o rate of potash is formed, wich can be purified by crystalli zation.
yELLOW GLASS FOR PHO'TOGRAPHIC PURPOSES.
The following simple method of testing the actinic profer ties of yellow glass for dark rooms is by Le Neve Foster, and the only apparatus required is a cheap glass prism. When a strip of white paper is rlaced on a dull black surface and looked at, through the prism, by daylight. it has the appearance of the rainbow, showing a complete spec. trum. On bringing the yellow glass in question betwe $n$ the prism and the strip of white paper, those colors which are absorbed by the colored glass disappear. If on look. ing through the prism any blue or violet rays are seen, it is certain that the glass transmits the chrmical rays and hence is unit for photographer's use. If only red and yellow bo seen, it is non actinic.
testing sulphate of alumina.
Sulphats of alumina frequently contains an excess of acid which injures it for use in dyeing. Whether the sulphuric acid be present in excess is easily ascertained by stirring the pulverized salt into alcohol, which dissolves the free acid but not the salt. It is then only necessary to filter the solution and test for acid with litmus. The amount of sulphuric acid can a`so be obtained volumetrically. Pure sulphate of alumina produces with a decoction of campeachy wood a dark violet or purple color. If free acid be present, the color is browner.

Progress of the Hoosac Tunnel during the Month of July, 1873.-East end section: Heading completed December 12, 1872. Central section: Heading advanced westward, 151 feet. West end section: Heading ad vanced eastward 137 feet. Total advance of headings during month, 288 feet. Length opened from east end westward, 14,285 feet length opened from west end eastward, 9,677 feet. Total 'engths opened to August $1,1878,23,912$ feet. Length re maining to be opened August 1, 1,119 feet.

Albumen Extracted from Milk -Schwalbe has found that if oil of mustard be added to cow's milk in the proportion of one drop to $1 \cdot 1$ drams, the milk does not coagulate even after being kept for a considerable period: but that the caseine is transformed into albumen. If this discovery says Les Mondes, is confirmed, it will be of considerable im portance in the printed fabric industry

Squeaking Boots and Shoes. - To prevent the soles of oots or shoes from squeaking, says the Shoe and Leather andonicle, rasp, with a coarse rasp, the outsole and insole friction by the action of the foot. Then apply freely good wheat or rye puste. If this is well attended to from heel to toe, the boot or shoe will not squeak.

Colt's Firearms Company has just received an order for 30,000 pistols. Smith \& Wesson have commenced work upon 20,000 Russian pistols, and will make about 150 daily.
[Continued from first page.]
in 1786, substituted large chambers of lead for the glass vessels used by Ward, that the manufacture of sulphur ic acid on the large scale, and at a greatly reduced price, became an established fact. It was found that, in working these chambers, a comparatively small quantity of niter could convert a very large amount of sulphurous acid into sulphuric, and chemists consequently set them selves to study the reactions that took place.


There is a compound of nitrogen, known as nitrogen tri oxide, $\mathrm{N}_{2} \mathrm{O}_{3}$, that is, 2 atoms of nitrogen combined with 3 atoms of oxygen, which will yield up at once, to sulphurous acid, one atom or equivalent of oxygen, just sufficient to oxi dize the sulphurous into sulphuric acid. This nitrogen tri oxide, having lost one atom or equivalent of oxygen, will take up its lost oxygen from the air, if mingled with it, and again deliver up its oxygen to another fortion of sulphurous acid, and so on $a d$ infinitum, acting as a carrier of oxygen from the air to the sulphu rous acid. All that we have to do, then, is to mix sulphurous acid gas, air, and nitrogen tii-oxide with some steam, the water of which is an essential ingredient in sulphuric acid, in a suitable vessel, to obtain all the oil of vitriol needed. On the large scale this is one of the most complete and interesting operations of practical chemistry.
On entering chemical works, where oil of vitriol is made, our attention is first directed to the
sULPHUR BURNERS.
These consist of small furnaces built of brick, a section of one of which is shown in the illustration above. Their sizes and number are regulated by the amount of sulphur proposed to be burned in a given time. The bed of each burner consists of an iron plate, termed a burner plate, on which the combustion of the sulphur takes place, and underneath which there is a flue (as seen in the illustration, connected in the rear with the chimney or shaft). Through this flue and underneath the burner plate, a constant current of air circulates. Its object is to regulate the heat of the plate, which might otherwise become so hot as to volatilize the sulphur. Each furnace is provided with a door, closed with an iron shutter but sufficiently loose to al low enough air to enter to completely oxidize the sulphur which burns into sulphurous acid. Into each burner the workman throws at intervals a shovelful of brimstone, as the crude material is sometimes termed. The moment this is done, he takes up an iron receptacle about a foot long, and

4 or 5 inches wide and deep, termed a niter pot I'his is rapidly filled about half full of nit ate of soda and covered to the depth of an inch or two with oil of vitriol from an earthenware pitcher at his side Theniter pot being charged at the mouth of the bur ner, the workman pushes it with a two pronged iron fork into the now glowing sulphur to about the mid dle of the furnace. The door is closed, and the same operation repeated with each burner until all are charged.
We have seen how necessary nitrogen tri-oxide is in the oxidation of sulphurous into sulphuric acid This nitrogen tri-oxide,
however, is not at once pro
NITER POT AND FORK.
duced. The fumes from the niter pot, from the action of the oil of vitriol upon the nitrate of soda, consist of nitric acid, $\mathrm{NO}_{5}$. But in the chamber this nitric acid yields up nearly all its oxygen to the sulphurous acid, becoming re-
duced to NO, or nitric duced to NO, or nitric oxide. This nitric oxide, meeting
with the air in the chamber, abstracts with the air in the chamber, abstracts oxygen, becoming
nitrogen tri-oxide, $\mathrm{N}_{2} \mathrm{O}_{3}$ which we have considered nitrogen tri-oxide, $\mathrm{N}_{2} \mathrm{O}_{3}$, which we have considered as the carrier of oxygen from the air to the sulphurous acid.
Although sulphur is almost exclusively employed in country as the source of sulphurous acid, in England very
large quantities of iron bisulphide, known as iron pyrites, are used. The mineral being often a bright, brassy looking ore, is sometimes termed fools gold, from the fact that many tocerienced persons are deceived by its appearance. Wher tains a small percentage of copper, it may be economicall utilized as a source of sulphurous acid. This is the case at Anthony's Nose, on the Hudson river, where chemical works were erected a few years ago by Mr. G. W. Gesner, a manu facturing chemist of New York, for the purpose of utilizing an extensive bed of pyrites that occurs in the hills close by This deposit. of ore was originally developed in the hopes o finding copper, but the great mass of the ore is hard, com pact iron pyrites. In the production of sulphurous acid, $i$ is burned in high, narrow furnaces. When once kindled the mineral contains sufficient sulphur to support its own combustion. The workman has only to keep the ore well stirred up or "tickled" at intervals, the ore being supplied to the furnace by a door at the top, and the residue, whe the burning is completed, carefully raked out from the bottom. From the sulphur burners, then, or from the pyrites kiln, let us follow the mixed sulphurous and nitrous fume through a flue, seen on the left in the illustration, to the

## Leaden chambers.

Here we have an immense room or series of rooms, whose top, bottom, and sides, are constructed of 5 lbs. sheet lead or lead that weighs 5 lbs. per square foot. The walls and top are sustained by a framework of wood, to which they are fastened at intervals by leaden straps, fixed to the cham ber, and overlapping the wooden frame, while heavy col amns of wood or iron beneath serve to support the grea weight of the structure above. The room under the cham.

manufacture of oil of vitriol. the leaden chambers.
bers contains the bins for the storage of the sulphur and niter used. Lead is used in the construction of the chambers, because sulphuric acid has but little oxydizing effect on it except at a high temperature, but no solder can be employed in joining the sheets, because this soon gives way. The heavy sheets of lead must be cemented at their edges in some way that will make a tight, strong joint, and one that the acid cannot eat through. This is done by melting the edges of the sheets together by msans of a blowpipe, done by men technically called lead burners. The lead burner is sup plied, through long flexible tubes, with a current of hydro gen gas and one of atmospheric air. The hydrogen is gen erated in the usual manner, by the action of dilute sulphuric acid on metallic zinc, and the air is supplied from a pair of bellows, operated by an attendant. To avoid any risk of explosion, the gases are mixed just before combustion in the blowpipe itself. The combustion of the mixed hydro gen and atmospheric air gives rise to a very hot flame, by means of which the lead burner melts the clean edges of the soft metal together, making a joint that will last as long of course, as the lead itself. Considerable practice and skil are required in the operation, and a horizontal joint is made wore easily than a vertical one
Steam is admitted into the chamber, by a small pipe, fit ed with a stopcock, as seen with the attendant in the illus ration. Finally, we have a vast space inclosed on all side with lead, and filled with dense suffocating fumes of sulphu ous acid and nitrogen tri.oxide, mingled with the mor harmless vapor of water and atmospheric air. Here take place the chemical transformations previously shown, and here the production of sulphuric acid goes on uninterrupted y night and day, to the extent, in the largest works, of thousands of gallons daily.
The capacity of some of these chambers, the largest of which are found in England, is worth noting. Mr. Schole field, of Bradford, near Manchester, has a chamber 70 feet long, 35 feet wide, and 35 feethigh, with a capacity of 85,750 cubic feet. At Spence's chemical works, Newton Heath, England, there is a chamber 75 feet long, 40 feet high, 50 eet wide, containing, consequently, 120,000 cubic feet, o oom enough to inclose two or three good sized houses. Mus pratt Brothers and Huntley, at Flint, North Wales, have chamber 140 feet long, $24 \frac{1}{2}$ feet wide, and $19 \frac{1}{2}$ feet high. Fixed to the side of the chamber, and shown in detail in the illustration, we have a drip for testing gravity. This consists of a leaden receptacle, into which the acid forme
in the chamber trickles or drips, through a pipe perforatin it. The acid is caught by means of a trough or spout run ning along the interior side of the chamber, and is tested when received, as to its speciic gravity by a hydrometer. The acid formed in the chamteam, and colle condensed team, and collects on the botom or loor. This lquid has a pecific gravity of $1 \cdot 55$, stands at $45^{\circ}$ Baumé's hydrometer, and is known as 45 or chamber acid. Containing 50 per cent real acid, it is frequently used forvarious purposes, as the manufacture of superphosphate of lime. Its concentration, however, as we shall presently see, is generally carried much further.
We have seen how the nitrous fumes, or nitrogen tri-oxide, act the part, simply, of a carrier of oxygen from the air to the sulphurous acid. Theoretically, then, when once the chambers contained the requisite amount DRIP FOR TESTING GRAVITY of nitrogen tri.oxide, this should
suffice for the oxidation of an unimited. amount of sul phurous acid. Practically, however, from 6 to 10 per cen of niter, in proportion to the sulphur, is ordinarily required This is owing to the fact of so much nitrogen tri-oxide be ing carried up the chimney, or stack, with which the cham bers are necessarily connected to maintain a draft throug them. To save these fumes we have what are called

COKE COLUMNS.
or "Gay Lussac's Towers," from the name of the illustrious chemist and inventor These consist of high narrow chambers lined with lead, and filled with pieces of coke down through which oil of vitriol is caused to drip from the top. The towers are con nected, as seen in theillustration, the first a the top with the end of the chamber, the second joined to the first at the bottom by a leaden flue, and finally the top of the second tower connected with the stack. The wast gases of the chamber, containing the nitrou fumes, are thus compelled to pass down the first tower and up the second, before escap ing. In their passage, the oil of vitriol trickling through the coke, largely absorb the nitrous fumes, so that by this method the amount of niter used is reduced 50 pe sent; the acid containing the nitrous com pounds is then returned to the front of the rhamber, where the heat is sufficient to libe. rate the nitrous fumes again.
To effect the first concentration of the chamber acid, it is run off into leaden concentrating pans.
These are shallow leaden vessels, made of very stout shee ead, and set in a furnace upon wroucht iron plates, whic receive the direct flame of the fuc. Three, four, or more pans are generally used, and connected together by siphons. n the lead pans, the concentration is carried up to $60^{\circ}$ Bau né and specific gravity $1 \cdot 75$, at which point at the heat con for This is termed 60 acid or pan acid, and is sometimes sold and used for various purposes. Neither the manufacture nor the trader, however, is satisfied with this degree of concentration. From the lead pans, the acid is usually run off centration. From the lead pans, the acid is usually run off
into platinum stills, where it is concentrated until it attains the specific gravity of 1.842 and stands at 66 Baumé, whe


## THE COKE COLUMNS

it is called 66 acid or oil of vitriol. These beautiful white platinum stills are very expensive. A still capable of making 100 carboys, or 16,000 pounds, a day will weigh only 200 pounds, yet cost $\$ 20,000$, or at the rate of $\$ 100$ per pound And yet platinum is the only available metal which wil withstand the action of sulphuric acid, at the high degree of heat, $600^{\circ}$ Fah., necessary for the manufacture of oil of vi riol, or 66 acid. Even this metal, in the course of time, becomes so thin at the bottom of the still that it must be
patched or renewed. When a break occurs, it is sometimes soldered with gold. To avoid the large outlay of capital for a platinum still, various suggestions have been made as to the use of other materials, and various forms of apparatus have been devised for the final concentration of sulphuric acid.


Leaden Concentrating pank.
Although glass has been tried, and used in England, we know of no apparatus more ingenious and effective than the patent glass concentrating retorts
shown in the large illustration (front page), and now in successful use at the Phœnix Chemical Works, South Brooklyn, N. Y. Here we have eight glass retorts, each holding about five gallons, and each set in a separate sand bath, in furnaces charged from the side. The acid from the leaden pans enters by a siphon, the upper retorts of each set or series, and flows out, after attaining a certain hight, by a glass tube, into the next lower vessel. By the time the acid has reached the lower retort, it is concentrated up to strength, that is, $66^{\circ}$ Baumé. It then flows out into a leaden pipe set in a trough of running water, where it is cooled to some extent, and whence it flows into shallow leaden pans to undergo a further reduction of temperature before it is packed for the trade. The goose neck of each retort is connected with a leaden pipe, seen in the illustration between the two series. This pipe joins a flue (seen on the left, rising from the lower end of the furnace) which conveys the mixed vapors of acid and water, evolved during the concentration, io a condensing chamber, also of lead, where the acid, which would be otherwise lost, is recovered.
Although of so fragile a nature, the inventor informs us that, with care and attention, it is not very often a retort breaks; he had not lost one during the last six months. When this does happen, however, means are provided in the shape of a channel, which runs under and communicates with each sand bath containing the retorts for the purcose of re covering all the acid possible and delivering it into a receptacle in front of the furnaces.
This apparatus of concentrating retorts is far cheaper than a platinum still. The glass retorts, with their furnaces and connections, capable of concentrating 100 carboys daily, will cost about $\$ 2,000$, while a platinum still, capable of doing the same work, will cost $\$ 20,000$.
We now follow the acid from the concentrating retorts to the cooling cisterns, where our illustiation shows the work $\operatorname{man}$
filling the carboys
This is done by means of a leaden siphon, provided with a stop cock. Care is taken not to fill it quite full, otherwise the absorption of water from the air by the acid, in the


FILLING THE GARBOYs.
course of time, will cause an overflow. A carboy is a large blown glass bottle containing eight or ten gallons, packed in hay or straw and set in a square wooden box. The mouth is closed when full, to prevent spilling and access of air, as far as practicable, by a stopper of clay, which is covered with a common canvas rag, and the whcle smeared outside with tar. Thís makes a primitive rough-looking package, and one extremely liable to accident and breakage; but the trade seems to be satisfied with it. An opportunity is here afforded for some ingenious inventor to make an improvement.

When once the glass is cracked or broken at the bottom, there is a sudden end of the carboy, as bcth straw and wood soon become converted into soft charcoal. These carboys are transported all over the country, and, when emptied, returned to the manufacturer, if not too distant, to be replenished.

The quantity of oil of vitriol annually manufactured in

Great Britain amounts to about 200,000 tuns, that made in the So
We are indebted to Messrs. Gridley \& Cotfin, proprieto of the Phœnix Chemical Works, and to Mr. Saunders, the superintendent, for facilities afforded in making the illustrations connected with our article.

## NORWAY AND SWEDEN.

An esteemed correspondent, now traveling in Northern Europe, remarks as follows :
" Never could more dissimilar nations be united under one government than Norway and Sweden. Norway clings with the most absurd tenacity to old things and old ways of doing them, while Sweden is ready to advance with the rest of the world. The difference appears strikingly on the line of railroad between Christiania and Stockholm. The road is about 400 miles long, of which, say, 100 are in Nor way and 300 in Sweden. The time for express trains is about 20 hours. Of this, something like 8 hours is taken for the Norwegian 100 miles, leaving 12 hours-really, only 11 hours-for the Swedish 300 miles, or 12 miles against 25 miles per hour. But most of the travel in Norway is by the very old fashion of carrioles and post horses, the principal roads-under government care-being in good order and the speed averaging, with push, six or seven miles per hour
The American Consul in Christiania-which is the only live part of Norway-is trying bard to get our mowers and reapers into use there, though thus far with indifferent success. In Sweden, these things are being taken hold of with something like freedom. The Swedes are, evidently, a contriving and mechanical people, and in such things very much in advance of their neighbors. They are just the kind of people to be at home in America, and the very best kind of people America could have. In both countries, as well as in Great Britain, I heard the loudest kind of lamentation over the great emigration to America. Lack of labor ers causes strikes and high prices, they say, and reduces the means of the old countries and the values at the same time. Land, generally, seems to have touched its highest point everywhere on this side the ocean, and to be falling with no little rapidity, and with an ever diminishing number of purchasers. Of course, I speak generally and not particu arly. What shall we do about it? seems to be an absorbing question, in each of the countries through which I have passed. The story of success in America flows back from every pen; and those who remain, having friends who have gone before, are in nearly every case anxious only to get away themselves."

