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## Vol. KXVIII.--NO. 9.J]

NEW YORK, MARCH 1, 1873.
[ ${ }^{\text {83 }}$ 3 per Annum
THE ROLIPER EECTIONAL STEAY BOILER posed of a number of separate sections, each by itself comprising all the parts of a complete steam generator. Our engraving represents a double forra of the device, so constructed as to economize room and yet afford a large heating surface. The upright chamber, A, and $<$ shaped series of tubes, B, compose one section; portions of others similarly constructed, placed beside each other so as to form the rearo the apparatus, are shown at C and D . Any required number of sections may be thus located. The chamber, $F$ and tubes, of of sections which form of sections which form the front of the boiler. All the chambers comand bottoms, so as to form continuous mud drums at $H$ and $I$, and water spaces at $K$ and L , the latter connecting by means of the pipes, $M$, with the steam drum, N. The sections composing the front portion of the boiler are less in num. ber than those in ber than those in rear, lor thereason that every other one is omitted in order to afford the necessary space for the
doors. doors.
Both parts of the apparatus, front and rear, have independent circulations, that in the forner commencing in the mud drum, $H$, passing through the tubes, $G$, to the water space, $K$, and thence back; in the latter the circulation commer, the from the drum I from the arum, 1 , passes through tubes, B, space, L , and return, and, being very rapid, prevents the accumulation of scale or sediment in any portion except the mud drums, which may be easily cleaned. The sections have man holes on both sides, and are held together by short bolts on the inside amund on the inside around these openings. The facing strips are of sufficientrioss to hold the sections apart and
to allow the smoka to
pass, thus making the entire boiler into heating surface, except the steam drum and bottom of the mud drum. The drums will allow a man to enter and pass through the sections, so that, in any case, should a tube become disabled, it may be replugged without loss in the service of the boiler.
It is claimed that the angular form insures the greatest amount of heating surface, and at the same time allows for the unequal expansion of the tubes. One end of each pipe is screwed into a return bend and the other is fastened to the chamber by a long thread and lock nuts, making reliable steam joints, which may at any time be loosened if required. The tubes are also so arranged as to be readily cleaned from soot arising from the use of bituminous coal.
The construction of the grate needs no especial reference. The heated air in rising passes around the tubes and out between the back sections into the flue, and thence to the chimney. The roof of the fire space is lined with fire brick, above which a layer of any non-conducting material is placed. It is claimed that, owing to the large heating surface, increased rapidity of getting up steam and a consequent less expenditure of fuel are effected. We are informed that steam has been obtained from cold water in the period of fifteen minutes.
The water chambers are large enough to insure a frec passage of the water, thus preventing foam and securing dry steam.
These boilers can be readily takien apart for trausportation, put together by any engineer without injury to joints;

The invention herewith illustrated is a steam boiler com
and can be enlarged at will by adding sections. They are constructed double, as shown in the engraving, or single. In the latter case the form is easily understood by imagining the front sections, of the generator represented, to be removed. Corresponding alterations are made in other parts to accord with the single set of tubes, B, and chamber, A. The steam drum, $N$, is not used, the upper portion, $L$, of the ections answering the purpose
The device in both forms, it is claimed, has been fount well suited for high and low pressure, stationary, portable and marine engines. It is also specially constructed for heating purposes.


## Vertical Grist Mills.

 shaft. No intermediate shafting is used, and the cost andThe idea of placing the grinding stones on horizonta pindles, like common pulleys, is very old, but has never come into much use except for small mills, where coarse grinding and speed are wanted. It does not follow, however, hat this plan cannot be successfully applied to the fine kinds of flouring. According to Leffel's Neus, "a vertica mill of somewhat novel character has lately been introduced in which two or more pairs of millstones are combined on ne horizontal shaft, or on sections of a shaft, and driven by one belt or gear, the power being applied directly to th are of a number pulleys, belts, gears tc., is thus in many cases saved by the adoption of such mill Furthermore, the mill tones are faced and furrowed on both side instead of only onc and combinedin group of three or more. In group of three the center stone is fast to and revolves with, the haft, with a stationa $y$ or bed atone adjust on each side of ating two of it thg mills ou the veing interchangeable, here is afforded, prac tically, the grinding surface of three mills. As each stone is double faced, any one of the hree may be taken ou to be sharfened at any time and another put in its place, so that the uill can be kept run aill can be kept run ion If one morestop tion. If one moreston be added to a group o hree, there win be toen, or with fou five stone ill on to mills no on to any de red number, all be ng driven by one bel or gear, and occupying ouly one foot in length of shaft to each mill is argued in behalf of this arrangemen hat a group of five tones, making mills, will occupy only he space usually taken by one mill, and tha

## the rclipse sectional steam bombr.

We see by the Pittsburgh papers that Messis. Jones \& Laughlins, proprietors of the American Iron Works, have contracted with the Eclipse Steam Manufacturing Company for three large batteries of these sectional safety steam generators, of 240 horse power, to take the place of the four tue boilers which exploded on February 3. They have had a umber of sections in use for a year, on trial.
Patented September 6, 1870. For further information ad dress G. W. Bollman, President of the Elipse Steam Manufacturing Company, 87 Wood street, Pittsburgh, Pa.

## scrap Iron

Manufacturers should look well to their scrap iron; do not waste a piece, no matter how small; gather all together, assort, have different receptacles for steel, wrought, cast and malleable iron. The wrought iron from the carriage shop is the most valuable of scrap iron, but to bring the highest price there must be no malleable or cast iron mixed with it; every pound of scrap has a market value, and it should be packed in barrels or boxes and sent to market. If there be and have it worked up into bary. It is the amall manufacturers who do not take care of their scrap, but allow year after voar to pass without paying any attention to it, and scraps of iron can be found all over their factoriea, while boxes and out of the way corners are filled with it, and hundreds of dollars of what would make the best of bar iran is allowed to go to waste.
the four have only two bearings to care for, while the step so troublesome to millers is entirely done away with
" There is evidently a very material saviag of room in this arrangement, whatever may be its other merits or de fects; and it must also be admitted that any device which enables the miller to simplify his machinery, dispense with complicated and costly gearing, and bring the work in close proximity to the power, is so far a very valuable gain."

## Spontaneous Combustion.

In the last report of the Fire Marshal of New York city ixteen recent examples of fires caused by spontaneous com bustion are recited. During the year 1872, there were 1,380 fires in New York. How many were spontaneously caused there are no means of knowing. Of the sixteen spontaneou cases above alluded to, nine originated among oily rags, cotton waste or rope materials, two in piles of coal, one in a mass of "excelsior" or fine wood shavings used for cheap upholstery purposes, one in salt hay, two in oily saw dust one in rubbish.

New Electhical Discovery.-Dr. Blake, of the San Francisco Academy of Sciences, and Judge Hastings, of the California State Geological Survey, announce the discovery of a current of electricity running north and south at a dis tance of about 150 miles from the Pacific coast, along a belt of metallic deposi $s$, which serves as a conducting chain between the poles.

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## 8MALL POX...-OLD AND NEW REMEDIES