## Origin of Plagues.

Dr. Tholozan, physician in chief to the Shah of Persia re cently read a paper before the French Academy of Sciences on the origin of pestilence. It has been generally believed, he said, that the plague or eruptive fever was exclusively engendered in low, warm, and marshy regions, especially in the north of Africa and in Asia Minor. This opinion is, however, without foundation, and a large number of facts as well as the evidence of past inflictions, prove that the disease may originate in any latitude, under all climates and in all countries, however elevated. It is not a consequence of climate or meteorologic influence,nor even the necessary concomitant of unhygienic causes, however energetic. Famine for instance, breeds typhus fever rather than the plague This exclusion of all physical origin leads to the con viction that the malady is due to some animal ferment; the pest, in short, is an organic fermentation.
M. Tholozan added that he considered the deadly forms of pestilence so common in Kurdistan to be principally due to the intimate contact of the inhabitants with their sheep in unhealthy and badly aired cabins.

## Shocking Accident

J. E. E., of Pa., says that Miss Craft, a young lady from Beaver Falls, Pa., while in a flouring mill, was standing nea two upright shafts that were revolving at the rate of fifty revolutions per minute, one of the shafts being covered with sticky corroded oil. Her dress, being of light material, touched and adhered to it; and instantly winding around the shaft, she was drawn between the two (they are only a few inches apart) which caught her flowing hair, then tearing the entire scalp from her head, to the eyebrows. One leg was badly fractured and she was much lacerated and bruised. She lies in a critical condition and her physicians have no hopes of her recovery.
Upright running shafts are always dangerous, and owners should have them encased with wood boxing

## New Photo Process.

A recent improvement, announced by Mr. Burgess, a pho tographic artist of Peckham, England, consists in sensitiz ing gelatin by means of bromide of silver. The mixture is applied warm to the glass plate, and the picture may be taken with the plate either wet or dry. The time of exposure is the same as for the ordinary wet collodion plates. The alkaline-pyro developer is used, the picture making its appearance rapidly, with any required degree of intensity. The new process promises to compete sharply with the ordinary collodion process.

THE reason why common salt sometimes becomes moist when exposed to the atmosphere is because it is not pure Chloride of calcium and chloride of magnesium are impuri ties generally present in salt, and they absorb moisture from the air.

HARRIS \& HEWITT'S PATENT SASH CORD FASTENERThe object of the invention represented in the accompanying engravings is to dispense with the knot commonly used to fasten window cords to sashes. Any ono, who has ever attempted to re-adjust the old fashioned though simple arrangempnt, will not fail to appreciate the utility of the

new device. An old knot is very commonly drawn up into the hole through which the cord passes, and requires no small exercise of time and patience to force it out. This only begins the trouble, for the rope has become hard and jammed, and persistently refuses to untie. After breaking off his finger nails and working himself into an uncomfortable perspiration, the operator, probably with a few forcible interjec tions, settles the difficulty by hacking the obdurate knot off with his knife. Then he pokes the rope carefully through the hole again, triumphantly ties a new knot, and pulls down the sash with a sigh of relief: The window descends nicely until within two inches of the bottom, and declines to move any further. He pulls, and pitches his whole weight on it, and gets mad, and screams short texts not taught in Sunday schools, and finally tries to push it down with his foot, and in doing so breaks a pane of glass. Then he retires for a short distance, and sits down on a tool box and glares. Event ually he discovers that the cord, by cutting off the knot, has brecome too short, and the weight is jammed against the pul ley: and consequently, after briefly communing with th weight and the cord and everything in any wise connected with the window, he puts on his coat, and goes down the street for a new rope, which, after considerable tribulation be manages to adjust
All this trouble is obviated by the little fixture herewith illustrated, the cost of which is only nominal, being, at retail, less than six cents to a window. It consists of a short cylindrical casting with a taper hole through it, through which the cord is passed after being threaded through the opening in the edge of the sash in the usual manner. Ther is also a serrated wedge, which is pressed into the hole in the fixture beside the cord, as shown in the illustration, fast eming it very securely. This wedge is so proportioned that it is impossible to draw it through the casting, and no mat ter how hard it may be dragged up, a slight pull at the short

end of the cord will instantly release it for renewal or re-ad justment. No special preparation of the sash, different from what ordinarily made for the knotted cord, is necessary
The expense of this fixture, it is claimed, in first hanging is more than saved in time and cord. It has been tested o xamined and is approved by the leading builders and ar chitects of Newark, N. J.
Patented July 22, 1873, by Horace Harris and Frederick Hewitt, 788 Broad street, Newark, N. J., from whom fur ther particulars may be obtained.
Approaching Exhibition at. Montreal.-An agricurural and industrial exhibition will be held at Montreal on September 16, 17, 18, and 19, 1873 . In all departments, the competition is open to exhibitors from any part of the world. The whole fields of agriculture and manufactures, commercial and domestic, are covered by the long list of premiums. Mr. Georges Leclère is the secretary, who will furnish full particulars if addressed at Montreal, P. Q.


THE GREAT EXPOSITION-LETTER FROM UNITED STATE COMMISSIONER PROFESSOR R. H. THURSTON

## number 6.

Vieyna Welt-Ausstelluna, July, 1873.
The work of the juries has, at last, been nearly completed and the members of the inturnatioual jury are leaving V enna for their wid-ly separated homes.
In Group XIII, which embraces machinery and means of transport, the work is all done, even including the awards of the greas Eiren Diplom, unless, as is almost invaria bly the case at such exhibitions, a few tardy or careless ex hibitors have been overlooked.
The publication of the awards will not be officially made for some weeks; but it seems well understood that the dis tribution has been made with unusual discrimination; al though the usual error of too great liberality will, very probably, be noted here, and an occasional obrious mistake may subject th H jury to severe criticism.
Of these awards, the United 'States section is generally supposed, and probably with good reason, to have received a liberal share. and to have taken a proportion of the med als for " Progress" entirely beyond comparison with that of any other nation. The richness of our own section in orig. nal and valuable mechanical devices is thus well illu trated.
Unsatisfactory and incomplete as our exhibit in the Ma chinery Hall appears to every American engineer, it seems to the European, remarkably rich in valuable novelties.
It will probably be found that, should any of our people find themselves undeservedly overlooked, or their exhibit not as fully appreciated by the juries as they should ke their misfortunes will, in most cases, le a consequence of their own errurs, either in neglecting to secure good repre sentatives here, or in the still less excusable, although ex tremely frequent, neglect to prepa:e for the jury exact and minute descriptions of their apparatus and of their clains. American exhibitors have been vastly more careless of thrin own interests, as a rule, tban have the exhibitors of any other nation. Should the result prove that we have been k :ndly deall with, it must be atributed to the conscien iousness of the juries, and to the peculiar ingenuity and the exceptional merit displayed in our.machinery depart ment, rather than to the efforts of those most directly inter ested in securing chreful examination and thorough discus sion of the merits of individual exhibits.
One of the most interesting records in our notebook is that of a day spent in lcoking over the

## steam bingines,

of which a large number, of all sizes and varieties, are dis ributed througluout the exlibition. The larger example of stationary engines are, very generally, more or less exac copies of the Corliss. The Sulzer engine, which is one o the largest on exhibition and which has attracted special at tention, would le considered a modified Corliss engine-a moditication also which is, on the whole, in the wrong direc tion. It appetars in my notebook under the denomination of "the Sickels Corliss-Greene engine of the Swiss section." It has a "drop cut:off"-the in vention of Sickels-and has the poppat valve, which is usually found on Auerican en gines of the Sickels type. Its governor determines the point of cut-off, and it is therefore, so far, a Corliss engine The péculiar motion adopted for engaging and disengaging is something intermediate between that of Coriss and one of the systems of Greene. The engine has a condenser, and is said to work with a creditable degree of economy.
Comparatively few of the Corliss engines seen here are precise copies of the original. Builders have usually en deavored to produce some difference of detail, which the claim to be peculiar to themselves, and to be improvemen upon the standard machines. They seldom or never suc ceed, however, in either avoiding its defects or in introdu cing improvements. The defects of the Corliss engine are not numerous, and those which exist are inherent in tha peculiarly typical and unique design which has grown int its most parfect shape in the hands of its originator. T eradicate them necessitates a change in every detail and th complete transformation of the whole design. To effect im provement, the engineer who makes the attempt must ex cel all who have y -t made a similar effort.
Tue Corliss engine is a quarter of a century old, and is, to day, very nearly as it was then, one of the most complete illustrations of a meechanicul type that can be found. It af fords, to the student of mechanical " comparative anatomy,"
one of his most interesting studies. But the Corliss engine cannot be claimed to be a perfect machire. English build ers, who usually exhibit quite a different style of engine while forgetting that an effective expansion (variable by the governor) can only be obtained, so far as eng:neers have yet learned, by the use of a detachaible valve gear, unless at the sacrifice of delicacy in regulation, have persistently adhered to the uie of the steam jacket, a detail never seen in the Corliss engine. The best

## ENGLISH ExHIBITORS

have usually presented a type of engine which is quite dif ferent from the Corliss. The bed is usually flat aad broad, and carries the cylinder, the guides, and the shaft pillow blocks, as was formerly the universal practice with horizon tal engines. The steam cylinder is jacketed, and the jacket tal engines. The steam cylinder is jacketed, and the jacket is firted with independent pipes to supply it with steam and to drain off water of condensation. The valve gear is that of Meyer: two blocks united by a screw with right and left hand thread, riding on the back of the main valve. In at least one instance, the designer has shown his appreciatio of the importance of allowing the least possible clearance by dividing the valve and making of it two, which cover ports at either end of the cylinder, instead of adopting the ordinary fom with its n+cessarily long steam passages. The governor moves a valve in the steam pipe and the degree of expansion is determined by the engineer, who, by use of the sciew, separates or draws together the cut-of blocks as occasion may seem to require.
One English firm exhibits an enginein which this is done by a link motion, the link being moved by a Porter govern or. The Porter governor, it may be remarked, is to be met with in every part of the Machinery Hall and its annexes Even the rough and awkward looking engines which driv the machinery of the breweries and the sugar mills are fre quently supplied with this American regulator
The crank is usually given up for engines of short strok and a disk, carrying a counterbalance, takes its place. Th orkmanship of these statdard British engines is usually excellent, and several firms present machines of the best of workmanship and having a most magnificent finish. Such a style of finish I have never been fortunate enough to see a ome, even on engines " gotten up for the occasion," as thes vidently are. One English engine, of considerable size has a plain steam valve at each end of the cylinder, and, on he top of each, is an expansion valve, apparently of the "gridiron." sort, sliding transversely. The time of its move ment, relatively to that of the main valve, is determined by an ingenious system of pond七rous gearing, intermediate be ween the valve motion shaft and the main shaft, whos axes are varied in position by the action of a large fly bal overnor. It may work well, as a number of certificates ex hibited by the builder claim that it does; but the first im pression of the stranger is that such a weight of gearin must add seriously to the cost of the engine, even if it doe nt impede the action of the governor, and add percuntibl to the resistance of the machine itself. It looks like a mons trosity of engiteering.
Two compound stationary engines are exhibited. One, in be British section, by Galloway, has cylinders of 14 and 2 nches diameter, respectively, and a stroke of $2 \frac{1}{2}$ fret. It cranks are set opposite each other. Regulation is effected by peculiar governor, resembling Porter's in being weighted and running at high speed, which adjusts the link operating the main valve. The steam jacket is not used, this im portan defect being supposed to be compensated by the resuiting simplicity of the cylinder castings, and by the convenience with which the intermediate valves may be reached. Thi engine is rated at 100 torse power, is wellmade, and mode ately well finished. The

FRENCH
xhibit no stationary engines worthy of special notice, ex ept, pe:haps, in one case, where an engine has been buil with crank shaft bearings spread far apart with no other ap parent object than that of placing the eccentrics inside The awkwardness of the arrangement is something remar able and not at all to the credit of the designer. The

## swịss,

beside the Sulzer engine already noticed, exhibit two Corliss ngines; and a fourth engine which combines the Corliss and he well known device known amorg our en -ineers as th "French cam." In this example, the condenser and ai pump are contained in the engine frame.
The other engine, which would generally be considered the hest of all. from the fact that it least departs from the stan ard design, is well built and prettily finished. Its balance wheel is a mortise gear, and a very common feature of those oreign built engines. The only stationary engine present foreig
ed by

## BELGIUM

is that of the great firm of Bede \& Co., which seems, in th pinion of engineers here, to divide the honors with that of he Gebrüder Sulzer It is a "mixed Sickels-Corliss," and i one of the least objectionable of the new departures from the familiar American design. The steam valves are noved by two separate heart-shaped cams. The trip and the regu lating apparatus are essentially the forms of Sickels and Corliss respectively

## germany and austria

exhibit sereral Corliss engines, usually with useless change miscalled " improvements," and also a few engines of less creditable form.
The Dingler compound engine is one of the quietest en gines in the Exposition, and attracts attention by its noise lessness and its rapidity of rotation. It seems to be fitted
with continuously revolving valves, and to possess many peculiarities whlich will require further investigation.
On the whole, it may be said that the row well established principles of steam - ngine economy: dry steam, high pressure, a maximum expansion, high piston speed, efficient steam jacketing, and perfect regulation: are not fully recognized in the design of any one steam engine exhibited bere, and that the best machines, of considerable size, which are iound in the :xhibition, are more or less exact copies of a well known standard American engine. Of this, or of any other of the several leading forms of stram engine which are so familiar at home, no single example is to be seen in the

UNITED STATES SECTION.
Of a smaller class, the two beautiful little vertical engines of the New York Safety Steam Power Company, which are in operation in the American d+partment, are excellent examples. Their elegance of design, fine workmanship, and high finish attract attention and elicit many compliments rom visitors. The neat horizontal engine of the Norwalk Iron Works represents also another of our best eflorts in small powers, and another small engine, furnished by Pick. ring \& Davis, is always under inspection. This latter en gine has been designed especially for the use of the Under wood angular belting. Its fly wheel is in line with the piston rod and is driven by a pair of rods and cranks, one on either side. The narrowness of the face of the wheel which is al lowed by the cord like belt permits this arrangement to be adopted without too great lengthening of the crosshead.
Juaging by what is to be seen here, it must be concluded that the building of stationary s.team engines for general purposes has made very little progress during the intercal which has elapsed since he Paris Exposition, which last permitted a similar international competition, and indeed, it may perhaps be said, during the last score of years. Cor rec principles are but little more completely, although much more generally, applied now than many years ago, notwith standil $g$ the fact that the great scientific principles which anderlie all successful engineering practice have, during this same interval, received their most wonderful and essen ial development.
It is to be hoprd that the same observations may not be called forth by the study of the American International Exhibition of 1876. Yet it rarely happens that marked change n engineering practice take place in so short an interval of time as that which separates us from that event
R. H. T.

## ©arxespandence.

## Boiless and Boiler Owners.

## To the Editor of the Scientific American

Your article on "Boilers and Boiler Owners," on page 38 of your current volume, reminds me of a specimen I saw three or four weeks ago. While in an engine room near here, the engineer showed me a piece of the feed pipe and mud drum taken from under his boiler. Two wetks pre vious to the time of taking the mud drum out, the boiler had been tested to a pressure of 125 lbs. per square inch, the pump and boiler gage agreeing. By examining I found that a hammer could $b ;$ driven through the pipe and drum at any place, while in some places, the $k$ lade of a pocket knife could be thrust through
Query: Why is it that boilers and mud drums are enabled to sustair. so high a pressure, in such a condition as the above, and the one as Bay City, Mich., were in?
Austin, Texas.

## Jumping from Raliway Trains.

To the Editor of the Scientific American
The query of J. B. T., on page 27 of your current volume " Why is it that engineers, etc, jumping from moving trains nvariably jump in the direction of the moving train?' in duces me to write a few words on the subject; a subject that every one who rides, whether by horse or steam power,
ought to fully understand for all such are liable to be some ought to fully understand for all such are liable to be some time exposed to danger. They should know what is best to be done at the last moment of an emergency, never before or jumping is so dangerous that it is only when the case is desperate that it should be attempted. Thereason for jump ing forward is that that course is the safest; the experience of enginerrs confirms this, and it is easily demonstrated by theory. Your correspondent argues that it is the most dan gerous. If every one could, like him, jump with the velocit of 15 miles an hour, $=21$ feet per second, the difference migh not br so great, but I consider only the case of average hu manity. But in his case, if the velocity of the train is 30 miles an hour, and he jumps in the opposite direction 15 miles an hour, he will then move 15 miles an hour with the train, and strike the ground with a force that will almos certainly be fatal
In the hope that some lives or limbs may be saved by a more general understanding of what should be done in suck cases, permit me to explain this; I have not yet seen it in cases,
print.

The comprative safety of jumping from a moving vehicle does not depend on the velocity of the jump, which should not exceed the velocity of the vehicle, if it can be helped, but entirely and solely on the anatomical build, if I may use he term, of man. The jump should be made facing,' as nearly as possible, in the direction of the motion; select if practicable the place; turf is best, sand is next. Never ump on a pile of stones; for a collision with stone is as dangerous as any possible casualty. One foot should be $i^{\prime}$ advance, so that it will come in contact with the grou nd first. Follow it instantly with the other foot, and each wil receive a part of the blow, and each will check the speed
little. Then first one hand, then the other, will take a part of the force, and serve to protect the head and trunk. If the patient is then alive, he may pick himself up, if he can, and count his broken limbs and contusions.

A diagram will, perhaps, best explain the succession of events that the jumper should endeavor to procure, for the
greatest safety to his person. He
should try to have his limbs act like the spokes of a wheel. One foot, $a$, in advance touches the ground, the other foot, $b$, will pass by and touch, then the hands, $c$ and $d$, and the head will follow. The momentum may be enough to cause the feet to turn over the bead in a somersault; but this is the best that can be done, that is, to check the momentum a little at a time.
If a person takes the advice of J. B. T., and jumps in the contrary direction, what follows? If the vehicle is moving only 15 miles an hour, and he jumps with the force of 5 miles an hour, he is actually moving backwards with the velocity of 10 miles an hour; and as soon as his foot touches the ground, it stops, but his head and body describe a curve through the air with a force due to the speed, the back of his head and his back :trike the ground simultaneously. Resul ${ }^{+} \mathrm{f}$, a broken spine, a cracked skull and a general de. struction of the acticn of the internal organs.
Not many years ago I was the involuntary witness of an experiment of this kind. A horse car was being driven pretty rapid'y by me, on the opposite side of the street. I noticed a passenger, with an apparently heavy bundle in his hand, preparing to get off ; the conductor was looking another way ; I saw the man's danger, but was too far off to interfere. He deliberately stepped off the car as if it were motionless, but the instant his foot touched the pavement, his body and head, retaining the speed of the car, were thrown down with great force on the stones; his hat and bundle flew in different directions, accompanied with the unmistakable sound of breaking of iron castings. The man, for a wonder, did not appear to be much injured, but picked himself and his property up, a much astonished and probably a wiser man.
Let every one remember that the only safety in leaving a moving vehicle is to face in the direction of the motion
Boston, Mass. Charles Stodder.

## To the Explitor of the Scirntific American:

I have read in your volume XXVIII., page 394, a description of a compound explosive projectile, which is, in my judg. ment, similar to one I invented in the year 1868 . I offered it to the British Government in that year for trial, but it was refused. On September 2, 1869, I sent one to the Emperor of Russia for his approval; it was received, but the answer is not yet returned. I offered it to the present British Gov. ernment, accompanied ly a drawing, November 25, 1870. It was polit-ly refused, and the drawing kept.
My projectile contained three bullet chambers attached to the main cylinder, grooved from top to bottom in center of chambers to one half the thickness of metal in main cylinder, and also grooved all round the center of the main cylinder. Each chamber contained 106 bullets, or 318 bullets in all. Outside size of projectile was eight inches ; the chambers were tapped, screwed, and plugged air tight. It can be filled in chambers with small shells and liquid fire, bullets and powder, fulminate, or other materials, as wished. A brass time fuse was fitted inside the powder chambers, and screwed in.
My p:ojectile was considered by many to be the most detructive known. When proved with only a minimum charge of powder, 13 lbs . of the main cylinder could not be found. This distribution of bullets and fragments took place without either fuse or plugs being in the chambers. The diference between my projectile and F. A. Morley's, according to the account, is that he has a separate fuse for ep.ch chamber, and possibly more chambers.
On page 368, same volume, on " Electrical Fire Arms," by Professor S. Gardner, you wish him to drive the bullet by electricity. I presume that can easily be accomplished. There is yet one further stride: to kill by electricity itself, at any distance, paralyzing those who may not be killed out right.
J. T. Fraser.

Liverpool, England

## To the Editor of the Scientific American:

F. H. R. (see page 100 of your current volume) does not show the fint lens in his section drawing, and the central lens may be made thinnest; but his views are eminently sound. As inventer of the composite object glass, I will call attention to its main defects.
First, the diffraction around the edges of the lenses will slightly injure the definition, as may be seen by placing a network over the glass of an ordinary telescope. Secondly, the segment lenses are harder to correct by hand than the zones of a single lens, and the local polisher machine will spoil their extreme edges, which must be cut off, reducing their size. The third difficulty is the adjustment of the parts. The iron frame must be protected from unequal expansion; and the lenses must not differ in focus the one hundredth part of an inch. The heliometer with its divided object glass, and the success of Mr. Sellack, at Cordoba, in mend ing a broken eleven inch photographic objective, show th91 the plan is a feasible one
We have consulted oracles on the subject with the follow-
ing responses: Professor Winlock thinks that a solid object glass would be the best, if we could get one. Clark \& Sons believe it possible to build an equatorial with solid object glass five feet six and a half inches clear aperture, less than seventy-five feet focus, with a useful power of 3,325 (50 for each inch of aperture) for the sum mentioned. They think it would be easiest to mount it between walls, allowing a movement of only two or three hours in right ascension. They recommend importing the glass makers, as they had to wait three years and paid $\$ 12,000$ for their pair of glass disks from Birmingham. Henry G. Fitz considers the adjustment of the composite lenses difficult, but that, if this were at tained with sufficient accuracy, the telescope might readily be corrected photographically by the addition of a third lens, and thinks this a better plan than using monochromatic ligh for the purpose.
S. H. M., Jr.

## [For the Scl ntific American.]

The Composicion of the Tails of Comets. At the conclusion of my communication on the subject of The cause of the zodiacal light, I suggested the question whether the tails of comets might not be accounted for upon similar principles. As I believe that the application of the optical principles concerned in this case (as wall as in the other), to account for the appearances observed, is new, have since considered the subject more fully; and as a result, I submit these explanatory diagrams for the considera tion of those who may take an interest in the subject.

the foregoing explanation; 1 . When the spectator, come and sun are in the same plane (which, in this case, we have supposed to be the ecliptic), the tail of the comet would be straight, and divided through its axis by the plane of the ecliptic. 2. If the comet's position were scuth of the ecliptic, the tail would incline towards the south, and would b curved convexly to the south, on account of the spherical shape of the atmosphere; and if the comet were north of th ecliptic, the inclination would be to the north and the curv would be convex to the north 3 . The length and breadt of the tail would vary inversely as the angle between the comet, sun and spectator increased or diminished; that is, it would appear longer and broader as the comet approached the sun, and shorter and narrower as it receded. 4. In this position of the comet, there would appear to be a lune shaped, darker space between the brightest part of the tai and the nucleus of the comet; that is, the brightest part o the tail would appear to be attached to the nucleus only at the two horns of the crescent. This is caused by the inter ruption of the line, a, 1, (Fig. 1) by the interference of the dark portion of the surface between the points 1 and 2 (Figs. 1 and 2). (See explanation of Fig. 1.)
The reason why the planets have no tails, when in the same relative position (with regard to the earth and sun) as the comet, is that they are, comparatively, so large that the reflection embraces nearly the whole of the atmosphere, the refection embraces nearly the whole of the atmosphere,
and therefore no part is brighter than another. Comets on and therefore no part is brigbter than another. Cometrary are, comparatively, exceedingly small; the di ameters of some of them do not appear to exceed thirty miles. This is why, in the diagram, the tail appears so dis. proportionately broad.
If the principle of this theo ry be understood, it will be evident that the shape and di rection of the tail may be varied almost infinitely, as they depend upon the relative posi tions of the three bodies, the earth, the comet and the sun.
T. R. Lovett.

Mount Airy, Philadelphia, Pa.
The proposition which I have here attempted to demonstrate is that the tail of a comet is an optical phenomenon, caused by the reflection of the sun's rays from the surface of the comet to the earth's atmosphere and thence to the spectator.
Fig. 1 is a section, in the common plane (which, for convenience, we will call the ecliptic) of the earth, comet and sun (the sun being in the direction of the arrows); $S$ is the spectator; D B is the portion of the illuminated surface of the comet which is visible to the spectator. All the space comprised between the points $\mathrm{E}, \mathrm{D}, \mathrm{B}, \mathrm{S}$, would be illumin ated by reflection from that portion of the surface of the comet between the points D B. But the atmosphere which renders the light visible only extends to a, 1,4 ; therefore the spectator would only see that included between the points a, $1,2,3,8$. The comet would therefore appear to him to be at $1,2,3$. The line $2,1,2,3$, would appear as the line $E, D, B$; and the line $S, 3$, would appear as the line 8, B. It will be observed that the line a, 1, does not touch the illuminated portion of the comet, but is interrupted by the interference of the dark portion of the surface between the points 1 and 2. That space, therefore, would appear darker than the rest of the illuminated space. This fact will be noticedamong our conclusions.

## To the Editor of the Scientific American

An Irishman, on being told that an addition of quinces improved an apple pie, remarked that an apple pie made entirely of quinces would be better still, I am not an Irishman, but it strikes me that, if the attachment of a bisulphide of carbon engine to a steam engine is a great improvement, it might be better still to apply the heat directly to the bisulphide. The boiling point being lower than that of water, and the specificheat and latent heat of vaporization, perhaps, also less, it would require less fuel to produce a given quantity of vapor oi given tension; and, as the products of combustion could be allowed to pass off at a lower temperature the heat of the fuel would be more fully utilized. Also, it would seem that a second vapor engine might be driven by the waste heat from the fire flues of the first engine.
In your article on the loss of porver in steam engines, it seems to me that you have overlooked two important points, in fact the most important. In your calculations, you start with steam instead of water, neglecting entirely the enormous quantity of heat required to convert water into steam, which is only very imperfectly atilized in heating the feed water, one pound of steam sufficing to heat five pounds, nearly, of water to the boiling foint. That this "latent"
 heat cas be utilized to a very heat car be utilized to a very
great extent by the use of an easily vaporized fluid seems to be proved by the bisulphide of carbon engine, which has al of carbon engine, which has al-
ready effected a saving far beyond your estimate of possibil ities.
The second point is the large
buantity of buantity of heat which necessarily (under present conditions) goes up the smoke stack. I have already suggested one remedy for this waste in the use of a second vapor engine. Another plan which may be worth considering would be to burn charcoal, petroleum, or anthra-

Fig. 2 is a section perpendicular to that of Fig. 1, on a line drawn from the point $\mathbf{S}$ (Fig. 1), through a, b, c, and thence to the center of the sun. S,A, (Fig. 2) represents that line, the letters and figures indicating similar points, as in Fig. 1, and the sun being in the direction of the arrows. With regard to the spectator at S , all the space comprised between the points $a^{\prime}, d, B, e, a^{\prime \prime}$, would be illuminated by reflection from that portion of the surface of the comet between the points $\mathrm{D}, \mathrm{d}, \mathrm{B}, \mathrm{e}$; but for the reason assigned in desciribing Fig. 1, the spectator would only see that part included between the points $a^{\prime}, d^{\prime}, e^{\prime}, a^{\prime \prime}$. The comet would appear to be at $d^{\prime}, e^{\prime}$; the line $a^{\prime}, d^{\prime}$ would appear as the line $a^{\prime \prime}, d$; and the line $a^{\prime \prime} e^{\prime}$ would appear as the line $a^{\prime \prime}, e$. The appearunce therefore to the spectater would be that of a crescentshaped comet on the confinee of the atmosplere, with a tail preading out from the inucleus, $\mathrm{e}^{\prime}, 2, \mathrm{~d}^{\prime}, 8$, in a direction , pposite to the sun, hdving af its extremity a widen equal to $\mathrm{a}^{\prime \prime}$ (Fig. 2)and a qepthequit to S, a (Fig. 1).
The following conturions may, $I$ think, be drawn from
cite in an airtight chamber, surrounded by water, un der such pressure that the escaping products of combustion would have, when released, the same or nearly the same temperature as the surrounding air, the question being whether the heat which passes up the chimney represents more power than would be consumed in forcing air into the furnace.
Another way to save a portion of this heat would be to apply it, as in Siemens' regenerating furnace, to heat the air which supplies the fire, unless indeed it is all required to produce draft.
Of course all these things present certain difficulties, but, o quote my Hibernian friend again, "if there was no hrouble, sure there'd be no work for us."
Benton, Cal.
C. H. Aaron.
R. A. M. states, from his personal experience, that an application of spirits of turpentine is a certain relief for application of spirits of
the pain of a bee sting.

## A NEW NOMESTIC MOTOR.

A short time since we published an illustration of a combined rocking chair and cradle, an ingenious plan the utility of which was obvious. The inventor of the device which we now present has gone several steps further, and not only employs the hitherto wasted female power to oscillate a cradle, but at one and the same time to vibrate the dasher of a churn. By this means, it will be observed, the hands of the fair operator are left free for darning stockings, sewing. or other light work, while the entire individual is completely utilized. Fathers of large families of girls, Mormons, and others blessed with a superabundance of the gentler sex, are thus afforded an effective method of diverting the latent feminine energy, usually mani fested in the pursuit of novels, beaux, embroidery, opera boxes, and bonnets, into channels of useful and profitable labor.
The apparatus, as represented, consists of a lever, A, suspended from the ceiling or other suitable support by a swiveled hook and staple In the extremities of the lever, A, are formed slots through which pass bolts and nuts which secure the adjustable arms, B. To the eyes of the bolts are attached the ends of two ropes, which pass around double guide pulleys fas tened to the floor and then to two single pulleys, arranged one beneath the forward and the other beneath the rear part of a rocking chair. The ends of the ropes are secured, as shown, to the rungs of the latter.
Near the extremities of the arms, B, sliding weights are placed, by moving which the lever can be properly balanced. Just inside the weights is secured on one arm the dasher of the churn, and at the other a cord communicating with a cradle rocker. As the chair is oscillated motion is communicated to the lever, and thence to both cradle and churn.
Necessarily this device may be put to a great variety of applications, and may suppiy motive power for washing machines, wringers, and other articles of household use, as well as for churns and cradles. At all events it opens a new tield for " woman's labor," and one in which she is not likely to be disturbed or encounter competition from the other sex. Patented through the Scientific American Patent Agency April 15,. 1873. For further particulars address the invent or, Mr. Gustavus Meyer, New Richmond, Allegan County, Mich., or the New York Exposition and Manufacturing Com Mich., or the New York Exposition and Manufact
pany, 52,54 , and 56 Broadway, New York city.

PERAMBULATING COT.
Invalids and persons who are afflicted with loss of power of locomotion will, according to the statements of the in ventor, find the apparatus herewith illustrated a great convenience and comfort. The aevice is called a perambulating cot, and is made with a pair of large wheels on an axle, upon which rests a ligh of pivoted caster wheels which follow the main wheels in-any direction. On the iron frame are four curved springs, extending up to the middle four curved springs, extending up to the middle joint in the latter, just back of the hips of the oc joint in the latter, just back of the hips of the oc-
cupant, arranged with ratchets, so that he can sit cupant, arranged with ratchets, so that he can sit
at any desired angle; and from the knee, forat any desired angle; and from the knee, for-
ward, is a light tapering board and half circle foot piece. At the rear of the cot is a handle, adjustable, so that it may be made high or low, by a rod in the center of the cot frame; and there are two rods from the ends of the handle and attached to the fraue at the swivel wheels, for propelling the apparatus. The feet are raised or lowered by lurning a small crank on the foot board, and there is a hinged drop leg for use when necessary. is a hinged drop leg for use when necessary.
Other conveniences, incidental to invalids' uses, are suitably and ingeniously provided for.
machinery will be used to raise water into Highland avenue reservoir in Pittsburgh, a light of three hundred and fiftysix feet. It is estimated it will raise seventy million pound of water for each hundred pounds of coal consumed, the cost being at the rate of one cent for every 3,070 gallons.

## Water Bollers upon Stoves.

A brass or copper vessel tinned upon the inside, holding several gallons, is usually found connected with cooking stoves used in families. As this vessel is kept full of hot water, which is used for ordinary culinary purposes, it is


PERAMBULATING COT.
with the metal employed in its construction. A recen analysis has been made of a specimen of tinned brass plate used for making these boilers, and it was found that the tin contained 26 per cent of lead. How far this may serv to cause injury, it is impossible to say. It is certain, how ever, that lead is an objectionable metal to be brought in contact with culinary utensils, and hence its use must be condemned. An iron boiler lined with porcelain would be much safer, añd perhaps not more costly. We understand such a vessel is


## A NEW DOMESTIC MOTOR

be a much safer one to employ as a reservoir of hot water for constant household and culinary use.-Boston Journal of Chemistry.

## THE PATENT REVENUE CIGAR BOX.

Quite a stir has recently been created among the cigar manufacturers on account of the proposed requirement, by

the Government, of the use of a patented form of cigar box. The object of the invention, an engraving of which we herewith present, is to prevent the fraudulent re-employment of stamped boxes. A dealer, in purchasing his stock, natural. ly desires to inspect in advance the quality and flavor of the article. To do this, boxes must be opened and stamps torn, so that, if the cigars be not sold, they remain on the maker's hands in cases which, so far as the mutilation of their stamps is concerned, are in precisely the same condition as if their contents had been once disposed of. It is plain that an ex cellent opportunity is hete offered for fraud upon the reve nue by packing cigars in old stamped boses, and in event of detection, asserting that the latter were inno cently opened as above described
The present device, lately patented by Mr Thomas A. Wiley, of Lancaster, Pa., consists simply in fitting two cross slats, as shown, into the edge of the box, forming a dovetail connec tion therewith; or a single broad longitudina strip may be employed to answer the purpose These slats are put in place after the cigars are packed, when the stamp is pasted partly on the transverse bar and partly over the side of the box. The usual ornamental paper is affixed in the ordinary way. By raising the lid, an oppor tunity is afforded for examination of the content through the ample apertures left; while not a single cigar can be abstracted without first rais ing the slats and thereby rupturing the stamp.
The introduction of the plan is vehementl opposed by the cigar makers, who assert that it is of no greater efficacy than the present mode while it will prove a serious detriment to thei trade.