Superficially considered, it appears singular that certain contagious diseases, especially small pox, spread more in the winter season (which, in other respects, is the healthiest time of the year) when the cold destroys the miasmata which tlourish in tropical climes and, in hot summers, sometime visit portions of the temperate zone. But in order to explain this apparent anomaly, we have only to consider that in winter a large number of the lower classes of people huddle ogether in ill ventilated rooms, in order to shelter themselve against the cold. Of course this is favorable to the growth of miasmata, which only need suitable conditions to propagate themselves. Microscopists have succeeded in tracing the origin of many contagions to parasitic growth, eithe egetable or animsl, and it is not improbable that this will ultimately be the case with all, the denial of many medical athorities notwithstanding. It should be kept in view that formerly, equally high authorities used to deny most peremp orily, to several diseases, the origin which is now, beyond he shadow of a doubt, proved to be the true one, namely, the growth of animalculx or vegetable parasites. It should also be considered that the fact of not finding such, in certain cases is only a negative proof; they may be there and the investi gator may have failed to find them; but other searchers in course of time and with instruments more perfect than we ill at present, or by help of an improved modus uperandi, will undoubtedly discover them. Microscopic investigation has only just commenced to be applied in medicine, and the most advanced physicians know now that it is one of the most powerful helps in medical diagnosis.
Eruptive fevers are diseases of the blood; they probably originate in a kind of catalytic poison in the system, which may be a yesult of parasitic growth, as is the case with fer mentation and many other chemical changes. However, the future will decide the question definitely; in the mean time we must observe, use our best judgment, and apply all he light, as far as the present state of science allows, to combat this class of diseases, among which small pox is one of the most virulent, loathsome and dangerous. In order to be fully convinced of this, one has only to visit a small po hospital and see this interesting disease in all its stages.
In regard to the effectiveness of the protoction afforded $b$ vaccination, the statistics show that this discovery, made by Jenner more than a century ago, had the most startling influence in staying the small pox ravages of that time, and it kept the nations who accepted it comparatively free; the ex perience of the physicians of the present day tends in the ame direction, and all doubt fostered by some in regard to ts effectiveness proceeds solely from want of acquaintanc with the facts, which are overwhelming in proof of its great value to the human race. As the health and longevity of accinated persons is on the general average equal to that of thers who escape the small pox without vaccination, there can be no serious objection on that ground. The rule, laid down by some, that persons must be vaccinated every seven eurs is totally arbitrary and without any foundation what oever; different individuals will differ greatly in this re pect, and, in order to be safe, it is well to try if vaccinatio will " take" in case any danger is apprehended, even if it has been applied only three or four years ago. If no epi demic is prevailing and the person is exposed to no danger is needless to revaccinate every seven years; ten years on more may elapse, and we have known individuals who un doubtedly, by a single effective vaccination in childhood, have been protected for their whole lives.
In regari to the treatment, it must be kept in view tha here, as in all eruptive fevers, it must have its course, and cannot be cut short without robbing the patient entirely of his chance of e cape. Careful guarding against taking cold,
good nursing, the mildest possible diet, and abstinence from
irritating food and remedial agents simil
are the first necessities of small pox cases.
The latest medical journals recommend two new remedies, which experience has proved to be beneficial. Dr. Revillod of Geneva, recommends glycerin as an exterior application this, through its soothing action, diminishes the intensity of the eruption. He mixes it with soap and some mercuria intment. Dr. Carl Nagel, Royal Chancellor of Health in Berlin, recommends xylol; he has administered this inter nally in eighty cases, thirty-six of which had the small pox in its worst form, and only four died, which is a better resu than that of any other remedy thus far known. When ad ministered while the disease is but surpected, xylol does not prevent it, but greatly eases the patient and facilitates
edy recovery.
Xylol, or xylen, is also called the hydride of sylenyl; it is ne of the hydrocarbons obtained by the distillation of coa tar, wood tar, or Burmese petroleum. The coal tar con
tains little of this ingredient, but one pound of oil separated rom crude this ingredient, but one It is a liquid similar to benzol and toluol, but has the antisep tic properties of carbolic acid from coal, and of creosote from wood. It separates from the crude wood spirit by the addi tion of water, and is purified, like other cognate products tion of water, and is purified, like other cognate products
by sulphuric acid; the brown mixture, after standing, is washed with a solution of potashand then in water, dried over washed with a solution of potashand then in water, dried over
chloride of calcium or glacial phosphoric acid, and then subchloride of calcium or glacial phosphoric acid, and then sub-
jected to a fractional distillation, when the xylol comes ove as soon as the temperature has risen to between $258^{\circ}$ and $266^{\circ}$ Fahr.
It is well known that many derivatives of tar, creosote carbolic acid, benzol, toluol, xylol, etc., are all poisons fo small organic growtis, either vegetable or animal; that they for instance, at once destroy fermentation by killing the icroscopic yeast plant; it is also known that mercurials ar mal ones. These remedies now appear to be effective in mall pox and this raises the very natural question if it not an argument for the probability of the theory that this isease also is due to a morbid organic growth, perhaps in the blood itself, which produces that violent fever, with the ymptoms of pain, nausea, etc., and finally works itself ou hrough the skin and mucous membrane by a copious erup ion, which is often strong enough to destroy the skin lik so many burns, and sometimes even so violent as to destro he life of the patient, in the same way as an extensive scald ing does, which is fatal by arresting the natural action of the kin, consequent to the annihilation of its organic structure In consideration of the excitement about the spread of mall pox in this country, we believe the above details to be of general interest and utility to our readers.

WORD WITH THE READER, THINKER, AND WRITER
We believe that there is no portion of our journal of great or interest than the columns devoted to our correspondence and we should be unappreciative did we undervalue th ractical suggestions and information imparted by its writers We would take the present opportunity of requesting from our readers even more frequent communications. Let us have all possible ideas. Criticise everything that appears pen to criticism; and, if experience has taught you differ ently, give the public the benefit of your wisdom. The mer act of your finding any difficulty in committing your knowl dge to paper need be no drawback. We want ideas, no words; and if the brain work is there, we will put it into roper shape. Every week we publish a large number o questions on different subjects. Sometimes we are at a los or a suitable reply which many of our readers can readil ind; in such cases responses from our subscribers are appre ciated both by the enquirer and ourselves.
The modern newspaper is the substitute for the ancien orum. Instead of a number of people meeting in som public place, as they used to do, and discussing various ques ions of interest they now write to their paper and inter change their views through the medium of its printed pages.
Necessarily, among the multitude of communication which reach us, there are many agreeing on some single topic n such case we exercise our discretion in the publication of uch as we consider the most sound and suitable. There ar thers devoted to the discussion of questions which it is only waste of time to consider. We allude to perpetual motion quadrature of the circle, and all of that class. We woul arnestly impress upon all who entertain such chimerica deas to turn their minds and labor to more profitable pur uits.
We believe that the ce is no better way of acquiring and and disseminating knowledge than to establish a co-operation between those who read and those who write-to place the pinions of the practical man beside those of the theoris better, and more comprehensive on subjects interesting alike to all.

## THE PHOTOMETER APPLIED TO ABTRONOMY.

In a recent article on the physical nature of the plane upiter (see page 400 of cur volume XXVII), we described he important results deduced from photometric observa ions of that planet; and we may add to this that photo metry has often been applied to the starry heavens, in orde determine the comparative luminosity of the heavenly odies. It is evident, however, that the common method as applied here on earth to compare the relative intensity of
different flames, and of which one was described on page 83
of this volume, are entirely inapplicable; and therefore other
ifferent principles must be resorted to
The most perfect photometer adapted to measure and com pare the light of the heavenly bodies is undoubtedly that in nted by Zollner, the famous astronomer and spectroscopist of Berlin; he invented it as early as 1860 , but only recently has he applied it extensively to celestial photometry. It is based on the principle of the polarization of light; and in order to accomplish his purpose, $h_{i}$ makes use of the prop erty of the analyzer (see Tyndall's lecture, page 35 of ou current volume) to transmit or obstruct the polarized ray in roportion as it is turned round an arc of $90^{\circ}$; for intermedi te portions of the angle of rotation, a strong light may b gradually diminished till the transmitted rays are equal to th weaker light.
The first thing Zöllner had to do was to determine how far he angle would serve as a measure for the intensity of ight. Mathematical theory teaches that the amount of ligh ransmitted does not increase as the angles themselves, but as the squares of their sines. Zöllner found this law per ectly verified by practical experiment, in testing this photo meter in many different ways. By attaching such a polariz ing photometer to an astronomical telescope, he has been en abled to determine the comparative luminosity of diver heavenly bodies with greater accuracy than had previously been possible; and the results obtained will especially b most interesting to posterity, who will be able to determine what changes have taken place in the course of time, change which are sometimes very great and of the utmost import ance to the extension of our knowledge of the nature of the heavenly bodies.
As a standard of comparison, he uses the light of a lamp shining through a pin hole; and in order to be independen of the perhaps variable light of this lamp, which may differ n different nights, he compares two stars with the lamp, and only notices the difference between the stars. If, for in tance, the planet Jupiter has to be compared with Venus, he directs the telescope to Jupiter and turns the analyzer til its luminosity is equal to that of the lamp shining through the pinhole, and finds it was turned, say, $10^{\circ}$; then he di ects the telescope to Venus, and finds that he must turn it $5^{\circ}$ in order to diminish its light till it is equal to the lamp ight. The relative luminosity will then be as the square of he sines of these angles, that is, as $0.0174^{2}$ is to $0.0389^{2}$, or as .00030276 is to 0.00151321 , or, approximately, as 3 to 15 or 1 to 5
Among the results thus obtained by Zölner are the fo wing :

COMPARISON OF PLANETS
The fixed star Capella as compared to Mars is as 1 to 7; to upiter, as 1 to 10 ; to Venus, as 1 to 50 ; to Saturn, as 1 to $0 \cdot 4$; to Uranus, as 1 to 0.0066 ; to Neptune, as 1 to 0.0007

## COMPARISON OF FIXED stars.

The same star Capella as compared to Sirius is as 1 to 5 to Vega, as 1 to $1 \cdot 2$; to Betelgeuse, as 1 to 0.5 ; to Regulus, s 1 to 0.4 ; to Pollux as 1 to 0.3 .
the moon compared to the planets
The full moon as compared to Venus, when full, is as 150 to 1; to Jupiter, as 700 to 1 ; to Mars as 1,000 to 1 ; to Saturn 18,000 to 1 ; to Uranus, as $1,159,000$ to 1 ; to Neptune, a $10,000,000$ to 1 .
The sun as compared to the moon is as 700,000 to 1 . Con equently the light of the sun surpasses that of the most dis ant planet, Neptune, $7,000,000,000,000$ times.

## DISCOVERIES OF TIN IN QUEENSLAND

The most recent reports substantiate the fact that tin fields of unexampled richness have been discovered in the English colony of Queensland, Eastern Australia, the presence of th metal being detected over an area of 550 square miles. Mr T. F. Gregory, the mineral land commissioner, states that $t$ the present time, only about 225 square miles of this area ave hitherto been found sutficiently rich for working, but here are many instances of tin being found in paying quan tities beyond these limits. The physical and geologica character of nearly the whole of the area described is that of n elevated granite table land, intersected by ranges of abrup hills, the highest limits of which are about 8.000 feet abov he sea, its eastern escarpment forming the water shed of the Clarence river, the northern that of the Condamine, and the southwestern, the Severn and McIntyre rivers. The por tion of the district over which the deposits of tin ore are dis ributed is that comprised by the water shed of the Severn iver. The richest deposits have been found in the stream eds and fluvial flats, the paying ground varying from ew yards to five chains in width, occasionally broken by ocky bars; but even in these instances large deposits ar requently lodged in the pockets and crevices between th ranit boulders.
The probable yield of ore is stated at ten tuns per linea chain of the beds on the various creeks. In some instances his has been found to extend to thirty tuns per chain. Re garding the mineralogical character of the rocks, it is stated hat the ore is associated only with granite which is invaria bly red. The granite generally is coarse grained and seems to disintegrate rapidly under atmospheric influence. There are numerous bands of loosely aggregated rock, granitoid in in character, highly micaceous and traversed by bands and veins of quartz in all directions, in which the crystals of tin reabundant. No tin floors, as at the Elsmore mine in New SouthWales, heve yet been discovered.
As the lodes and veins have as yet been but very partially ested, it would be premature to give any decided opinion pon them. It is probable that they will prove a source of reat wealth, and perhaps render Australia one of the first tin producing countries in the world.

## $\triangle$ FEW GRATUITOUS HINTS TO INVENTORS.

It often happens that the germ of an important discovery is contained in a short paragraph; but as it is the early bird that catches the worm, so it is only the most alert reader that eizes upon the obscure fact and appropriates it to his own use. We have inserted a short notice of a number of dis coveries which we hope to have brought back to us in ma tured plans for their application; but, for fear that some of hem may have escaped the vigilance of our readers, we refe to them again in a more conspicuous manner by way of gra uitous suggestion.
Has the cupro-ammonium solvent for cellulose been em ployed on a large scale in the manufacture of artificial wood water-tight paper, incombustible fabrics and the like? Th name may frighten many persons from paying the regard to his important reagent which it deserves. It is very easy to make it, as it is only necessary to keep strips of copper stand ing in concentrated ammonia, occasionally shaking it to ad mit the oxygen of the air. Oxide of copper is produced, whic dissolves with a blue color in the ammonia and gives the re gent sought. There is certainly a large scope for inventio in the use of this material. Paper bags can be rendered im permeable to water by immersing them for a few moment in cupro-ammonium and running them betwcen rollers. The can then be substituted for parchment for many purposes If numerous sheets of paper were to be similarly prepare and pressed together, thick layers of great lightness woul esult, which could be employed as a substitute for wood in architectural structures and interiordecorations. By impreg nating the wood paper with tungstate of soda, it would b rendered wholly uninflammable, and in this manner theat rical decorations, and the packing surrounding steam pipe and boilers, could be made of it; and in its fireproof form, it capable of a wide range of application which the invento must think out for himself. It is said that paper bands nearly as strong as leather, can be made on the same plan. The cupro-ammonia paper would find application for roofing water pipes, hats, boats, clothing, collodion; and as all kinds of cellulose are attacked by this reagent, much waste ma terial, such as seaweed, grass, sawdust, shavings and rags could be applied to many purposes. It is a question whether by combining cupro-ammonium and tungstate of soda, wood and timber could not be rendered fireproof as well as water proof and otherwise indestructible. There is evidently wide field for research in this matter, and it would be wel for inventors to give it attention.
There is another question which sometimes occurs to our mind, which is this: Are there any practical applications of thallium in glass making and otherwise? Lamy extibited a pecimen of thallium glass at the Paris Exhibition of 1867 , possessing a higher index of refraction than anything of the kind that had been previously made. Since that time a con siderable quantity of thallium has been found in the variou stages of metallurgical processes, and enough material could be found if there was any call for it. The whole astronomic al world is turning its attention to the use of the spectroscope in observations on the stars: and it is of great importance to mploy a highly refracting medium. Lead glass answers very good purpose; but if thallium glass is better, it'ought to e tried For optical instruments of all kinds, a new mat rial of this character would always prove most serviceable.
The employment of thallium in medicine and in colors is also The employment of thallium
A third suggestion we have to make is in reference to new applications of copal. We have seen it stated that gum copal can be vulcanized, so that it becomes very hard and closely resembles amber, for which it can be substituted for many purposes. The vulcanized amber can be turned on a lathe and is said to possess great durability. In what wa the process is accomplished has not been disclosed. It ap pears to be worthy of examination
The above are some of the paths that might be taken by ndustrious students in their search for new applications, and we commend them as being worth pursuing.

## PROFESSOR AGA8SIZ ON OUR COLLEGES

Professor Agassiz has evidently no very high opinion of ur educational institutions, and publishes his adverse view with characteristic freedom. He says our colleges are nothing but high schools, and that even Harvard is far from being university; while the knowledge imparted is " the tradition ary learning of the middle ages," and only "the dregs o cholarship."
In common with all progressive lovers of science, Profes or Agassiz strongly advocates a freer scope being given the study of nature. This branch of education should begin in childhood, and not nominally be taught in normal schools from text books which are often unsuitable. With regard to our system of popular education, he acknowledges that it is wanting.
It is probable that these ideas, from so eminent an authority will give new impetus to the war of science against classics will give new impetus to the war of science against classics
which, for some years past, has been waged in our colleges. which, for some years past, has been waged in our colleges.
That there is a strong and growing popular taste for science That there is a strong and growing popular taste for science courses of Professor Tyndall and the writings of other distin guished savants; but that, at the same time, there exists, even among people otherwise well educated, an inexcusable ignorance in scientific matters, is equally true. That the latter is, in a great measure, due to the imperfections of our college courses, we consider there is little doubt, and we adhere to the belief that, were the classics in our seminaries made subservient to the thorough study of the ordinary principles of science, the graduates would leave their books much better prepared to encounter the world.

DRAPER AND TYNDALL ON THE INVIBIBLE RAYS To the Editor of the Scientific American:
In your issue of February 1, you gave an abstract of Pro fessor Tyndall's lecture on "The Invisible Rays," in whic I find the following statements: "On both sides of the spectrum there is a copious overtlow of rays which are in competent to excite vision, but which, however, are able t agitate the molecules of certain substances so as to shake them asunder and produce chemical decomposition," and, further on, "it is shown that the heat radiated from the nonuminous portion is seven or eight tintes as great as from by a well known figure in which the invisible rays are se prezented by a curve very large in comparison with a simi lar line indicating the visible rays. In the same number of your journal you publish Dr. J. W. Draper's researches in actino-chemistry, in which the author says: "As Dr. Draper demonstrated the heating power of radiation to reside in all equally, whatever their refrangibility, so in this he prove the power to produce chemical changes to be manifested by rays of every refrungibility, different substances being acted on by different rays." The discrepancy apparently existin between the views of Drs. Draper and Tyndall, thus plainly indicated by the two articles from which the above extract re made, has led me to obtain a more extended report of che investigations of the former physicist. The conclusion herein contained seem to me to be flat contradictions of Professor Tyndall's assertions, as proved by the following it follows that the true distribution of heat throughout the spaces of the spectrum is equal, and that "the figure so enerally employed in works on actino-chemistry to indicat he distribution of heat, light and actinism in the spectrum erves only to mislead. The heat curve is determined by the action of the prism, not by the properties of calorific radi tiwhs; the actinic curve does not represent any special pecuiarities of the spectrum but the habitudes of certain com pounds of silver.
Can you or any of your readers reconcile such completel opposite iacas: How is it that Professor Tyndull did no allude to so radically different a theory, of the existence of which he must have been aware, in the course of his lectures When such eminent and cearned doctors disagree, it is indeed question who is to decide. A Perplexed Physicist.
Remarks by the Editor. - The discrepancy between the views of Dr. Draper and Dr. Tyndall, pointed out hy ou correspondent, did not escape the attention of scientific men during the visit of the latter to this country; and the subject was frequently discussed by them without the friends of either party being able to reconcile the differences. Dr Draper, we are told, is disposed to think that the spaces in and out of the spectrum measured by Dr. Tyndall were so ali that the chance for error was a very close one, and ther es an error was probably committed. On the Drapernd, Dr. Tyndall does not appear to believe in di eory, of which he wa fully aware, partly because it might have been considered a breach of hospitality and partly because the rostrum of public lecture is not the place for the discussion of such nice points of physics. The question is one which can only be determined by actual experiment. The learned doctors must epeat their observations, and, if they still aisagree, let high court of arbitrators appoint competent physicists to go carefully over the same ground and report the results to cientific congress. We take the opportunity to say that, in ur opinior, Dr. Draper has never received the credit that fairly belongs to him for his early researches in prismatic analysis. In the Philosoplical Magazine, for May, 1847, and February, 1848, are contained papers " On Methods for the Prismatic Analysis of Substances," in which will be found foreshadowed Bunsen's application of the spectroscope to chemical analysis. Bunsen at first proposed to substitute prismatic analysis for flame analysis as an aid to qualitative chemistry. In this he had been anticipated by Draper, but Bunsen went further and discovered a uew element; that event fixed the method beyond all possibility of being forgotten, and Kirchoff clinched the matter by his magnificent researches in solar chemistry. Still it must not be forgotten that Draper pointed out this line of research fourteen yea before Bursen took it up, and that if he had not been loade down with the cares of administration and the toil and
drudgery of teaching, he too might have pursued it to such a degree of perfection that no subsequent doubt could have arisen as to his share in the great discovery. The present good time to revive these points of history, and to accor credit where it belongs.