Cementing Metal to Glass.-Take two
parts finely powdered white litharge, and one parts finely powdered white litharge, and one part dry white lead, mix intimately, and work up with boiled linseed oil and lac copal to a stiff dough. One yart of copal is taken to three parts boiled oil, and enough litharge and white lead added to make a dough similar to putty. The underside of the metal is filled with the cement and then pressed upon the glass, the excess of cement leing scraped off with any sort of instrument. It dries quickly and holds firmly.

## Losation of Standard Compasses

For determining the deviation, due to ferruginous mate rials in their construction and cargoes and to other causes, of the steering compasses of vessels; a so-zalled standard compass is usually arranged on the upper deck, and at as high an elevation as convenient above the hull.

The position of the instrument is as nearly neu tral as can be found-that is, at a point where the local attractions are evenly balanced. By causing the ship to swing in different directions, and noting the variation between the indications of the standard and that of the binnacle compasses a table is formed from which the deviation of tho latter for various points is used as a correction to be applied when steering such courses.
M. Gloesener, in referring to this subject in Les Mondes, suggests placing the standard compass ou upon the bowsprit, at a distance previously determined to be without the ephere of attraction of the iron in the vessel. By this means, instead of the attracting substances being grouped around the instrument, perhaps unequally, they necessa rily are all upon one side of the compass and symmetrically placed in regard to it. The latter is, of course, so fixed that the lubber's point and the foot of the needle pivot are in a line parallel to the longitudinal axis of the ship. To reflect a portion and anclined mirror is arranged abov it, in which the indication is read from the deck by a spyglass.
Butter and Fats.-Dr. J. Campbell Browe says that the proportions of the chemical constituents vary so greatly (from zero upwards) that no reliable evidence of purity or impurity can be obtained by estimating the different fats obtainable by decomposing butter. In fact, the distinction between pure butter and butter mixed with flesh fats is no more a chemical one than the distinction betwe en different animals or different plants. The physiologist distinguishes one kind of tissue from another more readily by their microscopic characters than by their chemical composition; and microscopic exam ination with polarised light is the most reliable means of distinguishing pure butter from that which contains an ad mixture of less easily digestible and less palatable fats.

Lemonade from Currants.-Citric acid may be pre pared from ripe currants in the following manner: The curpared from ripe currants in the froken up by pounding or squeezing; the juice is then pressed out and allowed to ferment. When ferment ation ceases, the alcohol is distilled off and the residue neu tralized with five chalk. In this way citrate of lime is formed, which is afterward decomposed by sulphuric acid and the sitric acid set free. From 110 pounds of fruit there should be obtained about one pound of citric acid, beside a considerable quantity of alcohol. A dilute solution of citric acid furnishes a pleasant and healthful drink, and, although lemonade is usually made from lemons, we would not, says the Journal of Applied Chemistry, be far wrong in calling this drink lemonade, although prepared from currants.

## THE COOPER PORTABLE ENGINE.

In our illustration is shown one of the latest designs of portable engines, composed of an engine, pump, heater, fixtures, and connections, all mounted on the boiler; the last buing supported on side timbers which form the foundation for the whole structure. The apparatus comes complete from the shop, having been previously tried by actual tests with steam, and is ready for work. All that is required is to place it in projer position and connect it to such machine to place it in pro
ry as it is to drive. The boiler is the. The boiler is then filled and the fire started. This ar rangement, it is claimed, saves all the expense and time required to build the engine foundations, set the boiler in brick work, and make the connections, as would be the case with station case with station ary engine and boilers, while it adds greatly to the facility with which the ma chinery can be moved from place to place.

The construction of the device merits particular attention. The tngine consists of Engine consists of a bed piece sup ported on lugs attached to the boiler. This piece contains the shaft, pillow block, slides, and cylinder head, and to it the cylinder is so attached as to allow of the expansion of the panstion of without latter without
strain on the strain on the par connects dievar connects diresty, doingaway with the rock shaft, and the valve is proportioned to use the steam expansively. The pump is a vertical plunger of short stroke, driven by direct driven by direct making the feed crosshead, obviating the use of a belt an heater is of wrought in, with easy work on the valves. Th oint, proportioned to give a large heating surface to a thin int, pr water thereby insuring a high degree of hot th all the moving par motion at high speed. The journals and wearing surface are supplied with self-oilers, and the boiler with glass water gage, cocks, whistle, steam gage, etc
The internal arrangement of the boiler and tubes, it is clammed, has been thoroughly studied, so that the highest degree of evaporation is obtained with the least consumption of fuel. A jet blower is supplied for increasing the draft, and the chimney is provided with a spark catcher
We are informed that when the Japanese Government (in 870) ordered samples of machinery, the agents, after exam ination and tests, gave the preference to this engine over al others, and ordered a twenty horse power machine, with circular saw mill, to be sent to Japan. Letters since received show that the apparatus gave perfect satisfaction.
The engine represented in our engraving is of twenty horse powen and is mounted with a slide throttle valve. in place of thegovernor as used with circular saw mills.
For further information address The John Cooper Engine Manułacturing Company, of Mount Vernon, Ohio

## Lawns in Midsummer

We have touched the renewing and improving of lawns time and time again, says the Cleveland Herald, yet every now and then we are button.holed on the street with: " wish yould we ask bout it "، Why solow the grass seems to have rot thin and don't look ,ood and strong. the soil is rather got thin, and don't look good and strong; the soil is rather
light, allhough every year I have given it a top dressing of manureln the fall and raked it off in the spring.'
Yes, ne say, just as many another man, void of the knowl edge of the wants of the grass roots, has done. You have suppliedja little stimulus, and a very little one, to enable the plant to make a first start in the spring, by reason of the ammoniacal alkali obtained from the leaching of the manure during the winter; and as soon as that is exhausted which generally is ere the heated season comes in, the plant has nothing but the poor old soil and its broken roots to sup-
port it. Now, if you would first sow over your lawn fine bone meal at the rate of eight bushels to the acre, then plaster at the rate of one bushel to the acre, then cover the whole half an inch thick with fine garden soil, leaf mold, or fine chip mold from an old wood yard pile, and then sow clean blue grass seed at the rate of two bushels to the acre, and rake the whole with a fine tooth iron rake, finishing by rolling, we guarantee a lawn that will stay fresh and green all summer, no matter how dry the season. We hope that

To the vast array of quaint devices, with which the earlier rchives of the Patent Office are replete, belongs the invenion illustrated herewith. Our engraving, derived from the patent drawings, represents an individual not suffering uner any painful malady, as might be inferred from his prostrate position, but "laying off," if the apt vulgarism be admissible, while calmly enjoying the luxury of a breezerajsed by the oscillation of the fan above him. The latter, with its mechanism, is the first device of its kind ever patented in


THE COOPER PORTABLE ENGINF,
some of ou
keep it.

## THE FIRST AUTOMATIC FAN.

There is a peculiar interest which attaches to the first crude mbodiment of any well known device, which renders it al. most as much an object of curiosity as the most recent ap- ainly a very comple mode of attaining the proposed object. We should find $n$ difficulty in making a much more simple instrument for the purpose, a view which, perhaps, some scores of inventor have, since the date the above was written, demonstrated to heir own, if not to the public's, perfect satisfaction. W need not add that, in this case, for obvious reasons, we omi
our usual peroration beginning for further in formation," etc.

Discovery of America--Columbus Anticipated Interesting relics of the early discovery of Amer ica occasionally turn up. At a late meeting of th Mexican Geographical Society, Mr. Bliss state that some brass tablets had been lately discovered in the northern part of Brazil, and not far from the coast, which careful examination had shown wer covered with Phœnician inscriptions, telling of the discovery of America five centuries before Christ The tablets had been acquired by the Museum of Rio Janeiro, with whose director he was personally acquainted, and the connection of this gentle man with the discovery of the tablets was in itself a guarantee of the correctness of the report. The inscriptions, so far as yet deciphered, relate that from a port on the Red Sea, a Sidonian fleet sailed, and, following the east coast of Africa, doubled the Cape; thence following the African west coast, pro bably with the southeast trade winds of the south ern latitudes, until the northeast trades, pre venting further progress northward, forced the prows of the vessels across the broad Atlantic. At ny rate, according to Mr. Bliss, the tablets record the fact of the Phœnician fleet having reached the lication of the same idea improved, altered, and carried Americas five centuries before Christ, at some point now apparently to perfection. The one, indeed, indicates the known as northern Brazil; that the tablets give the number higher attribute, originality; the other, in its relation there- of vessels, the number of the crews, the name of Sidon as to, forms but a mark on an onward path which, while serv- their home, and, indeed, various very interesting particulars ing as a limit of present advancement, attained through the Mr. Bliss has promised, when he acquires further particulars, aid of past experience, must, in its turn, be left behind and to hand them to the Society. orgotten, as that experience, augmenting, enables the en rafting, upon the pristine stock. of newer, better, and mor useful conceptions
 Americas five centuries before Christ, at some point their home, and, indeed, various very interesting particulars.
Mr. Bliss has promised, when he acquires further particulars to hand them to the Society.

A GIGANTIC passenger depot, the largest in the world, is now in process of erection at Jersey city, N. J. this country, and he inventor was Commodore Jas. barron, of name famous for gallant service in the war of 1812. The date of the patent is November from its specification we extract brief description brief description of its operation Within the box shown near th is of the couch of clockwork, which moves crank, shown in the left hand lower corner of the case. This crank actuates a means of a ver tical arm, oscilla tes a rock shaft, supported as supported as
shown by two horizontal rods projecting from the box. To the upper arm, ex tending from tle rock shaft, is con nected the fan which is thereby freely vibrated while suspended by suitabl means.
In an old vol ume of the Jour nal of the Franklin Institute, we find an abstract find an abstrac of this patent accompanied by

## The Preservation of wood

When a country is first cleared, and timber is plenty, the onl $j$ desire of the settler in regard to it seems to be to destroy as much as possible with the least amount of labor. Afterwards, however, the opposite course is taken, and endea
are made to preserve it, and prevent waste and decay. are made to preserve it, and prevent waste and decay.
Many mut thods have been proposed for preserving timb varying somewhat according to the use to which it is to be put, and the situation in which it is to be placed. These may all, however, be divided into two great classes; namely those which preserve the wood from external influences by forming an impervious coating on the outside, and those whicl will enable it better to resist the action of fermenta tion and decay.
The first of these classes includes all painis and similar substances. In order to render paints effective, it is necessary that t'ee wood shall be well dried before their application, as paint applied to the surface of wood which is filled with sap will tend to hasten, rather than retard, its decay. This it does by confining the juices of the timber and preventing the drying of the wood that would otherwise take place. The first paint that was used was most likely the native bitumen and asphalt that oozes from the ground in many parts of the world, and to this day we have not found any more efiective substitute. But this is objectionable from its odor, the long time it occupies in drying, and its dark color; so that in the course of time other substances were substituted for it. Prominent among these are the so-called drying oils. Certain oils, such as linseed and poppy, have the property of drying when exposed to air, and forming a guinmy mass. This protects the wood from the action and
air and rain. But oil alone has but little covering power, air and rain. But oil alone has but little covering power,
and a substance painte. with it retains almost its natural and a substance painter with it retains almost its natural
color. or at most is only darkened. In order to vary the color and more thoroughly cover up any defects in the work, and at the $s$ me time hasten the drying of the paint, it is customary to mix certain earthy substances with the oil. Chief among these is ceruse, or white lead. This gradually combines with oil and forms a hard mass. In order to hasten the drying of the oil, it is frequently boiled before being mixed with the lead. The lead pain! made by mixing proper proportions of carbonate of lead with boiled and raw oil is undoubtedly one of the best and most permanent sub. stances that can be applied to the surface of wood; but unfortunate'y it is expensive, and the use of the lead is objec tionable on sfanitary grounds; the workmen employed in putting it on being subject to sevfre colic and paralysis from the poisonous effects of the lead. On the ground of cheapness, sulphate of baryta is frequently substituted for part of the lead, and, in fact, in some cases for almos's the whole. This, wiile it is not poisonous to use, possesses an inferior covering power; that is, it takes more coats to prodnce the same effect, and as it does not combine with the cil, it is liable after a time to chalk off.
Another substitute for lead is oxide of zinc. This is also not poisonous to the workmen, when free from arsenic, but it possesses little moce covering power than baryta.
Quite frequently a misture of lead, baryta, and zinc, is employed. Its chief recommeldation is its cheapness. For painting in localities that are exposed to sulphuretted hydro. gen, such as houses on the docks of large cities, a zinc or baryta paint is superior to one containing lead, as it does not blacken. Many attempts have been made to utilize various chemicals for painting purposes, and there is an endless vari:ty of so-calied chemical paints in the markec. Prominent among these is the "Averill" paint, in which water glass or silicate of soda is a leading ingredient; but the general fault of all these paints is that, when made thiu enough to work with ease, they do not possers sufficient body, so that whet is saved in the original cost of the paints is ey fended in the labor necessary to put them on.
Paints of tifferent colors generally depend upon white lead for their body, and derive thrir color from mixtures of various earths and oxides. For almost all the shades of red and brown, oxide of iron is used, under the various names of Venetian red, umber, terra di Sienna, brown ocher, yellow ocher, red ocher, etc., the va
way in which it is prepared.
way in which it is prepared.
Oside of chromium furnishes chrome green; oxide of copper, combined with various acids and with arsenic, gives $\checkmark$ rious greens; lead combined with chromic acid forms the chrome yellows, the different shades being due to the man ner in which they are prepared. For blue, we have Prussian blue, which is not very permanent, ar:d of late years ulcramarine, which is the best and most permanent of all colors.
Red lead, or oxide of lead, and sulphide of mercury give the most brilliant red; while for black, nothing is superior to carbon in the form of lamp black. For special purposes, such as painting the bottoms of ships or piles exposed to the action of the water, coarser kinds of paints are employed. The base of many of these is tar dissolved in naphtha; this is mixed with some substance such as oxide of copper, arsenic, or an alloy of copper and antimony, which is sup-
posed to prevent the adkerence of barnacles and other posed to prevent the adberence of barnacles and other
marine animals and plants. India rubber, dissolved in napltha, has been used for the same purpose; lime soaps have also been proposed for this use. No substanca has, however, been discovered that will resist the action of salt water more than a few months without requiring renewal ; nothing that is known to chemists being absolutely insolu ble in water. Lately there bas been quite a flourish of trumpets over a certain compound invented in England by Count Szerelmy, and called zopissa. This is essentially a paint composed of boiled linseed cil, brown umber, lime
water, sulphate of cop:er, Prussian blue, copperas, burn clay, calcareous silex (whatever that may be), lithar。 asphalt, red lead, gum animi, and turpentine. It was proba bly through mere modesty that the inventor stopped after
adding these ingredients and did not continue through the adding these ingredients and did not continue through the
drug shop. The paint is no better and no worse than one containing an impure oxide of copper for pigment, and lin seed oil and asphaltum for the menstruum. It will no doubt protect the wood to which it is supplied in sufficien quantities, from external action, so long as it lasts.-Boston Journal of Chemistry.

## Recent Researches on the $\mathbf{P}$

The arrangements by which the mind is brought into lation with the outer world are-(1)a terminal organ, such as the retina, or the intricate structures of the internal ear, or the touch corpuscles of Wagner, for the reception of impres sions from without; (2) a nerve, endowed with a special sen sibility peculiar to the sense for the conveyancs of influence from the terminal organ to the brain; (3) a sensorium or brain in which, on receiving these influences, changes occur whic give rise to the phenomena of consciousness.
The nature of the specific change produced on the termina organs by the action of external stimuli has not hitherto been experimentally examined. Let us take the case of the eye Numerous hypotheses have been advanced. The action of light on the retina has been conjectured to be a mere com munication of ribrations, an intermittent motion of portions of the optic nerve, an electrical effect, a heating effect, or a photographic effect like that produced by light on a sensitive photographic effect like that produced by light on a sensitive
surface; but up to thistime there has been no experimental surface; but up to thistime there has been
evidence in support of either of these views.
The result of investigations made by Mr. Dewar and Dr McKendrick, of Edinburgh, communicated to the Rr.yal So ciety of Edinburgh, has been to show that the specific effec of light on the retina and optic nerve is a change in the elec tromotive force of these organs. They have leen able to demonstrate this by the use of the well known arrangement of Du Bois-Raymond for collecting electric currents from an imal structures.
From each of the troughs a wire passes to a key so as to en able the experimenter to stop the current at pleasure, and thence the current passes to the galvanometer. They then lay the eye on a glass support between the cushions and carefully adjust the points so that the one touches the cornea and the other the transverse section of the optic nerve, or the one may touch the surface of the nerve and the other its transverse section. When the optic nerve of the eye to beoperated upon and the cornea are brought into connection with the galvanometer, and light is passed through the eye, there is at first an iacrease, then a diminution, and on the re moval of light there is another increase, of the electromotive force.
The amount of change in the electromotive force by the action of light is about 3 per cent of the total. There has been no difficulty in demonstrating the effect in the eyes of the following animals, after remov 1 from the body : reptiles, snakes; amphibia, frog, toad, newt: fishes, gold fish, stickle back, rockling; crustacea, crab. swimming crab, spider crab, lobster, hermit crab. The greatest efiect was observed in the case of the lobster, in the eye of which Messrs Dewar and McKendrick found a modification in the electro motive force by the action of light to the extent of about ten per cent. With the eyesof birds and mammals, they had great dificulty. It is well known that, in these ani mals, the great source of nervous power is abundant supply of healthy blood. Without this, nervous action is soon ar
rested. This law, of course, holds good for th $\rightleftharpoons$ retina and optic nerve. When, therefore, they removed the eyeball with nerve attached, from the orbit of a cat or rabbit recently killed, and placed it in connection with the clay points, they found a large deflection of the galvanometer which quick. y diminished, but all sensitiveness to light disappeared with the ore Thi fact of itself shows that what has bee observed is a change depending on the vital sensibility of the part. It was therefore necessary to perform the exper iment ou the living animal under chloroform. By so fixing the head that it could not move, and by removing the outer wall of the orbit so as to permit the clay points to be applied to the cornea and nerve, th 9 same results have been obtained in the case of the cat, rabbit, pigeon, and owl.
Without going into minute detail, which the space allowed for this short article will not admit of, the results of this in quiry have been as follows:

1. That the specific effect of light on the eye is to change he electromoiive force of the retina and optic nerve.
2. That this last applies to both the simple and to the mpound eye.
3. That the change is not at all proportional to the amoun of light in lights of different inten-ities, but to the loga rithm of the quotient, thus agreeing with the psycho physical law of $\mathrm{F} \epsilon \mathrm{chner}$
4. Tuat those rays, such as the yellow, which appears to our consciousness to be the most luminous, affect the elec tromotive force most, and that those, such as the violet, which are last luminous, affect it least.
5. That this change is essentially dependent on the retina, because, if this structure is removed while the other struc ture of the eyo lives, though there is still an electromotive orce, there is no sensitiveness to light.
6. That this change may be followed into the optic lobes.
. That the so-called psycho-physical lav of Fechner does
is really dependent on the anatomical structure and physi ological properties of the terminal organ itself, inasmuch a the same results as to the effect of light are obtained by he action of the letina and nerve without the presence of brain.
The method of investigation pursued by Messrs. McKendrick and Dewar is applicable to the other senses, and open up a new field of plysiological research. The specific action of sound, of the contact of substances with the terminal organs of taste and of smell, may all be examired in the same manner; and we are in hopes of soon seeing results from sucb investigations.-Nature.