## RAPID TRANBIT IN NEW YORE

The venerable Peter Cooper of New York has sent to State Senuivi 'icmann a new scheme to secure rapid transit in New York, which consists in locating a double railway track in the second story of the buildings along the line of the route. On these tracks he proposes to place a string of light cars in the form of an cindless belt, to be moved by endless ropes. There are to ie just as many cars as are re quired to move the vast num ers of people who are expected to patronize the work. The rigit of way is to be purchased by the corporation, to the stock of which, if placed in proper hands, Mr. Cooper engages to subscribe the sum of one hunred thousand dollars.
Peter Cooper, as all our readers probably know, is one of our most highly esteemed, generous, and practical fellow citizens. He rarely recommends to others a scheme in which he does not himself liberally engage. He was the originator of one of the earliest locomotives ever built in this country, and from that machine down to and including
the Atlantic Telegraph Cable, to which he was one of the riginal contributors, he has been an assistant in many high y useful and successful enterprises. The Cooper Union Buildings, which have now for several years afforded the most splendid opportunities for education, free of charge o working people, by its evening classes as well as day privileges, was a gift from him to our city, and will ever be a monument to his fame. Whetherhis present plan fo rapid ransit is ever brought into practice remains to be seen.
Mr. Speer and friends, whose plan for the Traveling Side walk was illustrated not long ago in the Scientific Amer can, are also applicants before t! : Legislature for a charte intended to afford rapid transit to our citizens. They would like the privilege of erecting their improvements on posts ver the present sidewalks on Broadway. The route is a good one. The plan of Mr. Cooper is somewhat analogous ot this. The Traveling Sidewalk consists of an endless mov ing belt, in the form of a floor, on which settees and chair are placed. You step on board the floor and away you go nd step off wherever you like. No stoppages.
Another new plan for rapid transit in this city is the "Mid Avenue Elevated and Surface Railroad," of John B. Church who proposes to erect a railway on iron columns in the cen er of some street to be selected for that purpose. He think that such a road can be built ssrong enough to carry train and locomotives at a speed of thirty miles an hour, for thre hundred thousand dollars per mile, the right of way bein granted free by the authorities. This is lower than any es timate we have heard of. The estimate, we believe, for the Gilbert elevated railway, which, bythe way, it is said is shortly to be built here, is from seven hundred thousand to one millio dollars per mile. The construction is substantially what Mr Church proposes, that is, in the street, on iron columns. W hink that Mr. Church will find that one million dollars pe ile bre more nearly correct figures than those he has given. Still another scheme for rapid transit is proposed by party of citizens who desire to have some of their number eceive authority from the State to manage the road, th money to build with to be supplied from the city treasury.
Meantime, while these various plans are being talked bout, the committees of both branches of the State Legis ature have unanimously recommended the passage of the bill authorizing the Beach Pneumatic Transit Company to go head and complete their railway under Broadway. Whe his bill passes we shall have a practicable route authorized or an underground railway, the construction of which cost one million dollars per mile, the same as the elevated; and it will be a valuable acquisition to rapid transit facilities in Now York. In London the underground railway is very popular, and carries between fifty and sixty millions of pas sengers per annum.

## sCIEATIFIC AND PRACTICAL INFORIMATION

## portable dry ink

At a recent meeting of the Frankfort Polytechnic Associs ion, Professor Boettger exhibited a novel kind of ink which is admirably adapted to take on journeys and explor ng expeditions. White blotting paper is saturated with a ine black and several sheets are pasted to form a thin pad When wanted for use, a small piece is torn off and covere with a little water. The black liquid which dissolves out good writing ink. A square inch of the paper will give enough ink to last for considerable writing, and a few pads would be all that an exploring party need carry with them As water is always available, the ink is readily made.
to clean silver.
Dr. Elsner says that hot water poured off potato parings r boiled potatoes is admirably adapted to clean silver. The objects can be easily rubbed by the fingers with the settlings of potato meal, and they become as bright as they usually do when rubbed with tripoli. The process is particularly advantageous for engraved and raised objects, where the powder is liable to collect in the cavities. Gesman silver and plated ware can be cleaned in the same way. Potato water which has become sour by long standing can be substituted for acids to clean copper vessels.

NEW UBES OF HYDRATE OF CHLORAL.
The hydrate of chloral, which is now made on a large cale, has been found to be useful for other purposes than the original one of a hypnotic. It is said to be an excellent antiseptic ; it stops fermontation and destroys germs that would be likely to develope in organic substances. One per cent of hydrate of chloral will prevent the decomposition of glue and albumen for a great length of time. Another use of hydrate of chloral is as a reducing agent. It is said to precipitate metals from solutions, and this property suggests its possible application in photography and for depositing metals.

Dr. Elsner states that an indelible red ink can be prepared as follows: Equal parts by weight of copperas and cinnabar, both in fine powder and sifted, are rubbed up with linseed oil with a muller and finally squeezed through cloth. The thick paste can be employed for writing or stamping woolen and cotton goods, and the color remains fast after the goods have been bleached. The reds usually employed are not fast colors, and do not resist the action of bleaching agents.

The planet Vence, it has been calculated, will apparently coss the disk of the sun on December 8, 1874. A full ex paturion thimportant astronomical event, a will be de ived from itsobservation, will be found in Professor Young's excellent lecture on "Our Present Knowledge of the Sun" on another page of this issue.


SORTING CORK_FROM_THE ROUGH BALES.

bllining the outside of the conmon colik woon


CORK TREE WITH bark on


The cork bolling department


CORK TREE PARTLY BARKEL

craping the cork wood after boilling

facinis the cork wood for the market

## CORK PRODUCTION AND MANUFACTURE IN SPADN.

CORE CUTTUTG II BPATE.
The recent political revolution in Spain, involving the voluntary abdication of the throne by the late King Amadeus, and the almost unanimous adoption by the Cortes of a Republican form of government. imparts a new interest, for Americans at least, in the industrial resources of that wonderful country. Not least among these resources is the production of cork.
The cork tree is found in its wild state in the south of Portugal, Africa and Spain. In the latter country the preparation of the bark for foreign markets is one of the staple industries fucnishing labor and subsistence to a large proportion of the population.
The tree is a peculiar kind of oak, and the cork in the soft
collular interior bark, lying just inside the exterior woody is cut down. It is a curious fact that if any portion of this covering. It is removed by making several longitudinal inner coating be destroyed, further formation of the cork on clefts up and down the trun:-, and then girdling the latter the injured spot ceases. After the layers of the cork are with horizontal incisions. This operation is not performed, stripped, they are inspected and assorted, according to their however, until the tree has attained a certain age, generally sizes and quality, those of the finest texture being of the fifteen years, and the first crop is employed only for inferior greatest value. The inferior portions are generally sorted purposes. Seven years afterwards the tree will have an- out, their crust burnt off and sold mostly for floats, thus other coating of bark, which is stripped and used for making receiving the name of fishing cork. The better qualities are corks, and so on every five to seven years, according to the first boiled and scraped, and then blackened over a coal fire quality of the ground. The tree does not suffer from the tho object being to make the surface smooth, and at the process of scraping as it generally lives from one to two same time to conceal flaws. Some varieties, generally the undred years.
Between the cork and the tree, there is another bark that best, are faced in order to exhibit the fineness of their tex Between the cork and the tree, there is another bark that $\begin{aligned} & \text { ture. All these various processes will be found graphically } \\ & \text { is used for tanning; but this is only removed when the tree } \\ & \text { depicted in engravinge given herewith. After being for }\end{aligned}$
warded to the warehouses, the largest slabs are cut into pieces of about three and a half feet in length, eighteen inches in width and ranging from one half inch to three inches in thickness. Drying and packing in bales weighing one hundred and fifty pounds each follows, and the cork is ready for exportation.
From five to twenty-five cents per pound is the usual price paid by the cork cutter in this country for the rough material as it arrives in the bale. It then undergoes another assorting, and a thorough steaming, in a chest designed for the purpose, the latter process softening the cork and rendering it easy to cut. To divide the substance special machinery is employed. Rapidly revolving circular knives are used, which cut by a drawing motion, as crushing strokes simply break the cork or cause it to crumble. The workman sitting in front of the machine places a piece of cork of suitable size in a revolving spindle by which it is firmly held. This spindle is raised a measured distance and the edges of the cork come in contact with the rotating knife, which smooths them off and leaves its work in a perfectly cylindrical form. Another method is toplace the rough bits of cork in grooves on the circumference of a wheel which, working automatically, carries each piece to a point where its ends are received by a small lathe. The cork is then revolved are received by a small lathe. The cork is then revoived thus giving it the necessary taper, and a surface as true and smooth as if sand-papered. As fast as a cork is finished by the automatic lathe it is released and another substituted in its place.
Every portion of the material is utilized, either as stuffing for cushions or life preservers, or as a non-conducting substance for placing between walls or floors of buildings to deaden sound.
It has been estimated that it would require 4,000 men to be continually at work to supply New Yorkalone with corks, if all had to be made by hand. There are at present 60 veanufactories in the United States, cutting and supplying corks to the value of $\$ 2,250,000$ per year.

## TEXTILE FIBERS UNDER HICROSCOPE

The present large demand for textile fabrics has led, not only to the discovery and application of new fibers, but also to several improved methods of disintegrating old rags that the fibers may be respun and used, either by themselres or in combination with new material. Wool thus treated is called shoddy, and its use has long been a common practice with makers of the lower qualities of woolen cloth. But as yarns are now spun for the making of mixed fabrics, wool, silk, cotton, and linen are so intimately blended that they all appear in the same thread, and a close examination with the microscope is necessary to detect the presence and the proportion of any of the four. Using a power of from 100 to 150 diameters, we observe, as in the engraving, the scaly hairs of wool, $\mathbf{W}$, the smooth thread of silk, S , the cylindrical fiber of linen, $L$, or the spiral one of cotton, $C$, the color of these varying considerably. When the presence of all or any of the four has been observed, a further test may be made by adding a drop of the ammoniate of peroxide of copper; by this salt, silk and cotton will be immediately destroyed, linen will gradually follow, and wool only will re main, its fibers being slightly increased in size. Concentra-

ted sulphuric acia wiil clissolve the wool, producing a red color. The next step in the investigation is to dctermine whether some or all of the fibers of the wool have been previously used. This is shown by the differences of the dyes, as the microscope enables the observer to discriminate between indigo, purpurine, madder, aniline, and any other dye stuff that may have been used, and worn fibers show traces of the bleaching to which they were submitted before being treated for a second process of manufacture. Another test for old fibers is the irregularity of their diameters, and the disappearance, in places, of the surface scales. A still further method of detection is the application of a lye of potash or soda, which attacks old wool with a rapidity to which new material is inaccessible.
To ascertain the proportion of old fiber in any mixed fab ric, the threads should be laid as nearly parallel as possible. A power of from 20 to 50 diameters is sufficient to enalle the investigator to count the fibers, the relative number of each being shown by the appearances above described. The chemical tests already mentioned will reveal at once the com position of the fabric to a careful observer. But there is ob viously room for an improved method of distinguishing the different materials, and the importance of the interests engaged in the manufacture will probably induce the scientific world to bestow some attention on the subject.
TUrpentine to be good should be as clear and white a water, of a strong penetrating smell, and very inflammable

OUR PRESENT EMOWLEDGE OF THE 8UN.
Professor C. A. Young concluded the annual course of lectures before the American Institute by an interesting and able discourse on the above topic. Modern science traces to the sun almost the whole range of terrestrial activity. We can ensily follow ont the solar action in our winds and no less easily in our waterfalls. The pumps that raise water to the hills are in the sun. The power that is expended in intercepting water in its downward flow is at the expense of solar fires. In a more remote way we may trace to the sun the steam power which is derived from fuel. The very force with which we move our limbs, the sound of our voices, even the power of mind, the impulses exerted in forming thought, in exciting emotions, are sun-derived, when traced to their ultimate source.

## distance of the son

The first point to be ascertained in relation to the sun, or indeed to any of the heavenly bodies, is its distance from the earth. The method of actually measuring the intervening space which can be most relied upon is by means of the tran sit of Venus. The planet will meet the eastern side of the sun's disk near the northern edge and will pass obliquely across. In Fig. 1, A and B represent stations on opposite

Fig. 1.

sides of the earth and $a$ a portion of the earth's orbit. V the planet Venus and $v$ a portion of its path. C D"and E F represent the apparent paths of the planet across the sun's disk. Fig. 2 shows the track of Venus more clearly. The upper and dark circle represents the planet as seen from the southern hemisphere, and the lower light circle, the planet as seen from the northern. The arrow shows the direction of the motion. The problem is to measure the distance between the center of the black dot on the great face of the sun to the edge of the latter with the utmost accuracy. An error of a hundredth part of a foot, at a distance of about 40 miles, would be fatal to any increase of the accuracy of our preeent knowledge.

## stations oft the earth

The earth must be regarded as seen from the sun the moment when the planet strikes the disk of the sun, provided an observer on the earth were at its center. At that moment we must suppose ourselves transported to the sun, looking toward the earth. This will show the apparent path of the shadow of Venus upon the earth. Stations are selected around the edges of the world, all along in Japan, Kamschatka, Siberia, China and Siam in the northern hemisphere and in New Zealand and some islands in the Southern Ocean

METHODS AND INSTRUMENTS EMPLOYED
In measuring this distance, there will be three different methods pursued. The old fashioned way was to note when the planet strikes the sun and when it leares it, from which we may know the number of hours it takes to pass across the disk of the sun. Thus at the northern station we have the length of the chord which it passes over, and the same at the southern station; and knowing the length of the two chords it is not difficult to compute the distance between them. Sir George B. Airy, the Astronomer Royal of England, is disposed to rely mainly upon that method. But there are great difficulties with it. The main difficulty is this: A bright object looks to the eye larger than its real size; and a dark body projected upon it looks smaller than its real size, so that it is difficult to determine the precise moment when the plan et enters upon the sun's disk

Fig. 2.


Another method, which will be used mainly by the German astronomers, is to measure the position of this spot from time to time in reference to the edges of the sun's disk by means of the heliometer, an instrument by which we can measure very accurately the distance of the iftle round spot rom the edge of the bright circle on which it will be shown. The other method, which will be used by all the nations, bu will be mainly relied upon by the French and the Americans,
is by photography. The English will use a common telescope, driven by clock work, with an eye piece to enlarge the image of the sun to about four inches in diameter. With this they will from moment to moment take photographs of the solar disk while the transit is going on, and they will afterward measure those photograjhs. The objection to this method is that the eye piece used to enlarge an otherwise too small image almost invariably produces a certain amount of distortio:. The round image will not be round on the glass or paper, and it is very difficult to allow for that distortion. They propose to photograph with the same apparatus a scale of equal parts, putting up a board perhaps as long as this romm, with laths nailed upon it at equal distances, to be photographed, and thus they propose to calculate, by comparison, the distortion of the different parts of the field of view. The Germans will use a telescope of the same kind and an eye piece of the same kind; but at the focus of their telescope they will place a piece of glass ruled with fine lines into squares. These will be measured beforehand very cars. fully, and the image of the sun and these ruled lines beisn photographed together, if there is any distortion it wh affect these little squares precisely as it affects the sun; and they need only refer their measure to the nearest lines of this otwork to get an accurate result
The best plan will be that pursued by the French and the Americans and by Lord Lindsay's party from Fngland. The telescope will be $\mathbf{3 0}$ or 40 feet long-it need not be very large in diameter-and the image will be large enough not to require enlargement. Of course such a telescope would be very unwieldy if mounted in the usual way; and the method proposed is to put the telescope horizontally, perhaps in a tunnel underground to protect it from currents of air, though that is not essential, and to throw the image of the sun into the object glass by means of a flat mirror. In this case "flat" means a great deal. It is very difficult to make a mirror flat and that is the difficulty in this method. The mirror must be so flat that at no point shall the curvature equal a radius of 18 miles.

NATIONAL EXPEDITIONS.
Russia-will establish 25 stations in her Siberian dominions. France will send expeditions to Palestine, the Red Sea, Pekin and Japan, the island of St. Paul, New Caledonia, and possibly to the Sandwich Islands. The Germans will send to the Falkland islands, McDonnel's Island, and Kerguelen's Island, in the southern hemisphere. The English will send to Oahu, to Roderick's Island, to the Falkland islands, and to Alexandria, in northern. India. Lord Lindsay will send a private expedition to Mauritius. The United States will Fig. 8.

send out eight parties; four to Japan and China, and the other four to New Zealand, the Falkland islands, Van Diemen's Land and possibly Kerguelen's Island.

## LlUSTRATIONS OF THE SUN's distance.

At present we consider the distance of the sun from the earth to be $92,000,000$ of miles, with a margin of error of about 500,000 miles. It would take a railroad train 263 years to move from the sun to the earth; so that if the Pilgrim Fathers had started from the sun at the time they started from England, by a train whose only stopping places would be Mercury and Venus, they would not have arrived yet. It would take a cannon ball, going at full speed, about nine years to make the journey. Light takes eight minutes. Sound, if it could be carried over the celestial spaces, would be fourteen years on the way. You know, continued the lecturer, that if you touch a part of the body, one does not feel it instantly. If you touch the hand of any one with a pin, it will be an appreciable part of a second before he will feel it and draw his hand back. Now if I had an arm long enough to reach to the sun, and should put my fingers into enough oo reach to the sun, and should put my ingers int dred years before I should find it out, and another hundred years before I could remove my hand.
dmensions and dmasity of the sun.
Once having found out the distance of the sun, it is rery easy to find out its diameter, which is about 860,000 miles If the earth were represented by a ball $2 t$ inches in diameter he sun would require a ball of 18 feet in diameter, which would just about lie between this stage and the ceiling. If he earth were placed at the center of the sun, the moon ould be so far inside the sun's surface that there would be almost room for another moon beyond, the distance of the moon from the earth being 240,000 miles, and of the surface
of the sun from its center, 430,000 miles. In bulk, the sun is a million and a quarter times larger than the earth; that is, it would take that number of earths rolled into one to make up the bulk of the sun. It would not take that number to make up the weight of the sun, for the sun is lighter, bushel for bushel, than the earth. It weighs about 325,000 times as much as the earth. With that enormous mass, the force of gravity must be 28 times as great as on the surface of the earth; so that the weight of an ordinarily heavy man on its surface would be about two tuns.
the heat of the sun
is estimated by French physicists to not greatly exceed that of the electric arc, being, perhaps, once and a half or twice as great. Secchi, on the other hand, estimates it at $2,000,000^{\circ}$ Fahr., and Ericsson at from $6,000,000^{\circ}$ to $7,000,000^{\circ}$. Sir John Herschel illustrates the quantity of heat given out by the sun, as determined by his experiments, as follows: Suppose ice should be formed into a rod forty-five miles in diameter, and that rod of ice should be darted at the sun with
the velocity of light: if all the heat of the sun could be conthe velocity of light: if all the heat of the sun could be con-
centrated upon the point of that advancing javelin of ice, it centrated upon the point of that advancing javelin of ice, it
would never approach the sun, for the point would melt off would never approach the sun, for the point would melt off
as fast as it came. Or we may put it in another way : Suppose we should build a railroad from here to the sun, and should take to it two and one quarter miles square of solid ice, carrying it clear by the moon, Mercury, and Venus, and if we should concentrate upon that the heat of the sun, it would take just one second to melt it, and in seven seconds it would be volatilized, changed into steam, and invisible.