## Saddle Trees

A correspondent, R. C., of Texas, remarks that his State has always been famous for the production of saddle trees nd although California and other States have been rivals, Texas has always stood first on the list. "The ordinary plan f making a saddle tree is not only tedious but incorrect wing to the want of an accurate plan, and the consequen use of guesswork. I claim to have produced a simpler plan by which a man, using patterns, can make a good saddle ree. Within the last few years, several makers have con eived plans to make saddle trees that would allow the fas enings to rest on the front end of the side boards, and the ront part of the seat on the side boards and on both sides o the prongs of the horn piece, forming not only the fastening but a yart of the rig also.
The tree was a desirable one on its claims; but there was serious objection to it. The projecting part of the side board; in front of the horn tapered down straight with pointed or square corners so as to admit of the fastenings and so the bottom part of the side boards had to be mad traight, with a straight twist, and the ends in front would urt the horse's shoulders. To remedy that def ct, I cut the ide boards tapering back towards the seat far enough t receive the prongs of the horn and the fastenings. Thi flaring or tapering twist also enabled me to change th entire shape and bearings of the tree, making a general im provement on the whole arrangement.

## Uses of Waste Paper

A writer in one of our exchanges (we have forgotten which) says that few housekeepers are aware of the many uses to which waste paper may be put. After a stove has been blackened, it can be kept looking very well for a long time by rubbing it with paper every morning. Rubbing with paper is a much nicer way of kerping the outside of tea kettle, coffee pot or tea pot bright and clean, than th old way of washing it in suds. Rubbing them with paper is also the best way of polishing knives and tin war after scouring them. If a little soap be $\mathrm{h} t \mathrm{l}$ d on the papt in rubbing tinware and spoons, they shine like new silver For polishing mirrors, windows, lamp chimneys, etc., paper is better than dry cloth. Preserves and pickles keep much better if brown paper instead of cloth is tied over the jar Canned fruit is not apt to mold if a piece of writing parer cut to fit each can, is laid directly upon the fruit. Paper is much better to put under carpet t! an straw. It is thinner, warmer, and makes less noise when one walks over it. Two thicknesses of paper placed between the other coverings on bed are as warm as a quilt. If it is necessary to step upon a chair, always lay a paper upon it, and thus save the pain and woodwork from damage.

## Watering House Plants

The English Garden is inclined to dispute the rule that water "should be given in molerately small quantities, and supplied frequently." If the causes of failure where plants re culcivated in windows were minutely investigated, the dribbling system of watering would be found to be the prin cipal cause. A plant ought not to be watered until it is in a fit condition to receive a liberal supply of that element having previously secured a good drainage, in order that áll superabundant water may be quickly carrie 1 off. Those ho are constantly dribbling a moderately small quantity of water upon their plants will not have thrm in a flourish ing condition for any length of time. This must be obvous to all, for it is quite evident that the moderat ly small quan. tity of water frequently given would keep the surfacs of the soil moist, while at the same time, from the effecis of good drainage, which is essential to the well being of all plants in an artificial state, all the lower roots would prish for want of water, and the plant would become sickly and eventually die.

A French writer, in estimating the future of scince, points out that in fifty or a hundred years' time the Enylish language will in all probability be spoken by eight hundred and sixty millions of individua's, while the Geman will be the language of one hundred and twenty milliors and the French of sixty-nine millions only, and that in onsequence science is likely to seek English channels of poplication, scientific books having at best a limited sale and tectssarily seeking the widest audience.

Narrow gage passenger cars, as generally constucted, NARROW GAGE passenger cars, as generally constucted,
stand thirteen inches nearer the rail. and have ab ut fifteen inches less overhang at the side; hence, the center of ravity is considerably lower than on the scandard gage, makng the car ride very steadily, and with less oscillating motion than is usually observable upon the wide gage. The seatsthirtysix to a car, are arranged double on one side and siggle on the other, with the order reversed,midway of the cas to distribute the weight equally.

August 23, 1873.1


Inventions Patented in England by Americans.
Compiled from the Commissioners of Patents' Journal.) From July 19 to July 21, 1873, inclusiv
urds, et :-C. G. Wheeler of Cite
Distributiva Fluids, et :-C. G. Wheeler (of Caicago, ili.), London, Eng Lifa Praserver.-E. l. Coyswell, New York city

## NEW BOOKS AND PUBLICATIONS

Chimneys for Furnaces, Fire Places, and Steam
Boilers. By R. Armstrong, C. E. No. 1 of "Van Nos
trand's Science Series." Pıice 50 cents. New York:
are pieased to see an 1ssue of handbooks on practical subjects com menced with so excellent a specimen as the work before us. The chimney
has always becn the builder's puzzle and the occupier's torment; and some has always been the builder's puzzle and the occupier's torment; and some
practical, well digested reason ng on the subject, by a thoroughly capable writer, will be found in thisneat little volume. The reputation of the pul treat ses
The Canadian Ornithologist, a Monthly Record of In formation relating to Canadian Ornithology. Edited by
Dr. A. M. Ross. Price 15 cents per month. Toronto
Willing and Will Willing and Williamson.
An excellent little magazine, entertaining to many who live beyond the borders of the British Provinces. It appears to be written by
well versed in the most interesting branch of natural history.
The art of Shooting on the Wing, wath Hints and Recipes for the Use of Sportsmen. By An Old Game
keeper. Price 75 cents. New York: The Handicraf
Publication Company, 37 Park Row.
Pubical and will
A practical and well written handbook, especially adapted for the use of
young sportsmen, as it gives sensible advice on the manipulation of fir arms and the rules and etiquette of the field.

## 

Inproved Metallic Clasp.
Charies Marshall, Lockport, N. $\mathrm{Y}-$ The object of this device is to fur nish ready and convenenent meane for holdong or supportung drawers on
overalls when a autton falls, for hanging up hats and other article clothing. or for supporting ladies' dresses, elc. The clasp p is attached to the
 slide is turned one side, and then back over the teeth There 1 a a slight
spring to the sllde, wnich holds it it place and makes the stachment se cure. As manufactured for use, the cllsp does not exceed the welght o -

Improved Sewing Machine.
John Albert Smith, Columbus, Ohio.-This improvement consists in new combination of machinery, by which rotary motion is imparted to the
shuttle. A rutary disk for carrying the shuttle carrier is mounted on the end of the pulley shaft and is arranged with its face, to which the cariter is pivoted, in the plane of the needle, so that the carrier will pass the needle
close to its side, suitably for passing the shuttle through the loop. Tve currier is connected to it by a pin which is fitted into the disk so as to tur
therein, and is connected by jolnted to the frame so that it can swing with the pin around the axis of
the shaft, but not turn itself, and thus prevent the carrier troan turning a the shaft, but not turn itself, and
it swings around with the disk.

## Improved Harvester.

Elgin M. Awrey, Caistor, Canada.-This invention has for its object t furnish an improved device by means of which the table or finger bar may
be ratised, when desired, by the advance of the macnine, thus dispensing with the ordinary levers and keeping the machine free for the operation of the self rake.
Improved Hog Trap.
Aaron B. De Vore, Talkington Township, , mit - This invention is an im provement in a crib or stocks fur holding or confining hogs. The bottom
inclines downwardly toward the head lock and falls considerably below the front beam, so as not to afl out of the lock and pull out of the lock. For small shotes a secondary pen or
ranged in the large one to contract the space sultably for them.

Improved Wasling Machine.
John W. Conroy, Terry, Miss.- -By sultable construction, by adjusting a nu', a jointed rubbing board may be held up against a corrugated cylinder
with any desired pressure, so that the said cylinder may carry the clothes along the rubbing board, and at the same time rub them, thus washing the clothes quickly and tho:oughly.

Improved Rotary Hog Scraper.
New York city. . This invention consists
Robert Fyfe, New York city.- This invention consists of a rotary scrape with blades adapted for scraping of the hair, bristles, etc., of scalded driving shaft worked by a pilley or other drivirg gear. It Is very simple Improved Self Closing Faucet.
Alexander Brinckmann, New York city.-This invention rele, tes to improvements on faucets of the kind having swivel discharge tubrs, which
tubes, when in one position, are closed and stop the ontlow of water, tubes, when in one position, are closed and stop the ontllow of water,
while in the other position they communicate with the water supply, are ooen, and allow the water to How out. Whenever it is desired to have the
water flow out, the horizontal tube is turned by hand to open the aperture, and is held so as long as necessary: but as soon as this tube is let go, the pressure of water aga nst another piston immediately causes the rertical
tube to swing closed.

## Improved Manufacture of Wadding.

 Andrew Chambers, Prosidace, Re, -1 it proposed to manufacture waddings of old delaines, and other part cotton and part wool goods, b:picking the stock into sufficlently fine and soft particles to form a soft fine lap, and then passing it directly from the machine in which it is made through a bath composed of a solution of resin, caustic soda, and also col
oring matter. he solution saturates the lap thioughout and secures the oring matter. She solution saturates the lap thoughout and secures the
fiber so as to make as good and strong an article as the ordinary long fiber and yet does notinjure the fiber in respect to the light, crispy nature which it is necessary for all good waddings to possess. It is also proposed to ap
ply a dressing of plaster of Paris to the surfaces of the wadding as it ply a dressing of plaster of Paris to the surfaces of the wadding as it
passes out of the bath, tu glaze it and prevent it from sutcking, by passing passes out of the bath, tu glaze it and prevent it from sutcking, by passing
it between a conple of boxes containing the plaster, and brushes for throwing it on the wadding as it passes along. The claims cover both the $m$
ufactured article and themechanism by which the wadding is made. Improved Clothes Dryer.
Almeron Graves, Roscoe, Ill.-The central vertical standard upon which Almeron Graves, Roscoe, in.-The central vertical standard upon which collar and braces. The braces arealso at their upper ends pivoted to a similiar socket cullar, which moves loosely upon the vertical standard
The lower ends of the feet are made fast to the ground by suitable vins driven through loops. The number of braces is equal to the number of feet employed. A serites of semi-vertical brace arms, which at their base are pivoted to a socket collar s:milar to those above described, torms a base for the drying apparatus. These brace arms are also at their upper ends plvoted to an equal number of radial arms which also are at thein inner
ends pivoted to another similar socket collar. The whole series of arms are provided with a network of clothes lines. Cords pass over pulleys, having their outer ends attached to one of the radial arms at opposite
sides of the dryer, and are used to fold up the dryer like an umbrella.

Improved Device for Manufacturing Jeweiry Bases Shubael Cottle, New York city.-This invencion consists in a peculiarly constructed former combined winh ale banisher and mandrel. A blan has a bottom and barrel at a sharp angle to each other. The former is
made in sections. The female die is made with a detachable bottom for convenience in removing the blank, and with a shouider in its cavity leaving a space around the barrel of the blank, when said blank is inserted
in said die. A plunger is made with a square edge, and a recess having in said die. A plunger is made with a square edge, and a recess having a
rounded angle. The former is placed in the blank and the blank is inserted rounded angle. The former is placed in the blank and the blank is inserted
within the shoulder of the die. The piunger is then brought down upon the edge of the harrel of the blank, turning the sald edge inward over the former, producing the blank. The blank is now placed in a hollow man drel, and while the mandrel is being rotated in a lathe, a burnisher is held
acainst the turned over edge, which is thus pressed down upon the formel agannst the turned over edge, which is thus pressed down upon the forme
until thas a sharp argie. The blank is now taken out of the mandrel, and until it has a sharp argle. The blank is now taken out of the mandrel, and
the midde section of the former is removed, and subsequently the others, he middle section of the former is removed, and subsequenty the others,
after which the bottom is cut out so as to produce a blank which consist them, vertical.
lmproved Tobacco Transplanter.
Clempnt E. Bates, South Deerfield, Mass.-Thisinvention has for its ob ct to furnish an improved maihine for transplanting tobacco plants. I ously supplied with plants, is placed upon the upper platform, the handl is grasped by the left hand, and a lever $p$ "shed forward so that a plant dropped through a tube to rest in a cup formed by plates. Tte instrumen is then pressed down upon the ground and the lever drawn to the rear ard. This forces the plates ont ward and edgewise through the snil, an the same time moves the paddles inward and sidewise through the sol raised from the ground, the lever pushed forward, another plant inserted n the tube, and so on

Improved Vise.
Daniel S. Coe, New Hartfora, Conn., assignor to Chapin Macrine Com any, of same place.-This invention has for its object to furnish an in
roved bench vise. Upon the inner ends of screws are secured small gea proved bench vise. Upon the inner ends of screws are secured small gea
wheels, the teeth of which mesh into each other, so that by turning th Fit ecrew the left screw will be turned in the opposite direction, and th two screws will work together to carry the movable jaw back and forth,
exactly parallel with the stationary jaw.

Improved Dress Protector.
Adolph Herrmann, New York city.-This invention is designed to furnis an improved dress protector which shall be so constructed that when a The invention consists in folding the material longitudinally so that it edges may meet or overlap each other along the central line, plaiting
transversely, and securing the plats by two rows of stitching about equal transversely, and securing the platts by two rows of stitching a
distant from the edges of the protector and from each other
$\underset{k, \text { New Brunswick, N. J.-Tinis is ven }}{\text { Improved Iry }}$
Charles W. Gulick, New Brunswick N. J.-Tuis it vention furnishes a rmly secure the railrond rails, which shall support an les for railroad tracks, having transverse flanges formed solid upon them o form grooves to receive the ralls, and having holes formed through them

## Improved Dies for Plain Finger Ring

 Genrge Krementz, Newark, N.J.- Chis invention is an improved device hich has a hole formed through it of such a size as to allow a plunger t ass through it freely. In the upper end of the hole is formed a rounde recess to receive the ring. The plunger is made tapering or conical, andith its upper part of exactly the size required for the ring. Upon the uppe nd of the plunger is formed a tenon to enter a hole in the lower end of the older, by which the said plunger is forced through the ring. In using the through it by the holder, bringing the ring to exactly the required size, an leaving it perfectly true. The same inventor has also patented an improve node of making plain inger rings without a joint. The invention consist two sets of dies for forming a jointless ring from a solid ring plate he half round ring plate is laid, rounded side downward. in the flaring uporces it into the lower part of the cavity of the die, giving it a somewh concacal form, and producing the conieal ring. The latter is placed, larger forced into it, which forces the smaller edge of the ring outward, whil the taper of the cavity of the die forces its longer edge inward, and pro-
duces a ring convex upon its inner surface and half round upon its outer urface. The ring may then be finished, enlarged, and sized in the ordinar manner.

## Improved Pencil Case.

Samuel S. Rembert, Memphis, Tenn.-This invention is an improvemen calenar pencli cases; ; and consists in providing the case with a perfo
rated cap and a scale of fineal measurement, whereby the same is adapte to be applied to pencils of any length and to be used as a rule or measure in
lmproved Machine tor Sawing Laths.
Alexander Rodpers, Muskegon, Mich.-This invention consists of a gang tircular saws on a horizonral arbor, in different sizes, with an incline awn obliquely to the sides, to produce bevel edged strips by saws on horizontal arbor. The invention also consists of one or more feed rollers made silightly conical, and provided with spiral ribs arranged to force the
Improved Glove Fastening.
Horace P. Carver. Binghamton, N. Y.-This Inveation
Horace $P$. Carver. Binghamion, ported firmly by the projecting parts op a plate attached to one side of the the other which catches between coiled parailel springs of a plate attached to the supporting side plate of the pin on the ends of the springs, firmly hold

Improved Adjustable Scaffold.
John S. Tilley, West Troy, N. Y.-For adjusting the scaffolds of wall
 the room, it is proposed to have shont trestle heads mountec on three legs,
with a vertically adifusting standard in each head having a fastening to with a vertically adjusting standard in each head having a fastening to
hold it at any hight, and having a couple of plates clamped to it at each side near the top, so that they can De readily adjusted to form, with the standard, a T het:d whereon the scafold boards may rest fatwise, when, standard, a T het:d whereon the ecafold boards may rest fatwise, when,
as in the case of deco ating cellings, it is desirable to build broad scaftold by laying the scaftold boards or planks, extending from one trestle head to another, and arranged edge wise to suppart the scaffold boards. In order to
pack the bencles the legs are jointed to them so as to fold over on the side pack the benches the legs are jointed to them so as to fold over on the side
When in use the ends of the legs bear against the walls or shoulcers of th notches, and so transmit the force directly from one to the other withou ${ }^{1}$ njury to the joints.