## the origin of solar heat

has been attributed by some to chemical combinations, but if the sun were of solid coal, it would have been completely burned out in 5,000 years, giving out heat at the present rate. The proper view is that its heat is maintained by the influx of matter. As meteors fall upon the earth, several millions in a day, so they fall into the sun, millions of millions per day, and contribute to the solar heat. But that does not account for it all. Another cause, I doubt not, is the contraction of its volume. If the sun were to contract one hundred and twenty feet in radius, or two hundred and forty feet in diameter, in a year, that would account for all the heat it gives off. Bodies may give off heat without growing colder. If we freeze a pail of water, it gives off heat while it is freezing, but the thermometer will indicate no fall $n$ temperature until it is all frozen. So it is quite likely that
the gases in the outer surface of the sun will enter into comthe gases in the outer surface of the sun will enter into com-
binations with each other, dissociating and uniting in other binations with each other, dissociating and u
forms, and emitting heat in the combination.
the physical appearance of the bun
in the telescope is like a mass of clouds, or rather curdled milk or cotton wool. It is much darker on the edges, which is a very important point in explaining its constitution, and there are also numerous bright streaks, called faculæ, besides
the solar spots. Mr. Nasmyth thinks that these irregular the solar spots. Mr. Nasmyth thinks that these irregular
forms resemble willow leaves. I have not seen that, but I have scen in the sun what scemed irregular masses, dark spuces, and here and there apparently little holes.
The bright spots, called faculæ, are elevations on the solar surface. But the most remarkable objects on the surface of the sun are the spots; they are far more striking than the faculæ, and this before you (pointing to the diagram) may be taken as a good example or type of such spot, fairly formed and well established. In the center of it is a dark spot looking like a hole. The holes are not usually uniformly dark; there are usually little bays formed in the surrounding region; the edges of these are sharply defined, with no shad ing. Around this center, called the umbra, there is a wide its outside edge, and striped radially. This hole-the umbra, if it be a hole-is so large that the earth might be dropped through into it without touching its edge. It is over 12,000 miles in diameter. The faculæ are always very numerous near the spot. Where the faculæ comes to the edge, ther is a little projection. As to the nature of the

## sUN sPOTs,

it is absolutely certain that the dark centers are depressed below the solar surface, but whether they are holes through to the body of the sun is another question, but they are cavities when the spot is first formed. You do not see the umbra, but the penumbra. To talk of temperate zones in a body as hot as the sun seems strange, but the spots are found in the temperate zones. They are not common in the sun's equator, or more than $30^{\circ}$ from the equator. Rare examples have been found at $40^{\circ}$ or $45^{\circ}$ from it.

## variations of sun spots.

The most curious thing about them is that they are not equally frequent in different years, and are regular in their irregularity or periodicity. After appearing in great force, they becore infrequent for three years; then they gradually increase in number until, in about ten years from the first period or maximum frequency, they are again abundant. Sometimes as many as 400 or 500 separate groups of spots have been remarked upon the sun in a single year, and again there is a year when spots are few, and there may not be more than 80 or 100 in a year; so that in the year of maximum spot-frequency, the number is four times as great as on the year of minimum frequency. The cause of this is not yet known, but it is surmised that it is connected with the motions of Mercury, Venus and Jupiter, though it is probably due to a periodical boiling over of the vast caldron. When we examine the sun with the spectroscope, we find outward motion. Under the cloudy surface there is an ocean of liquid, and slags are formed in this ocean, and there is a blow-
ing out of matter which gives rise to the penumbral phenomenon. There is undoubtedly an underfeed from the outside toward the center, but whether by a rush downward from the center of the spot, I cannot say. The English astronomers believe it is from the outside atmosphere to the center of the spot.
Professor Young then proceeded to explain and illustrate by diagrams on the screen, the solar prominences and their spectra. Fig. 3 is a representation of the sun with chromosphere and prominences, showing the relative magnitudes of the latter as compared with the sun, and also their num ber. The inner circular line is the boundary of the sun proper as distinguished from the chromosphere. The re mainder of the lecture was devoted to the description of eclipses and the lecturer's observation of phenomena, the details of which have already appeared in our columns.

## Correspondence.

Extraordinary Parhella observed lat Independence To the Editor of the Scientific American:
The inclosed diagram represents phenomena that occurred ere on Saturday, January 25, at 9 o'clock A. m. In order hat it may be better understood and more highly apprecia ted, it will be necessary to give some few points of descrip tion.
$A$ is
$A$ is the place of observation; $S$ the sun, $E D$ a circle around the sun, or rainbow; $F G$ is what we term the first reverse circle or rainbow; H I is a second circle or rainbow whose brilliancy is cut short by the bright silvery belt, I) B C E, which extends the whole heavens around, from east to west, in a plane, the hight of the sun, and parallel to the plane of the horizon, having its origin in the two dazzlingly brilliant sun dogs, or false suns, $b b ; \mathbf{J} K$ is the second re verse rainbow, which was the most brilliant of all. The observations A B and AC, are west, and point to two ver bright sun dogs, $b^{\prime} b^{\prime}$, which seem to correspond to D E in the east. $d$ and $d^{\prime}$ are in the north and south, and quit
bright also. But what is more singular, two more are at $c c$

but they are much the same as the others, except $l b$, in color being bright and silvery ; and'emanating from each, at right angles, are the silvery bright streaks shown in the figure which neither absorb nor are absorbed by the semicircle, H I, but cross and produce the remarkably beautiful figure as seen in the misty clouds that morning. J K is a remarkably brilliant rainbow. E $G$ is not so brilliant in the rainbow as K, but is made dazzlingly bright at the point of contact with E D, by the two streaks from $c c$. Part of the circle E $D$, is very brilliant, and $H I$ is nearly as distinct, if no more so. The two sun dogs, $b b$, were fiery red around the edges, and some colors of the bow attend, which made then dazzlingly brilliant. One very singular thing about it was
the appearance of the entire upper part of the figure in a the appearance of the entire upper part of the figure in a
plane, horizontal to D BCE, instead of in a vertical one, as is usually seen in rainbows. The background for the streaks proceeding from ecs was a dark hazy blue, somewhat deeper than a sky blue.
The segment of the arc, J K, was apparently $90^{\circ}$; that of eet; $\mathbf{F}(1,375$ feet, and E D, 500 feet. The citizens here de sire you to give or explain the philosophy of every part of the whole thing, either through your columns or by private letters. As we think it would be a very interesting matter gram and an explanation in your valuable paper.
The sky was, generally, slightly cloudy, hazy, and misty nd the earth was, and had been for some time, deeply covred with snow.
Will you please explain, particularly, the reversion of these rainbows? Some parts we understand, but what we want is an explanation of the whole thing as it was seen. The extreme upper part of the figure was east of a vertic
Independence, Mo.
D. M. Woodson.

Independen
Rearskes by the Editor.-When the sun is seen in clearsky, the luminous disk is visible to us without any attendant phenomena; but if the air is loaded with moisture, or there are other favorable conditions, a great variety of phenomena present themselves and become the subject of investigation and study. The name halo is given indiscriminately to the circles which appear around the sun and the moon. and, for the purposes of precision, it has been proposed to call the rings about the sun " parhelia," and those about the moon, "paraselenæ." The parhelia witnessed at Independence were of
rare occurrence, and we can only give the explanation of the phenomena that has been propounded by Newton and accepted by other philosophers. In cold weather, when parti cles of ice are floating in the higher regions, the sun is some times surrounded with the most complicated rings, circles, and mock suns, formed at the points where these circles in tersect each other. Sir Isaac Newton considered the rings a produced by the light passing through very small drops of water, in the same manner as colors are produced by thin plates. Descartes supposed that the halos were due to refrac tion, through crystals of ice and snow floating in the air. The same view was taken by Moriotte, Young, Cavendish, and Brewster. In order to explain the larger halo. Dr. Young supposes that the rays which have been once refracted by the ice prisms fall on other prisms, and the effect is doubled by a second refraction, so as to produce a deviation of $90^{\circ}$. This explanation is not accepted by Brewster, who think that the external halo may be produced by the refraction of the rectangular terminations of crystals. All parties agree that such phenomena as wereobserved at Independence, Mo. are due to solid particles of ice floating in the higher region of the air, and that refraction through ice prisms is the prim itive cause. The air has been unusually charged with frozen water this winter, and an extracordinary number of halos, around the moon as well as around the sun, have been ob served. On Lake Superior, the sun has been known to sink below the horizon and then to come up again to view, owing to a sudden change in the refracting medium through which the light passed. At Independence there was an unusual number of mock suns; but the other features of the parhelia were the same as have been pictured and described in ha were the same as have been pictured and described in
works on natural philosophy. In fact, our correspondent will works on natural philosophy. In fact, our correspondent will
find in Brewster's " Treatise on Optics," two diagrams, one find in Brewster's "Treatise on Optics," two diagrams, one
of parhelia and the other of paraselenæ, witnessed in 1630, of parhelia and the other of paraselenx, witnessed in 1630 ,
which coincide very closely with the drawing shown by our which coincide very closely with the drawing shown by our
engraving. The explanation of the whole set of phenomena is, therefore, resolvable into this, that the light was doubly refracted by ice prisms floating in the air, the sun being a a convenient hight above the horizon to produce the best ef fect. Experiments to prove the accuracy of this theory have been prepared and shown in the lecture rooms of professor of physics; and until a better explanation is offered, we pre fer to abide ly the above decision.

## A Brilliant Meteor in Massachusetts.

## To the Editor of the Scientific Americren

I notice in your journal mention of meteors seen in Mason City, Ill., and in England, and the perusal calls to my mind a very sharp flash seen on the evening of January 11, 1873 It was caused by a large ball of fire, about the size of a bushel basket; it fell in Tyngsboro', Mass., some 6 or 7 miles from Lowell, on the Boston, Lowell, and Nashua Rail road. The tlash was seen some twenty-five miles all around and $a$ dull rumbling sound was heard. It fell near or upon the railroad track, just in advance of an approaching passenger train, and caused quite a panic among the passengers, for a short time, until the conductor could satisfy them that there was no danger in procceding.
Lowell, Mass.

## Tree Transplantation

To the Editor of the Scientific American:
On page 37 of your current volume some one says: "Most persons make a fatal mistake in trimming trees when transplanted. Never cut off a limb or a twig till they (the trees) This advice foothold
This advice, in the Scientific American, at once becomes a powerful influence. Whatever affects the tree planting interest is of national importance; and I think I can show by reasons sufficient, as I could by the experience of all successful tree planters, that the advice referred to is radically wrong, and should read: "Always cut down the top of a tree transplanted, so that the relative proportion be preserved between roots and branches.
A tree to secure a foothold in its new bed must make a new growth of wood both at the top and root; otherwise death results in all cases after transplantation. Most trees lose, in transplanting, the larger portion of their roots; how does this operate when the top is left of full size and untrimned? The leaves come out full with the advent of spring; and it takes all the nourishment supplied by the remaining ronts to support the leaves, and no new wood is made.
If the top of the tree is cut down and the leaf buds de stroyed, then, of necessity, in order to put forth leaves, there must be a new woody growth; when this occurs, there is always a corresponding root growth, and thus a foothold is se-
cured. Many trees, like the sugar maple, only make wood cured. Many trees, like the sugar maple, only make wood ed with ever so much care after this season, they invariably ed w.

A tree which continues making wood during the entire eason, like the willow and locust, can with care be transplanted at any time; but it may be set down as a rule, with but few exceptions, that deciduous trees should only be transplanted when bare of leaves, and then the top left must be proportioned to the root.
To further illustrate the fallacy of the no trimming theory, suppose that in putting out cuttings, as of the cotton wood or willow, a top was left. Does any one suppose that a new root would be formed? It is the growth of the new top that is accompanied by new root growth; in fact they are inseparable. The everywhere popular white elm and sugar maple, although exceedingly difficult to transplant successfully with large tops, will generally live and grow if every branch is cut off and the short bare poles only set. E.H.R.

## To the Editor of the Scientific American:

If a description of a spider balloon will be of any interest to your readers, I will endeavor to give you particulars of to your readers, I will endeavor to give you particulars of
one that I saw on the 10th of last October. It was a very one that I saw on the 10th of last October. It was a very
calm and pleasant day, and not a breeze disturbed the still calm and pleasant day, and not a breeze disturbed the still
waters of Lake Seneca. In company with others I was crossing the lake, and when near the center one of the party noticed and called our attention to a small wake, caused by the moving of some insects; and with some difficulty we succeeded in gaining a point where we could see that they were spiders, three in number, gliding at a rapid rate over the mooth surface of the water; and we were much surprised to see a single thread, the size of a knitting needle, extending in the air to the hight of thirty feet, at an angle of sixty degrees, terminating with an enormous balloon-shaped web I should think that it was eight feet long and five feet wide with stays fastened to the main thread, something similar to those of a balloon; and it was managed, apparently, by an inthose of a balloon; and it was managed, apparently, by an innumerable number of these insects stationed at proper inter-
vals. Wishing to obtain a closer view, we undertook to vals. Wishing to obtain a closer view, we undertook to
approach it; but when we were within a few feet, it began to rise, though the last spider, which proved to be about the size oi a house fly, was brought back by the stroke of an oar. The balioon went onward and upward until it was lost to sight. Whether this is a mode of travel peculiar to spiders, and how the balloon is kept in its proper shape, I am at a loss to know; and I should be glad to have an opinion.
Rock Stream, N. Y.
C. f. hathafay.

## Heating of Journals.

I take great interest in reading the various articles in your paper, especially under the head of "Answers to Correspondents." I have watched the discussion lately in regard to running and standing balance, and last week I was called to look at an engine which was heating in the journals of the main shaft to such an extent that water had to be used to cool them off. I found the fly wheel about $\frac{y}{8}$ of an inch out of truth edgeways, the key being imperfectly fitted. The shaft was about 7 feet long and 5 inches in diameter, and the wheel, 10 feet in diameter. After properly fitting the key and trueing the wheel, I found the tendency of the shaft to " wobble" had disappeared; and after a few days of careful usage, the engine ran quietly and the bearings were cool.
C. C. C.

## Spinning Cotion in the South.

To the Editor of the Scientific American:
In your issue of January 25, a correspondent from Aiken, S. C., mentions the necessity for a machine to spin cotton, that can be operated by the same power which gins the cotton in the Southern States.
This reminds me that, about thirty-five years since, some one introduced in this section a machine worked by hand, which ginned the cotton and spun it into yarns. These machines were usually placed in the hands of slaves and soon became worthless. Now is it not possible that some scientific mechanic might so enlarge and improve this machine as to make it available for the purpose suggested?
Warthen's Store, Ga. John H. Walker.

## Powder versus Dynamite

The explosive power of dynamite as compared to that of blasting powder is $2 \frac{2}{3}$ to 1 , that is to saj; the same quantity blasting powder is $2 \frac{2}{3}$ to 1 , that is to saj; the same quantity
of dynamite will do $2 \frac{2}{3}$ times the work of powder. At the of dynamite will do $2 \frac{2}{3}$ times the work of powder. At the
calamine mines of Chrzanow, the working effect of each calamine mines of Chrzanow, the working effect of each
hewer, driving in hard dolomite rock, is in an eight hours hewer, driving in hard dolomite rock, is in an eight hours
shift 6.0 cubic feet with dynamite against 3.5 to 4 cubic feet with powder, and when using the former each man can bore and fire three holes of 16 inches against two with powder. The explosion of dynamite is very sudden, and the rock is far more shattered by it, without being projected, as is the case with powder. At the tin mines of Graupen, in Bohemia, dynamite only shows a decided advantage when deep bore holes can be used, but it is unquestionable that in water-bearing rocks, when a charge of dynamite has never failed when judiciously treated, it is considered as much safer than powder. When sinking a round shaft of 12 feet diameter at the Britannia colliery, near Mariaschein, in Bohemia,through a bed of very hard and tough clay, another explosive, "haloxyline," was employed. Three holes of 30 to 40 inche were bored in the bottom of the shaft, and inclined to the sides of the shaft with an angle of $60^{\prime}$. They were charged each with 3.5 ounces of haloxyline, and fired simultaneously by electricity, when the whole mass of the rock, about 226 cubic feet, covering the area of the shaft, and to the depth of the holes, was so completely shattered that it could be easily removed.

## A New Paper.

Iron, the Journal of Science, Metals and Manufactures, is the name of a new first class weekly paper, of large size, which made its appearance in Londor, on the 1st of January. It is devoted chiefly to iron-producing interests and iron manufactures, including also other metals. The numbers before us give evidence of marked ability in the editorship of every department, and the paper promises to be a most valuable addition to the ranks of scientific and special journals.

An old colored minister, in a sermon on hell, pictured it as a region of ice and snow, where the damnedfroze throughout eternity. When privately asked his purpose in representing Gehenna in this way, he said: "I don't dare to tel dem people nuffin else. Why, if I were to say dat hell was
warm, some o' dem old rhumatic niggas would be wantin' to start down dar de bery fust frost!"

## How to Search for Metale <br> searching for gold

The paying localities of gold deposits are the slopes the Rocky and Alleghany Mountains. Gold need not be looked for in the anthracite and bituminous coal fields, nor The thitone rock. It is seldom found in the beds of rivers. If soil or itself is the purest indication of its existence. I son or sand is washed, and the particles of gold are no bed will not pay.
bed will not pay.
Along streams
Along streams rather high up among the mountains, and in the gravelly drift covering the slopes of the valley below, are the best prospects. Where the stream meets an obstacle in its path, or makes a bend, or has deep holes, there we may look for "pockets" of gold. Black or red sands are usually richest. Gold-bearing rock is a slate or granite abounding in rusty-looking quartz veins, the latter containing iron pyrites or cavities. Almost all iron pyrites and silver ores may be worked for gold. When the cuartz veins are thin and numerous rather than massive, and lie near the surface, they are considered most profitable. Few veins can be worked with profit very far down. As traces of gold may be found almost everywhere, no one should indulge in speculation before calculating the percentage and the cost of speculation before calculating the percentage and the cost of
extraction. Gold hunting, after all, is a lottery with more extraction. Gold
blanks than prizes.
The substances most frequently mistaken for gold are iron pyrites, copper pyrites, and mica. The precious metal is easily distinguished from these by its malleability (flattening under the hammer) and its great weight, sinking rapidly in water.
searching for silver.
This metal is usually found with lead ore and native copper. Slates and sandstones intersected by igneous rocks, as trap and porphyry, are good localities. Pure silver is often The Colorado silver lodes are porous at the surface and col ored more or less red orgreen. Any rock suspected of containing silver should be powdered and dissolved in nitric acid. Pour off the liquid and add to it a solution of salt. If a white powder falls to the bottom, which, upon exposure, turns black, there is silver in it. Silver mines increase in value as in depth, whereas gold diminishes as we descend.

## searching for copper.

The copper ores, after exposure, or after being dipped in vinegar, are almost invariably green on the surface. They are most abundant near trap dykes. The pyrites are gence. per very rarely occurs in the new formations, as along the Atlantic and Gulf borders, and in the Mississippi valley south of Cairo.
searching for Lead.
Lead is seldom discovered in the surface soil. It is also in vain to look for it in the coal region and along the coast. It must be sought in steep hills, in limestone and slate rocks. A surface cut by frequent ravines, or covered by vegetation in lines, indicat $: s$ mineral crevices. The galena from the slate is said to contain more silver than that from the limestone. The purest specimens of galena are poorest in silver; the small veins are richest in the more precious metal. A lead vein is thickest in limestone, thinner in sandstone, and thinnest in slate.
bearching for iron
Any heavy mineral of a black, brown, red, or yellow color may be suspected to be iron. To prove it, dissolve some in ril of vitriol and pour in an infusion of nut gall or oak bark; if it turns black, iron is present. If a tun of rich magnetic ore costs more than $\$ 4$ at the furnace, good hematite more than $\$ 3$, and poor ores more than $\$ 1.50$ or $\$ 2$, they are too expensive to pay, unless iron is unusually high. Deep mining for iron is not profitable. Generally speaking, a bed of good iron ore, a foot thick, will repay the cost of stripping it of soil, etc., twelve feet thick. Red and yellow pearths, calied ochers, contain iron. Magnetic ore is easily found by a compass.-Underground Treasures, by Professor found by a co
James Orton.