Improved Box Scraper.
Abraham Tester, Brooklyn, N. Y., assignor to himself and John Cunnigg am, of eame place.-This invention has for its object to constructa scrape
which is used on packing boxes. ships, etc., wlth a movable blade, so tha the same may be sharpened when worn, and adjusted to a suutable angle fo use in any desired position. The invention consists in pivoting the blade to the bifurcated handle of the instrument and in connecting it therewit and rigidly held theren.

Improved Invalid Bedstead.
Madison Station, Miss.-This inven
John Rohinson, Madison Station, Miss.-This invent'on consists of an be raised and lowered gently and gradually part of the be extent, so as to change the position of the person lying upon the bed. To he head parts of the slats is secured a cross bar, to the lower side of the ads of which are altached sockets to receive the apper end of rods, the another rou, upon one half of which is cut a right screw thread, an on the other half a left screw thread, so that when the latter iod is turne in one direction the nuts may move to ward each other; and when the sald od is turned in the other direction, the said nuts may move from eac other, thu
desired.

Improved Metal Window Sash.
on consists in making th val headed T shaped moldings for show windows by first forming an ova he head of the molding, by forcing the head through a die of sultable form in the manner of forming lead tubes. Second, in drawing the silver plated ver of sheet metal upon the sald lead bar, by forcing a flat strip of th soldering the iton bar which constitutes the vertical portion of the T to th ie id bar by beating one edge of theiron barin a bath of solder and tinning it at the same time, and then laying the tinned and heater edge in the the lead bar sufficiently to cause the union of the lead with the tinned sur ce of the iron when they become cool. Fourtn, in making a cheap bar or molling fur inferior work, where ths plated molding will be too expe sive, by uniting the lead and metal bars, as above described, without the Improved Mirror Holder.
William Simpson, Beriin, Canada.-The object of this invention is to sup ply a neat and simple deviee by which a mirror may be suspended at an
desirable inclination toward the wall. The invention consists of V . holder, of strong wire, bent forward and attached to the sides of the frame of the mirror in such a mann er that the same may be inclined at pleasure.

Improved Apparatus for ©craping Hogs.
Orison McNell and Peter W. Dalton, Jersey City, N. J.-This invention hain, the last being used for carrying rollers with scraping blades and the blades.
Jacob L. Ring, Mt. Pulaskived Heating Stove.
f combining the main extends from beneath the stove hearth into the hot air chamber, which 18 arrcunded by the drum, leaving a space between the two, from which the moke and gaseons products escape to the chimney. On top of the a ated ring. $\Delta$ lug is on this ring by means of which it is turned to allo the discharge of air from the chamber. The air tube may estend rp from he hot air chamber and conduct a current of heated air to any part of the d welling. It is surrounded by the fuel in the fire box, and an active current,
through it and through the chamber, is produced by the intense heat to hrough it and throug
which it is exposed. John F. Winter, Broved Paper File. Ish an improved paper file for blading letters, buls invention is to fu ets, sheet music, etc., in a simple, elegant, and quick manner, without tea ing, defacing, or otherwise injuring the papers or documents. This :nven on consists of a square, round, or polygonal piere over which stinngs are
ongitudinally stretched in suitable manner, which, in connection with teral binding strings placed over a grooved or recessed part of the mat lece and a thread and needle, bind the sheets in a manner similar to tha of binding books.
Improved Cotton Gin Knife Roller.
Thomas
R. Rushton and William Dobson, Bolton, England.-This inven Ton consgsts in a cotton gin knife roller provided with blades having two
or more angles arranged in line witheach otherin the direction of the shaft heir inclined parts being parallel to each or her

Improved Sap Frotector
Henry C. Cole and Edgar D. Sabin, Wailingford, vt.-The object of this nventiou is to provide means for protecting maple sap, as it is caught in buckets from the tree, from snow, rain, leaves, etc.; and it consists in a
creen or cover attached to the tree and to the sap bucket, and covering he latter
Laurance Bryan, New York city. This invention is a toy for children which will furnish not only amusement but exercise: and it consists in That is known as the "child's whe:l runner "combined with a whisile,
he wheel being made to operate and blow the whistle as the child pro pelsit.
Improved Apparatus for Moistening the Atmosphere. James G. Garlaid, Biddef rd, Me.-For mois ening the atmosphere
weaving and other rooms, it is proposed to employ an atomizer, air cham g pump, a water cistern, reservoir, and an automa egularly and uniformly, to be expelled to the atmosphere by the air from the air pressure chamber, in which it is condensed by the pump. In com-
bination with the reservoir and cistern is a filter to separate frou the ater any solid particles that might obstruct the pipes of the atomize tomizers will be applied to one air chamber and ctstern as may b emanded by the capacity of the room to be charged.

Improved Machine for Cutting Tobacco.
Francis S . Kinney, New York city.- This invention has for its object to ructed with a single knife working upon inclined bearings, and operating with a sliding shear cut upon the tooacco, which is placed in a box with bottom parallel with said knife.
Improved Die for Making Watch Case Caps and Backs. usual form and ma'erial, but having, instead of a flat surface, an elev tion, which graduallyincreases from the circumference toward the center ucing a perfectly flat even plane, more accurate than if spun out. It is a importa
watehes.

## Improved Double Acting Force Pump

 John P. Flanders, Vergennes, asignor to nmself, Elif B. Hayes, of sameplace and $\mathrm{H} . \mathrm{M}$. Mitchell, Burlin ton, Vt.-The cylinders are arranged on each side of a wide bed frame, and bet ween them suction pipes are ar-
ranged, risiag vertically from the well and connected to the cylinders by ranged, risig vertically from the well and connected to the esylinders by
horizontalbranches at the upper ends above the check valves. Four ids. charge plpes rise vertically a short distance above the cylinders, and there contlnue by curves above the check valves into a discharge box at the
bottom, where the check valves are arranged to prevent the back flow These pipes support the dsccharge box and the air chamber. For packlng the pistons, the barrels in which they work are divideed in longitudinal parts with lap joints at the edzes, 8 that they can contract and expand a
little without opening seams for the escape of water. $A$ small annular iltte without opening seams for the escape of water. A small annula
channel surrounds the barrel, in which is maintained a high degree of pressure by water admitted through a pipe connection. To hold the barrel in position and allow them to be free to expand and contract, notches are formed in the shell in the cylinder, and lugs in the barrels, which project into the noter

## Improved Table Dish Stand.

Fiorlan Grosean, New Yord citcy.-The essential feature of the invention
Is a stand or tray for dishes, of which the top or plate is composed of is a stand ortray metal wth a porcelain cover or enamel, the enamel being to conceal the fron or glve it a fine finish, and form the ground work for fine picture ornamentation by the decalcomanic or other process.
 of stop valeves sin Whith two disks are arranged to move forwardand cacks
ward at right angles to the water channel in a coamber through which the
 channel passes at openings on opposite slees whereat
for the disks, and on which they are caused to press tighty when moved upon them.

## Improved Egg Carrier.

John A. Beam, Cailiforniar, Mo.-TThis invention consists of a strong wood box in ten compartments, or tiers of paper cells, adapted to hold an egg
upright, on the large end, the cells being formed of a paper cylinder and apright, on the large end, the cells being formed of a paper cylinder and
pasted or otherwise fastened together at the stides. Between each tier of tie cells, alss between the upper and lower tiers and the box sides, are
cusbions to soften the shocks. The rows of cells along the sides of each tier are proteteted from the shocks agionst the side walls by springs. The sidee
 ng on them, so that the eggs are secured against Iying on the sides while in
transit. some of the end projections of the case constitute handiles for transit. Some
handung it.
William Gulllan, Speeter, Minna.-The object of this invention is to furnish William Gulillan, Speier, Minn.-The object of this sinention is to fornish
a horse power for thrashing grain and ocher purposes. The cogs of of bed
 gear wheels, which are on a horizontal cross shaft. The power is applied, to
arevolving frame attached to the cross shaft by stands, by means of levers. arms connect the rim of the frame with the centrac ap. . ravererse wheels.
attached to the frame revolve through slots tin the rim of the fram attached to the frame revolve through slots in the rim of the frame and
rest upon the top of the bed wheel, and thus prevent friction. The internal part of the vertical wheels engage with other wheels. The exterior cogs of
the vertical wheea engage with the cogs of the bed wheel and thus the vertical wheeamengage with the cogs of the bed wheel, and thus impart motion to the centralvertical shaft.

Improved Washing Machine.
Moses L. Hawks, 1 , 1nderheork, Mich.-- Trisin invention has for its object to
furnish an Improved washing machine of that classin which the washing is furnish an Impored washing machine of that class in 1 which the washing is
done by oassing the ciothes bacca and forth between rollers, and which shanl
wash the cothes aickly and toroughy wash the c.tothes quickly and thoroughly and without injuring them, and
without becoming clogged. A large upper roller is corrugated longitudiwithout necoming clogged. A arge upper ronier is corrugated 1 ongitudi-
nally, and to it is attached the cranks by which the machine e ts operated. Four small rolliers are placed beneath the large roller. By sutitable con.



Improved Washing Machine.
Jacob Sheffer, Deselm, III.-In using the machine, thie clothes are placed
upon a false bottomid around a rotating vertical cyllinder. The handle 18 grasped in the left thand to apply pressare, and a vertical roller, helel between
pivoted bars, to which the hangle is attached is revolved with the right hand by means of the crank. The cylinder holds the clothes out so that they
 Whe seidn cyrinder pushing the lower part of the clothenes in beneatht the mass,
to that they will be continuoully turning over. The outer part of the bot. so that they will be continuously turning over. The outer part of the bot.
tom, as it is rotated by the roller, moves faster than the inner part, so that tom, as it is rotated by the roller, moves faster
the clothes will be rubbed as well as pressed.

Improved Last Block Fastencr.
Asnland, Wiss,-Thls invention consists of
 block in connection with pin fastenings of the same.

Improved Water Elevator.
Sylvester Bennett, New Orleans, La.-This invention consists of a station.
ary case in the form of a hollow inverted truncated cone, inside of which is a reviliving inverted cone with one or more siral lianges extending from
bottom to top, and apparatus for revolving the inner cone for raing bottom to top, and apparatus for revolving the inner cone for raising wa
short distances in large quantities, for draining purposes and the like.
Willam J. Saffery, Brempen, Olio.-This Invention.
Willam J. Safery, Bremen, onito.-This invention consists in corrbining
furrow opener, a seed dropper, a rolling coverer, and a guano or manure a frrow, penen, a beed dropper, a aroling coverer, and a guano or manure
dropper, so that, between the seed and the guano, there will
dimways bea small layer of fine dirt to prevent the destruction of the vitality of the
seed.

## Charlie D. Rathbone, Belpre, Ohio.-This Invo

Charlie D. Ratthbone, Belpre, Ohto.-This Invention consists of a novel
construction and mode of applying a bush or lining of glass or other hard oonstruction and mode of appy ying a bush or lining of glass or other hard
and durable wearing substance in the pump cylinder or stock to sustain the wear of the sucker or pump barrel.
Jonathan' V. Taylor, La Cygne Cye, Kansas - Bottom.
palrs of bars about half as long ase the bed, itixed at one end on a transverse
 other to the foot, and connecting wild cross bars thereat. One cross barat
the head and one at the foot are aech connected by several tension straps of strong fexible material arranged thove the pivot. and sufficiently shor to support the arma sand cross bars, and any weight that may be placed on
them above the horizontal plane of the pivot. At tach end there is a stop bolt which limits the hight to which the end may be raised, and thus pre vents the other end from falling too low. In connection with the above are
the arms provided p :ith springs at the pivot to increase the range of springing action of the bootom.

Improved Floor.
Levi S. Wood, Marion, Yow. -The object of this invention is to provide
 with brige blocks titted between the jiotsts on one or both sides of each
rod. Nutson the rod are turned up, giving the rod any required degree of

Improved Sharpening Machine.
James P. Kealy and Joseph Bigney. Bridge Mort, Conn. - This Inventionts
machine for dressing lathe centers, and consists of a traversing grinder actuated by an automatic feed screw and placed in a frame adapted for beng supported in the tool post of a lathe.

Improved Equalizing Attachment or Plows.
David H. King and William M. Hulse, Palmyra, Ill.-This invention con.
sitas in an improved metallic loop attachment for hold sistsin an Improvedme tallit loop attachment for holding the equalizing
appartasu of a plow, and also in in applying a guard bar to the chains used in

Improved Fireproot Shutter.
Isaac s. Mettler, Jersey City, N.J.-The object of this it tect buildings from fre, and it consists n a metallic, shield composed of sliding sectionsformed of an inner and an outer sheet of metal secured to gether at top and bottom by ylates. The sections are connned in grooves on the inner sides of the casings, each section having grooves of its own.
A cross the top of the ehield, beneath the cap of the cornce Across the top of the shield, beneath the cap of the cornice, 182 shaft hav-
ing a pulley near each end, over which are cords attached st one end to the lower section and at the other end to $a$ weight. An inwardly projecting fanere extend and rom each section into the groove of the adjacent teection,
so that, when the lower section is raised, its top strikes the flange of the so that, when the lowern section 1s raised, its top strikes the fange of the
next above and raisest hat, and so on, each section reing raised by the sec next above and raises shat, and so on, each section being raised by hhe ee
tion below, so that all mayy be securely packed beneath the cornice and back of the frieze plate. The weights are intended to balance the sections
in that position. At night, or whenever thereis danger from fre from the burning of adajacent buillidings, the shield is drawn down, thus forming a
are protector to the wido ire protector to the window or door.
Improved Waste Removing Device for Carding Machines.
George W. Craner, Darby, Pa.- - This invention consists of a brush and an endlesscarrier for it combined with the burr box of a carding machine, in
such manner that it brushes out the burrs, and, by keeping it clear of such manner that tit brushes out the burrs, and, by keeping it clear of
them, prevents it from filling and the burrs from overflowing upontie them, preve
main card.

Improved Insect Destroyer
Nashylle, ohio.-An axle ts turn
John A. Finney, Nashville, ohio.-An axle is turned by drive wheels, and by suitable gearing actuates an endiess belt which carries the insects forward. From the belt the tnsects drop into a hopper placed beneath a
roller to receive them, and which has a slot or opening in tts bottom, through which the insects drop tnto the angle between the revolving axie
and theroller bottom of the box to the ground. A reel operated by the advance of the buttom of the box to the ground. A reel operated by the adarance of the
machine pushes off the insects. As the reel arms come in contact with the plants, the ends of the hammer handies slip from a stop bar, and the nam.
mer heads a:e drawn by springs against the reel arms with a sudden blow, mer heads a aed drawn by springs against the reel arms with a sudden bow,
knocking the insects from the piants upon the inclined apron whence they knocking the Insects fron
pass to the endless belt.

Improved Dredging and Ditching Machines.
he Gonellaz,Vermilionville,La,-In the aredging machin Hyacinthe Gonellaz,Vermilionville,La.-In the dredging machine, a bucksame in ventor, No. 130,213, dated August 6 , 1822 , are arranged so that the wheel mounted at the bow of the boat revolves in a plane at right angles to it, and dellivers the earth at one side, and the pan carrying it it the same
direction delliversit on the bank of a canal or river. They are by virtue of direction delivers it on the bank of a canal or river. They are by virtue of
such arrangement specially adapted for drenging rivers and canals. In this such arrangement specialy adapted for drengign rivers ance and. .
case also the colters used for cutting and loosening up the earth prepara-
 of the wheel, and so inclined as to draw the boat forward at the same time
that they loosen the earth. The ditching machine, the subject ot a sepathat they loosen the earth. The ditching machine, the subject ot a sepa-
rate patent, consists of a series of intermittingly rotating colters preced-
 operating devices, combined in a portable machine, and provialong the ground, the cutters loosen nnd enen up the ground, the buckets raise and discharge it into the pan, and the pan ansin of the ditch.

Improved Furniture Spring.
William T. Doremus, New York city.-This tinvention has for its object to furnish an Improved spring for application to other parts of a chair, spring
bed, or other piece of furniture where $a$ yielding connection is required Upont the lower side of one edge of two p pates are formed in wardily yroject-
ing tinges, in which are formed a number of holes to recelve the screws by
 which they are secured in place. In the plates are formed holes to recelve
the bar, which has a pin in a recess formed in the upper eide. $A$ rubber hiock, of any suitable form, is in interposed bet ween the pates, through
which is a rod which forms the hinge, and which is provided with a nut to regulate the tension of the spring. The same inventor has also patented ano
ther form of chair spriug which consists in flanged plates, nnged togethe, by a transverse bolt passing through suitable lags. An india rubber block
ss placed beneath the axis of the hinge. These are only two patents out of more than one doz

## Value of Patents,

 and how fo Obrail reili. Practiond Iints 10 lirationsROBABLY no investmenc of a small sum of money brings a greater return than the expense ircurred in obtaining a patent
even when the invention is but a small one. Larger inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelof, Colt, Ericsson, Howe, McCormick, Hee, and
others, who have amassed immense fortunes from their inven. tions, are well known. And there are thous.
have realized large sums from their patents.
 of the services of MuNX \& Co. during the TWENTY-SIX years Thev stand at the head in this class of business: and their large corps
of assistants, mostly selected from the ranks of the Patent Office: men nap. of asistants, mostly selected from the ranks of the Patent emice: men nap.
able of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent oftcee enables $M T N X \mathbb{C N O}$ Co.
to do everything appertainng to patents BErTER and cris Pri than any

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OBTAIN $P$ ACDEAB This ts the closing inquiry tin nearly every eletter, descril ing some invention which comes
0 this office. A positive an.

 malities must a:so be observe.. The efrorts of the invent or to do all this
business himself are generaly. without success
 business, and have all the worl done over again. The best plan is to $\in$ olicit
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tha improvement ts poobabiy paientable, and will give him all the directions the $\dot{\text { improvement tis probabiy }}$
needfui to protect his rights.

## How Can I Hest Secure My Invention?

This is an inquiry which one tnventor naturally asks another. who has had
some experience in obtantng patents. His answer generally is as follows. cond correct:
and
Construct a
Construct a neat model, not over a foot In any dimension-smaller if pos.
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of a patent will be received, usually, by return of mail. It is sometmes
best to nave a search made at the Patent ofitce. Such a measure often save the cost of an application for a patent.

Preliminary Examination.
In order to have such search, mase ouca written description of the inven
 due time you will receive an acknowledgment thereof, followed by a writ ten report in regard to the patentability of your improvement. This special
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ents of which his composition consists. These should be securely packed the inventor's name marked $c \mathrm{n}$ them, and sent by express, prepaid. Smal models, from a distance, can often be sent cheaper by mail. The safest
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## 

A. M. C. asks: Is there anything which vanizing process, but which is less expensive?
H. J. H. ask: What is the best composiT. B. C. wants a recipe for sticking emery on tin. ". Therer
will not hold."
H. F. U.asks for the exact proportion of in M. C. asks: What is the process of grain M. C. asks: What is the process ond wat colors are used by painters in do
ng ait in distemper?

## 

C. T. S. can preserve his composing stick or


 Gueestion as to the weight on a safety valve answered in sult the makers of wind ilils. His query about slip of

belts 1 s answered on page 380 , vol. 28.-J. L. R. can try | $\begin{array}{l}\text { belts } 18 \\ \text { the m m } \\ \text { water. }\end{array}$ |
| :--- |

$\underset{\text { ssue through a round hole, one elghth inch long and }}{\text { W. C. . . asks }}$ one sixteenth of an Inch in dameter, under a pressure
of 100 bse. to the square inch; and what would be the of 101 irs. To the square tinch; and what would be the
difirenece In the elocity provide the diameter of the
hole be increased to one elghth inch, the pressure and hole e in increased to one eighth inch, the pressure and
tength of rone remanning the same? Answer: See edit orial pages of this 18sue.
W. . H. S. asks how to precipitate gold, sil-
er, copper, nickel, and platinum from golutions. wers : To prectiptate gold, add a strong solution of ferrous sulphate, or sulphate of iron, to a asolution of an
salt of gold, ast the chloride prepared by dissolving gold in aguar ejiai. The gold is precipitated as a brown
powder. Silver 1 s preciptatated in themetallic state from the chlorde, made by dissolving silver in aqua regia
by Iron. Add clean pieces of ron to a onution of the a solution of blue vitriol, sulphate of copper. For me.
tallic nickel, , Irst add a strong solution of oxalic acid to a strong solution of sulphate of ncekel. Collect the pal
 solve the metal in aqua regia (a mix ture of muriatic
and nitric acids), prectpitate with a solution of sal am moniac, and heat
spongy platinum
N. J. N. asks: 1 . How can I calculate the stationary enenine? Ins atrone inch exxanaus large enough
for an engine of 12 inch bore and 20 inch stroke, with
 What is the accompanying specimen composed of? 3 . Will it tafect the water tin the boiler to put in the carcass
of dead mule, in pieces? 4 . How can I compute horse of a dead mule, in pieces? 4 . How can I compute horse
power? Answers: 1. Consult "Link and Valve Mo tions," by w. s. Auchincloss. 2. Some compound of lime, probably the carionate. 3. We never heard of
plan before. 4. See answer to M. C.,on this page.
J. R. K. says: 1 . We want to carry the the
condensed steani from an engine into a tub eight feet deep, for the purpose of bolling straw. What per cent
age of power dowe lose on the eng.nes?
2. We have $a$ 4 feet long, with sta feet tigh, with very 1 oor draft. The boiler is situate in
a hollow; the hill on one side is about as high as the a hollow; the hill on one side is about as high as the
stack, the other twice as high. Can you suggesta $a$ rem.
 densed steam does not have to be raised, to be put into
the tub. 2 . Probably a mechanical draft, by a blower, will remedy the trouble.
J. P. C. says: I use a small vertical porta-
ble engine and boiler, and sometimes I have to carry 100 118s. steam to do the work. The boiler is 56 Inches high
28 outside diameter, with 24 one and a half inches tubes. The frebox is 18 inches diameter $x 22$ inches high. The midddele gage is is 99 ninches from bottom of boiler, and she
steams best with water at that hight. I use if wood for steams best with water at that hight. I use fir wood for
fuel, which makes an intense heat. Am I safe from
hen fuel, which makes an intense heat. Am I safe fro
heating the tubes too hot with the firebox full of wood, aend water at middale cock, 13 inches above crown sheet?
Evaporation is rapic and steam is pretty wet if carried higher. The bolier foamed so badily that I could not tell anything about the hight of the water. I fancied
that the oll which got in around theplunger of the force
 something I I Nce saw in the Sornsiririo since then
have been very careful to keep all oll out and have never been troubled with foaming in the least, at any
rpessure from 20 to 100 bbs. Answer: If when the engin
is tn motion, the water issues solid from the lower gage
cock, there is no danger. It 18 only when bollers have cock, there is no danger. It it only when boble
such bad corrulation that the tubes or crown she
left bare that there is s sanger from heany fring
H. B. \& \& K. ask what kind of dryer is best
to put in coal tar, in making gravelroof. To put in coal tar,in making ag
T. S. S. asks how to make and bleach skel.
etonized or phantom leaves. Answer: Boil the leaves In a weak solution of caustic soda for some hours. wash
thoroughly and then expose to the fumes of sulphur.
 he pressed drom sheet metal or ortherwise. They, are
required to spring $3 /$ inch and not to rust, and to be as cheap as possible. Is there any metal cheaper and bet
ter than sheet spring steel? ter than sheet spring steel? They can be tinned or
galvanized to prevent rust. Answer: Spring steel will probably be the best material for you to use.
G. says: Some bins containing soft crushed
sugars are full of litte red ants ; I would like to know why they select that sugar from the other stinds, and
ow wecanget them out? Answer: A plentiful suply of what is known as Persian powder, around (not in) or what is known as Persian powder, around (not in
the sugar bing, ㅍll prevent the inroad on ants. Sugar
bins should be made of hard stout plank, with closely bins should be made of hard stout plank, with closely
fitting covers, and kept perfectly clean. If they could tight, so wuch the better. The only way we can suggest
the mer to you, for getting rid of the ants already in the sugar, is to spread it out in thin layers and pick out the ants by
hand. The ants prefer the brown sugar, probably on
R. W. W. asks how to clean a carpet which suds: and to remove a sour smell, it was washed with
soda water. " The color remained good until, toremove soda water. " The color remained good untili, to remove
further odor, I poured on bay rum ; that operation turned it a light green color. The orisinal colors are ground." Ansmer: We arvise you by anllmeann to dis-
continue the use of soda water and bay rum on the carcontinue the use of soda water and bay rum on the car-
pet. The alcohol in the bay rum has probably so dis. pet. The alcohol in the bay rum has proobal so ars.
solved and spread the colors that there is no remedy.
To To remove
bolic acild.
W. H. R. asks: 1. How great a vacuum can
 g.ass answer for artificial stone exposed to the weather 1y, if fiven by quanatity of gunpo wder or other com busti-
ble
Answers : It d deends on the relative size of the bie? Answerss 1. It depends on the relative size of the
reeiver and connections. With the cylinder alone, recelver and connections. With the cylinder alone, if
the piston is tight, a nearly perfect vacuum can be pro. the piston is tight, a nearly perfect vacuum can be pro.
duced, with reference to the air. 2 . No, if the trap is

 strain, and then the pressure per square tinch that th will
sith In tnches by the safe strain, and dividing it by the diam.
eter of the tube in inches. This 18 for thin cylinders. For thick on June $21,18773$.
A. . ask
A. S. asks how to bleach and cure palmetto
grass. Answer: Steep or boll the leaves in a weak solution of caustite soda, , wash thororoughly, and then expose
them to the fumes of burning sulphur in a close cham.

H. R. asks: Is there such a thing as scag.
Hiola? If so, where can I get it, how can I m ase it, and what 181t used for? Answer: Scagliola is a species of
stucco made with the best plaster of Paris and a weak stacco made wrth the best plaster of Paris and a weak
solution of Flanders glue ; it is colored according to taste. This composition is often appliied upor hong how
column of wood, and the surface, when hard, can be smoothed in a lathe or polished.
A. H. C. asks: What is the cause of white sugar Hashing like a glow worm when yon run the scoop
into it? Answer: The cause of sugar flashing as you describe, is probably owing to the electricity de
by the friction between the scoop and the sugz
C. E. asks: What is the difference betwe for the yeur 1.773? Answer: The magnetic north is
P. D. asks: By what means flowers, leaves and other vegetable matters are deprived of their col-
ors, that is, bleached or whititined, for introduction into
 burning sulphum tn na a close e evsel, care beting taken to
prevent the heat from reaching them. W. A. S. asks: 1 . What formulx are used
in measuring safety valives of different sizes?
2. How Mo you go to work after you get the figures? Answers 1. Measure the dameter of the valve, in inches-square
his and multiply it by the dectmal 7 -754; ; this will give the area of the valve in square inches, Find the weight of the lever, and the distance of its center of gravity
from the fulcrum. This can be found by balancing the lever on a knife edge. We call the distance, the lever
arm of the lever. Weigh the valve, and measure the dis. tance from the center of the valve etem to fulcrum,noting
that all distances are to be measured horizontall, that all distances are to be measured horizontally. This
is the lever arm of the valve. Find the number of pounds
In the weight, The distance of potnt of suspension of
weight from fulcrum is called the leverarm of the weight. weight from fullerum is callee the leverarm of the weight.
2. Having obtanned these figures, make an equation, 2. Having obtaned these ingures, make an equation,
thus: Pressure of steam in pounds per square tinch $\times$ area of valve in square inches $\times$ lever arm of lever) + (weight of valve $\times$ lever arm of valve:) equation will determine that part.
E. M.K. says: 1. How quickly can a 35 horse power engine be sopped
per minute with 7 libse steam? ?
 put above the governor in the steam pipe ; ts thatright? 4. How can I reverse an engine? 5. The boiler is to
arry 751 lbs steam. There 1 s a 4 y 1 lbs . Iron welght added to the safeety valve. When it it offif steam blows off at 75 1bs. by steam gage. Is this right? 6. Is there water or ofl used on emery. stones and whells, and how are.
they turned off? ? Are the toads that stay around gar. dens poisonous? Answerss 1.1 .1 depends sina great meas-
ure on the weight of the moring parts, but under ordinary circumstances such an engine conld be saiely
stopped in 15 seconds. 2 . If it is boo, closed at both ends, heat the journal, cover it with a piece of olled
writing paper, place it in the boo
metal. If the place is open at the bottom, after putting
in the journal stop the opening with clay, and proceed
as J. Yes 4. Arrange stops for the eccentric so that it will be loose on the shaft, between the post.
tions for ror ward and backward motion. 5 . We think
Jon had bet you had better remove the extra wetght. 6. There are
emery wheels made to run in oul and water. Unless enery yheels made to run in orl and water. Unless
they are specially prepared, thes siould be run dry. 7 they are specially preparea, the sinould be run
so far as we know, uuch toads are not polisonous.
$\underset{\text { storm glass? }}{\text { J. }}$ 2. How can I expel fleas from a cat that ig filled with them? Answers: 1 . Put the following ingre-
dientsint dientsinto long and narrow bottle: one quarter ounce
camphor, muriate of ammonia, dissoved in 2 ounces of alconol
Cover the mouth of the bottle with a piece of bladder containing a puncture made by a fine needle. 2. Boil tion.
$\underset{\text { made from? }}{\text { M. . W. Does it, when ignited, leave any and sedi- }}$ ment or ash? 3. Can gunpowder be it innted by a c crrerent
of electrictity without tie conducting wire touching it? 4. What will be the pressure of one ounce of common gunpowder, when ignited in a cubic foot of space? 5
 fulminating powder per ounce, in a cubic foot of
space? 7 . How many cubic feet will one ounce of common gunpowder fill, if exploded in a cyllinder or will be only the a tmospheric pressure of one square foot to suptain? 8. Will sulphuric acid keep thk from moldIng? 9. Will a pocket compass lose tits magnetic power?
If so, how long willit take and can the
 and glycerin. 2. No. 3. Yes, if the powder be confined.
4. One ounce gunpowder equals about 1 cubbic inch space, and expands at the moment of explosion, as esti. mated by conpenetent chemists, , 2700 times, or toabout $1 / 2$
 square tich. 5 . Nitro-glycerin has 13 times the explo-
sive force of gunpowder, therefore the pressure of one ounce may be estimated at 293 lbs. per square inch above termined. 7. At moment of explosion 11ヶ cubic feet After the gases have cooled, , onwever, probably from $1 / 2$
to $1 /$ of this. 8 . The effect will be to corrode steel pens. to 1 of this. 8 . The effect mill be to corrode steel pens.
9. It will not, if n not tampered with. When lost, the magnet
C. G. G. says: I wish to dip an ice cellar
nearmy weil of excellent water. If $Y$ drain the cellar through a filter, into the well, will the water be affected
hurtully? Answer: We would advise you by no means
ho to drain your ice enouse, ven throus a filter, into your
well. Fultered water may hour
 M. C. asks: 1. How can I find the power of
a steam engine by plain arthmetic?
2. I want a plain Fule for finding the horse power of a tubular boller. 3 .
Winl the for fnding the capactity of a plunger pump? 5. Which would be the proper place for an air chamber of plunger
pump, on suction or force side? I propose to attach it to relleve a very heavy trumpng. . . What causes a
vacuum tn steam crlinder, and how can it be revent Answers: 1. Multiply the diameter of the ceslinder in
inches by the decimal 7854 ; multiply this by the number of revolutions per minnue, and by twice the length of
stroke in feet and divide the result by 33,000 , the number of square feet of heating surface by 15.
h.
Only only approximately to eny. We do not know of any
absolute rule, except a practical test. 4. Multiply the absolute rule, except a practical test. 4. Multiply the
diameter of nlunger in feet by the length of stroke in feet, and by half the number of strokes per minute, and
you will get a rough approximation of the number of cubic feet dellivered per minute. So much depends upon
the construction and location of she cult to give cult to give a general rule that is reliable. 5. On delivery
side generally. 6. The condensation of the steam. It side generally. 6. The condensation of the ste
cun be destroyed or prevented by letting in air.
$\underset{\text { mechanics to studj mathemetics. Will you tell me how }}{\text { J. How }}$ long it will take to make a person suffciently posted on
the subject, provided that he has an average amount of brains, a good general knowledge of arithmetic, no knowledge of algebra (or very slight), a fair amount of
perseverance, his nights only to study, and no funds to emilloy a teacher? What work would you advise me to
commence with? Answer: commence with? Answer: A great deal depends upon
making the right kind of start, so as to know how to study, as well as what to study. In algebra, we would
recommend Davies' "Bourdon," and in geometry, trigo nometry, and the use of logarithms, Davies' "Legendre. Each book costs from $\$ 1.50$ to $\$ 2.00$, and to master their
contents thoroughly will require, with the limited time afforded you for study, from nipe months to a year. But you will have gained a recompense; for avenues of great
benefit to your business will be opened to you, which would otherwise have been as sealed chambers. In
commenclng your studies, remember that it is not sc much rules, as methods, that you wish to acquire. Al.
ways proceed on the principle the the book is wrong and must be proved right; and get practice continually A. A. D. says: I am constructing a rotary
engine with 4 vanes, each of which has $2 \cdot 8125$ squarr inches area; it is constructed on the eccentric principle
and is to work on expansion, with 50 lbs. steam pressure and to make 200 revolutions per minute. Would more vanes create more power? What sized boiler would it
require, and what kind of boiler. of plate fron or copper for efficiency and cheapness? How much fire surfac ought it to have to make the most steam and be the
most economical? Please rate the power of the abovt engine, and give a reliable mode of calculating power
rotary engines. Answer: We cannot answer the questions without receiving more data. To calculate the power developed by a rotary engine, multiply th1
piston ares that is acted on continuously by the meal pressure of the steam throughout the stroke. Multipl:
this by the mean piston speed in feet per minute, ani divide by 33,000 .
$\underset{\text { er lscker applied to small articles of wire, such as fllst }}{\text { E. A. . . asks }}$ hooks, hair pins, etc., and of what is it composed? An
swer: Add to 2 lbs. asphaltum (fused in an iron pot) ho boiled oll 1 pint; mix thoroughly, remove from the fre Apply with a varnish brush.
F. B. T. asks: What should be the size of
water wheel, and of the stream of water to run ; sewing machine? The water is supplied throngh host
to a tank 8 feet above ground. Answer: There are a number of sewing machine motors, driven by water, it
the market. Correspond with their manufacturers.
V. R. H. asks: How can I make india rub-
ervious to kerosene oll?
Answer: You cannot pre : kerosene a atacking Indiar inber where it comes in
et contact with it. still good rubber, well vulcan ought to last long enough to make its renewal ought to last long enoug
valas not very expensive.
A. H. asks: Is nickel plating a surcess
general thing, and can zinc be successfuly plated
 19 no known method of plating $z \mathrm{zinc}$. The acid
used is an obstacle, the aclis attacking the $z$ inc at
P. G. asks if the dry heat of the Turkish an body can with htand for some time a heat far
an that of the Tursish bath, 200 Fahr, 1 the medum e that of the Tarkish bath, 2:20 Fanr.,1t the medium
at of hot dry air. The rapid evaporation from the ice of the body yreventrs she internal heating of the 1. If the air be motst, ho wever. or the medium of
be steam, a temperature considerably below 2120 $\underset{\substack{\text { man } \\ \text { man }}}{\text {. }}$
F. A. asks: 1. How can I melt old compo-
 gradients s. sed in makent the e omposition roilere by deorators for looking glass frames, etct, is
Answers: $:$. You can melt composition rollers acing them ina vessel surrounded ty y boiling water, the ordinary ylue pot. When melted, you can pour
0 molds. 2. Dissolve, in two pounds of molasses molds. 2. Dissolve, in two pounde of molasseen
at heat not above that of bolling water, one
 cosaic gold", a bisululphuret of tin. This is mixed arnish and appiled to wooc.
S. B. asks how to recover diamonds from ne, or $\begin{aligned} \text { ang subs tance that will remain tor a length }\end{aligned}$ Re suspended in water, by the following means: de a large tank, fitted with a stirrer at the bottom. the tai k is full of water and the stirrer in motion e debris in as fine powder as possible. Let a pipe off the surpus water at the top of the tank. In sy, with plenty of water, you can wash free fro.
tand lime. E would like to know the rule for find. making 420 revolutions per minate with a belt ruu in 10 noct one; what would be the number or titions of the small one? Wh $t$ is the rule for such astances, are inversely proportional to their dam. If the belt did not slip, wouldae $420 \times 22+10=924$ Hifns a minute.

- H. D. asks: 1. Is an engine shop the what manufacture would you rew mend?
you recompend me to work at lart is set upon, in preference to anythtng else? ars: 1 . Probabl ly a large machine shop would be ra acquiring a general know wedge of the work, on
at of the great variety of macotnery constructed ha place. 2 We cannot recommend any particu-
ablishment. Try and get in a shop where themen courazed by the owners to study and Improve ur favorite pursuit, by all means do so. That the greatest steps towards succeess in life.
S. L. F. Says: Cun you refer me to any take to force water up žo feet high, at the rate of

 tion.
C. C. asks how to take off window glass.
luish appearanee eald to be caused by using creo. 1d sulppur. It makes its appearance while the going through the tiattening process. An:wer:
uish appearance on your glass is probably caused le defect in its mode of manufacture. Too mueh would be apt to cause it. If only on the surface,
ell with whiting and rub off with a linen cloth. R. C. asks: Will a railway head, conrds without alteration? Answer: It will proba. . S sa 3h to convert it into a a steamall. Sheiling is boat feet id of 8 feet beam. What number of horse power
int to run her 12 or 15 miles an hour? What be the size of wheels and what the length, width,
mber of buckets? Answer: See Gimensions pub mber of buckets? Answer: See kimensions pub-
n Scientific Americas for May 10,1873 . in shass: We had a new engine cylinv pattern. The supply pipe and gove rnor are $31 / 2$ is between the ports and cylinder are about $91 / 2$ rea, but the passages above the ports are onty ns area, and still the designer of the valve persists
g that the valve and passages are exactly right. ry 70 pounds of steam and run 96 revolutions per
. I claim that the stiam is wire drawn, and that ot obtain the full power of engine. Please say ts are sufficienily large, and that the cylinder ave more area than is absolutely necessary to


## wire drawing

I asks: What is the effective power
by 24 inches cylinder stationary engine, running olutions per minute with 50 poundssteam press he power that would be available for driving chinery after deducting that necessary to run e itself. Answer: We could not answer this t , but we think the engine would develope from . says: The joint between the cylinder am unable to make a tight joint wita rubber have thort time. It appers to be eaten way by m or tallow. How can I make a joint that will Answer: You can probably make a permarent uttinz a groove and driving a rust joint; but it
ufllcult to break the connection if this is done tish to make a jotnt that can be readlly broken, tie, try some other lubricant; but we have an t , if you will get the joint perfectly tight, you
e no farther trouble.
J. H. H. . Bays : I am using a horizontal cyl
nder boller. 4 feet in in diameter,
fis feet long, with mud

 aken from condenser for boiler. The inside of mu
rum deteriorates oy somethiog eating holes in the sur aree, gome of which are large enorgh to place the end o o
a fuger in. and the. bolts which protrude e into drum from check va:ve, llow-off, etc., are eaten off. The boller y detached when about $7 /$ inch thick. Pressure of steam 50 pounds. Please give your opinion as to the cause of this corrosion or deterioration of mud drum. An.
swer: We have known cases of this kind in which the troune was caused by the lub icating material used in thence tnot the boilier. We cannot say positively that
the corrosion in your boliler occurs in this way, but it the corrosion in
quite probable.
T. E.C asks: How much resistance is re miles an hour? 2. Which is the best putented stea ear brake, the cost of the same, and the cost of keeping tt in running order? 3. In how short a apace of tim
can a car running at the rate of 30 miles an hour be sto ped oy the best brake? Answeis: 1 . The moving forc of the car can be ascertained by multiplyng its weigh
by the square of its velocity, in feet per second, and d ylding by 64.4 Suppose a car, moving 30 miles an hour
weight 48000 pounds. $A$ speed of 30 milles an hour cor esponds to 44 feet per second, and the power rear co to stop the car will be sufficient to raise $\left[48,000 \times(44)^{2}\right]+$ $64: 4=1,442,981$ pounds one foot high. 2. With so many
eompetitors for public favor, it would be out of place or us to name any one as the best. We advise you to
correspond with the difent correspond with
about 10 seconds.
A. W. I. says: I differ from J. E. E. in his
repy to $\mathrm{H} . \mathrm{B}$., concerning the power required for differ ent sized circular saws. He says that "a saw jast larg han a saw larger, the number of teeth speed nos the ress beng equal in each." Nuw I am running thre saws, one 48 ncches with 48 teeth, one 52 Inches wihh 4 . teeth, and one 64 Inches with 56 teeth, all 8 gage in thic
ness ; and $I$ tind the 64 inches savy will cut throug or 14 Inclies cut with less power than elther of th others. Idifler with him concerning the saw with fe
teeth cutting the easiest, as my 52 inches saw with teeth takes more power than either of the others; and
run the same run the same hook to the teeth, and file them all ex
acty alke. My engine is mall and timber large, setiy alike. My engine is smali ind timber large, so
that Inave every facility for finding out which cuts wth
W. E. H. says, in reply to S. N. G., wh asked for a recipe for crystalgold fordentai uses: Tak any gold, the purer the better, roll into thin ribb nns an
dissolve in $a q$ ", rega $a$ or 1 part nttcic acid and 3 part hydrochloric acid, by measure. After action has ceased pour off into a deep glass jar, leaying the silver allog in form of a chluride. Dillute the clear solution of gold with an equal quantity of water, and slowly add a satu
rate 1 solution o protosulphate of ircn in water, which precipitates the gold as a brown powder. Pour off th water, etc., wash hhe powder with several waters, dry
it and amalgamate it with mercary to the consistency o
thick cream. Wash out the oxide found during amal thick cream. Wash out the oxide found during a mal
gamation with alcohol or salt water, and put the mix. ture inté pure nitric acid, setting the dish into a hot sand $\begin{aligned} & \text { thth. The acld dissolvee the me reury, leaving the } \\ & \text { gold in torm of a sponge, which wash with water and }\end{aligned}$ nneal a ca red heat for :2alf an hour to expel any traces
facid or mercury. The porosity will depend on the thickn os of the amalgam. The softer the amalgam, the
lighter the sponge. There are diflculties attending the process, owing to impurity of che..nicals, mercury, etc.
which are so great as to make it impracticable for an amateur to make the gold as cheaply as he can buy ft the market; but the above directions are rellable, as the in er has made severallost from tis form
A. M. asks for an explanation of the word In the early history of our country, all nalls were pounds, shillings, pence and farthings. Each sized nalls were sold by so many pennies per hundred. The usual
 ed oy the price in penties per hundred. When cit nalls werrs introduced, the sizes were still designated by pennies ; and this has ben continued and in all proba-
billty will be, as long as nails are used.-J. E. E., of Pa.
C. F B says: In filing hand saws, the ma the teeth with nure bevel on the back side than on the front, which is caused by the taper of the inle. $A$ few
persons ille their saws towards the point, which more bevel to the front or cutting side of the teeth. nearly square across; the saw will cut equally, well and reanan sharp much longer. The frons side of the teeth
should be beveled to suit the timber; soft wood requies more bevel than hard wood. Answer: The cor
respondent is perfecily correct in his idea of flling


COMMUNICATIONS REOEIVED.
The Editor of the Scientific american acknowledges, with much pleasure, the re. cipt of original papers and contributions pon the following subjects:
On Steam and Compressed Air. By-.
On Retrogression of the Sun. By J.A. B. On the Patent Right Question. By R.H.A., by M. J.. by T. W., and by L. G. J
On a New Motive Power. By H. P. J.
On the Nebular Hypothesis. By E. H. P. On a Shocking Accident. By J. E. E On the Case of Stearns, Hill, \& Co. By J.F. On a Diagram of the Months. By E. B. W. On the Multiplex Telegraph. By J. T. On Steam on the Canals. By S. W. H lso enquiries from the following
 Correspondents whe write to ask the eddress of certann manufaturers, or where specified arlucles are to be had, also those naving goods for sale, or who want to find
partners, bhould send with thatr communications an amount sumplctent to cover the cost of publication under
the head of " Buasness and Personal," which is speciall deroted to such enquiries.

Index of Inventions

## FOR WHICH

Letters Patent of the United States were granted for the wrek ending July 22, 1873

## and each bearing that date.

(Those marked ©r) are relssued patents.]
abdominal supporter, J. W. Gurle Axle and sleeve ror vehicle
Bag holder, C. H. Thomas. Banjo, J. S. Stiles ....
Basket, S. H. Wheeler. Baskets, co ver for fruit, Ingham \& Colby. Beer and yeast, manufacture of, L. Pasteu Bevel, carpenter's, S. D.
Boiler, steam, S. Ritty. Bollers, in jector for feeding, w. \& C. Sellers
Boller injector, w Sellers, Bolt heading machine, J. O. Jones Boot soles, sha ping, J. B. Johnson.... Borlng machine, earth,
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Car coupling, Beddow \& J Car coupling, T. smith Car elevator, coal, P. H
Car starter, C. J. Moor Car wheel, rallroad, w. H. Paige Car window stop, a djustable, C. Pa
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Carriage seat, J. N. Mi ler
Cartridge, loading. T. L. Sturtevan Chair, reclining, E. Collin
Clasp for suspenders, J. w. Smith Cluthes line reel, C . Rosenthal
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radle, F. Chichester...
culinary apparatus, R. H. Cazie
Cultivatoz, O. Kugle
cultivator, O. Kugle
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Electrotype etching plate, A. \& H. T. Da wson.........
Engine, air and gas, O. Trossin.
Engine, rotary, w. P. Eayrs..
Faucet attachment, E. L. D.......
Faucet
compound, W. Bate...
Fire escape, J. A. Talpey.
Fire extinguisher, H. S.
Fire plug, J. P. Gallagh
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Fres by steam, etc., extinguishing, J......................... Furnace for melting metals, J. Harrison Fornace for roasting ores, L. Stevens.. Furnace, gas, L . Stevens

Furnace, metallurgic gas, J. M. Hart

Furnace, puddling, H. McDonald, (r) ................
Furnaces, hot air flue for heating, G. R. Barker. Furniture leg, Orr \& Baird..........
Gage, carpenters', M.C. Robichau Gage cock, Bellemre \& Fieer
Game board, F. P. Holmes...
Gas, manufacture of, W. .
Gas, vapor, R. L. Cohen
Gate, titing
Gate, tilting, J. Bartholf ..................
Grafting, C. E. Symonds...
Grain dryer,W. F. Morgan.
Griddle gies.ser, W. H. Bixler
Harrow, J. A. Walker....
Harvester, corn, L.Hamilton.
Harvester rake, M. L. Mix
Harvesters, etc., seat for
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Hat pressing machinery, D. Brown...
Hatchway, self-closing, A. Reld ...
Hater, kerosene, Z. B. \& C. E. Gr
Hinge, seat, M. W. Chase .........
H.jisting machine, C. H. Hersey.
Hifisting machine, C. H. Hersey.....
Hoo, skirts, tape for, C. C. Carpent Hoo, cream freezer. A.
Inhaler, S.J. Shaw.
Iron, restoring tinned skeeet, W. E. Brockway Journal bearing, frictionless,
Kettle lifter, E. A. Tricsell.. Kenfe, L. Eddy....
Knid
Lamp, T. B. Atterbury
Lantern, W. McKay
Lantern, S. Naylor.
Last block holder, 1 . Dan
Lathe, rotters'. W. Meek. ......
Leather, artificial, H. A. Clark.
Leather, imitation, H. A Clark
l.ock, combination, H. Clarke (r)

Locks, seal for, F. W. Brooks ...
Loom picking mechanlsm, W. Townsend
Lubricator, D T Pray..
Magn sia, milk of, Phillips \& Rei
Medical compound, C. D. Bradley
Miling machine, e.T. Pillings..
Music notation,J.Y. Po
Ores, treating, M. Lafing
Packins for piston rods, w. Heston.
Padale wheels, feathering, G. K. Glann...........
Paint for roofng, wood, etc., J. C. \& C. M. Bils.
Paint for rooing, wood, etc., J. C.\& C.
Paint vessel and package,J. W. Masury
Paper fle,
Paper stock, iberous, T. Routledge.
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1411,018
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Sa w mill, B. Berndt...............
Saw, seroll, J. W. Rowlingson
Sa wing machine, A. T. Nichols.
Sa wing machine, scroll, M. Han Seeding machine, G. F. Stroud.
Separator, grain, O. Sewing machine, D. M. Smith Sewing machinine brake, D. T. Peek Sharpening machine,s. F. Emerson
Signal, flash light, Mitchell \& Mayo Silk machine for spreading, J. Sauit Soda water apparatus, J. Matthe ws Sole channeling machine, C. C. Ballou ...........
Spinning machine roller clearer, C. B. Brown. Sta ves, jointing, E. \& B. Holmes Steam trap, Maxim \& Hawes.........
Steel wire, hardening, A. Benjamin Stove, base burning, J. Easterly (r Stove platform, Bingham \& E Stove pipe drum, A. W. Foote
Strap, sha wl, F. H. Willis Strap, shawl, F. H. Willis
Stump extract or, $\mathbf{T}$. Herbig Stump extract or, T. Herbig ..........
Sagar, manufacture of,I. A. Morrell Telegraph, printing, G. M. Phelps... Thrashing machine, R. H.
Top, spinning, J. Spencer. Truck, F. H. Abeel
Tuck marker, F. L. Tilesto
Twisting machine stop mechanism, A. J.Milistead Umbrella, C. C. Lasby....
Valve, stop, G. w. Eddy Chicle wheel, C. Andereg Vessels, camel for raising sunken, H. H. Siebe.. Vest supporter, Martin \&
Washing machine, J. Gline Washing machine, H. C. Grover.
Washing machine w. Walton. Watch, calendar, D. J. Mozart.. W. tch eases, spring joint for, J. Gor
Watch, push top for, J. C. Dueber Wa toh, push top for, J. C. Dueber
Water closet disinfecting, J. M. B. Water wheel, E. R. Percy. Weather strip, F. Siering
Well polnts, perforating Well points, perforating
Windmill, C. A. Taylor

aPPLICATIONS FOR EXTENSIONS. Applications have been duly fled, and are now pending-
or the extension of the foilowing Letters Patent. Hear'rys upon the respective applical
the days hereinafter mentioned: 5,874.-Bronzing Machine.-G. H. Babcock. Oct. 8. 25883.-GLASs Cofrin.-J. R. Cannon. Oct. 8 .
25,978.-TACKLE BIock -I. E. Palmer. Oct. 15 . 25,984.-Bit Stock.-N. Spofford. Oct. 15.

EXTENSIONS GRANTED 1,955-Casting Copper Cylinders.-F. Adame. 24,923.-Elevator.-A. Betteley.
$24,952$. -MEa C Cutter.-J. G. Perry

DISCLAIMERS.
24,963.-Flour Packer.-S. 'Taggart.
DESIGNS PATENTED

 ,,784.-Carpet.-J. Powell, Kidderminster, Engla

TRADE MARKS REGISTERED.
 1,373 --M EDICINE.-D. Dick, E ew York city.
1,374.- MINERAL WATER.-C. \& E. E. Dunbar, Waukesha
 1,377.-Sterl and Iron - -Leng \& Ogden,New York city 1,38.-TOBACCO.-Loe wenthal \& Co., Chicago, ill.
1,379.-SoAPSTONE PACEING.-Sellers Bios., Pbila , Pa.
1,380 -STEEL 1,380 -STEEL AND Iron.-Sweet \& Co., Syracuse, N,
1,381.-HEATERS.-Gold Heating Co., New York city
ind SCHEDULE OF PATENT FEES:
 in filing each apppincatal Patent. On appeal to Examiners-In Chief.........
On appeal to Commissioner of Patents. n application for Reissue ............................... On flling a Disclarme

nn an application for Design ( years).
On an application for Design (14 years)



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