## Treatment of Expposed $\begin{gathered}\text { [Dental Cosmos.] } \\ \text { BY DR. C. F. FRANCIB. }\end{gathered}$

If, by any unlucky turn of the excavator, a healthy pulp gets suddenly uncovered and wounded, there is no gentle treatment will almost itality. Proper care and we have but to prevent inflammation by keeping awny irritating agents, and the pulp will soon heal by first intention and deposit a sufficient amount of calciferous matter to fill the breach, and thus protect itself. Now let us see how this may be accomplished. If the tooth is aching, apply just sufficient carbolic acid to allay the pain; then cove with a small cap of note paper, and carefully fill with a tol erably thick paste of oxychloride of zinc. This has been my
method for several years, as has been repeatedly stated and method for several vears, as has been repeatedly stated and
published. I have found, however, that though protected in this manner, pulps would sometimes become irritated by the application of the zinc, thus endangering their vitality. Recently I have overcome this trouble, and now have little fear of such danger. After applying the carbolic acid, and carefully mopping out the excess with a bit of soft spunk, I cover one side of the paper cap with a solution of balsam of fir with chloroform, and place it gently over the wound. The chloroform quickly evaporates and leaves a smooth, glossy coating of soothing balsam, which perfectly protect the pulp and holds the paper snugly in its position. The
coating cannot be permeated by the muriate of zinc, and con sequently bids it defiance.

Having given reasons for using the balsam, let us consider the benefit derived from the use of the paper "cap." Cut from note paper, it is smooth and of just the thickness to be manageable, and is the best substance of the same bulk for protecting the pulp from thermal shocks that can be used. As for the zinc, its office is purely mechanical. It simply makes a good, firm cover to the pulp, and a floor or foundamakes a good, firm cover to the pulp, and a floor or founda
tion for a gold filling. Some individuals seem to imagine that oxychloride of zinc possesses some medicinal virtue that
that that oxychloride of zinc possesses some medicinal virtue that
acts with magic influence upon an exposed pulp. No such acts with magic influence upon an exposed pulp. No such
thing! Despite its "antiseptic properties," it tends to irrithing! Despite its "antiseptic properties," it tends to irri-
tate wherever applied, and endangers the vitality of any pulp that it touches.

## Aerial Navigation.

M. Hannel, Ingénieur des Arts et Manufactures, lately presented to the French Aëronautical Society some observapresented to the French Aerronautical Society some observa-
tions upon the flight of birds, which are worth noticing. He assumes that, during normal flight, the speed of the center of movement of the wings is constant, and equals $1 \cdot 15$ meters or $3 \frac{1}{2}$ feet per second. This center of movement is situated on the line which divides the triangle representing the wing in two equivalent parts. The weight which a bird can support without fatigue, may increase, according to circumstances, up to one half of its own weight; the mean value is equal to one fourth of its weight. The total load, that is to say, the weight of the bird, increased by the weight that it can carry, is thus, on an average, equal to fivefourths its proper weight. The relation between the total load and the breadth of wing is $x=y \log .500$, or,$x=y^{2.69897}$. In this formula $x$ represents the total load expressed in kilogrammes, and $y$ the breadth of the wing in meters. A kilogramme is $2 \cdot 2$ lbs., and a meter is $1 \cdot 1$ yards nearly. A kilogramme is $2 \cdot 2 \mathrm{lbs}$., and a meter is $1 \cdot 1$ yards near
This formula can be applied to insects as well as to birds. This formula can be applied to insects as well as to birds.
Supposing this formula to hold good for all bodies passing Supposing this formula to hold good for all bodies passing
through the air, and carrying with them their motive power, the application of it can be made to a man or a machine. For a machine weighing $3 \cdot 5$ tuns, the spread of wing should be 26 feet, and 6 yards for a man weighing, with the necessary appliances, 220 lbs.
The conclusions of M. Hannel have been discussed by a large number of the Society, who in the majority do not agree with them. They have been compared with those of M. Harting, according to whom the weight increases according to the cube of the lengths of the wings, modified by a coefficient which varies with different kinds of birds. M. Hannel and M. Harting do not consider the weight and fannead of wings in the same manner, and they do not adopt the same speed. Besides, M. Hannel assumes a constant the same speed. Besides, M. Hannel assumes a constant
speed in the center of motion, an assumption which has speed in the center of motion,
not been proved mathematically.

## Improvement in the Manufacturs of Sul phuric

The platinum vessels employed for the concentration of sulphuric acid are extremely costly. A small portion of the sulphuric acid are extremely costly. A small portion of the
platinum is moreover constantly dissolved, and represents a platinum is moreover constantly dissolved, and represents a
money loss of considerable importance. Manufacturers money loss of considerable importance. Manufacturers
have, for these reasons, long sought for a less costly material have, for these reasons, long sought for a less costly material
to replace the platinum. In 1844 M . Kulhmann, of Lille, remarked that the temperature of boiling sulphuric acid at $66^{\circ}$ Baume, when, instead of being subjected to atmospheric pressure, it was kept almost in vacuo, was reduced from $325^{\circ}$ to 190 or $195^{\circ}$. Now lead is not attacked by the acid at a temperature below 200 or $205^{\circ}$.
M. de Heuiptume, a manufacturing chemist of Molenbeek-Saint-Jean-les-Bruxelles, has succeeded in establishing, on a commercial footing, a process of concentration in lead vessels and in vacuo.
The vacuum is made to the degree desired by the condensation of steam injected into a cast iron boiler in communi. cation with the concentrating vessel
According to the calculation of M. Heuiptume, the concen tration of one bottle of sulphuric acid, weighing 220 lbs . costs $17 \cdot 4$ cents, if effected by the platinum process, and $9 \cdot 46$ cents if his vacuum method be adopted. The gain there fore, resulting from this latter system would be 7.94 cents per bottle, or 44 per cent.

The Purification of Rivers.
Mr. J. J. Lundy, of Edinburgh, Scotland, recently pub plan which will take, from foul wapic, in which he proposes a kind, whether of sewage or of manufacturers' and dyers' waste waters.
The substance used is a peculiar kind of animal charcoal made from any substance which is not bone. It is stated to be not only a powerful decolorizer but has peculiar powers of absorbing not only organic but also inorganic substances, while it is from twenty to fifty times cheaper than ordinary one charcoal.
In carrying out the method proposed by the author, of using this material, the sewage is caused to fall into a bed of sand which lies on a thinner bed of gravel, under which lies a bed of the charcoal. After passing through anoiher layer of gravel, the liquid goes upward through more charcoal and flows over into a bed of sand. It is thus thoroughly filtered and parified.
The charcoal after use may be laid aside in the open air without causing any smell, and in a little time will recover its original power, or it may be reburnt or distilled with its original power, or it may be reburnt or distilled with
great profit, as the whole of the nitrogen taken from the great profit, as the whole of the nitrogen taken from the
sewage would pass over in the distillation as ammonia, acsewage would pass over in the distila
companied by other valuable products.

The production of musical sounds from magnets, by Dr .
Page, was effected in 1837 . Page, was effected in 1837.

## CULINARY boller.

We leave the question to housekeepers generally whether, in all the varied routine of the kitchen, there is anything more extremely disagreeable-soul-trying we might saythan to elevate a heavy kettle from the range and pour off the water from its contents, thereby scalding one's fingers $o r$, in an unguarded moment, dumping the cooked article into the sink. With the presumption that the universal response will be that there is not, we present an illustration of an invention which, by the simplest possible method, does away with the whole difficulty.
Here is a large kettle having a curved bale, $A$. Within is a smaller vessel, $B$, having a cover and bale, the lower part of which, $\mathbf{C}$, instead of being solid, is perforated. This inner kettle has a flange around its top so that it fits closely into and on the outer vessel.


Water is placed in the large kettle, and the thing to be cooked in the small one, which, of course, is tightly covered, and set down in place. Then, when the boiling is finished, the inside kettle is lifted by its bale and hung by a hook to a swivel attached to the bale of the outer vessel in the position shown in our engraving, and there it is left until its contents are properly drained or steamed.
Ruth Russell, of 182 Union street, New Bedford, Mass., is the lady to whom the credit of this excellent little invention is due, and from her further particulars may be obtained. Patented January 2, 1872.

Statue of Elian Howe, Jr.
The model for the statue of the inventor of the sewing machine, Elias Howe, which is to be placed in the Central Park in this city, is now complete. It is the design of Mr. Elis. The work is eight feet in hight and the tall figure stands erect, the weight of the body resting on the left foot In the right leg a certain stiffness is noticeable, and the knees are closer together than perfect proportion sanctions. These peculiarities, however, belonged to Mr. Howe's physique, and demand recognition in any honest portrait of him. The right hand holds a walking stick, the left a broad brimmed hat. The costume is simply a reproduction of that of the ordinary man of business in the upper walks of life. The long and many-ringlet-d hair, which constituted so impressive a chevelure, is exceedingly well rendered, and the countenance expresses that intrepidity, obstinacy, patience, hon esty and hope which sustained the inventor of the sewing machine through the quarter of a century through which he toiled to obtain permanent success. The statue is to be cast in bronze in Philadelphia, and is to be ready in May next. Three bas-reliefs are to adorn the pedestal. One of these is to illustrate the misery of the pre-sewing machine needle woman, as indicated in Hood's "Song of the Shirt." The second will show Elias Howe, Jr., in his workshop pondering over his first machine. The third will indicate the perfected instrument under the easy manipulation of the average worker. These bas-reliefs will adorn three sides of the pedestal. An inscription will probably find place on the fourth.

## VIagnetic Iron.

Magnetic iron ore, or " magnetite," received its name in early times from its magnetic properties. A mass of the ore influences the needle at a great distance. The magnetism of the ore is polar, the same side which repels one end of the needle attracting the other, and vice vers 6 with the other side. It crystalizes in the cubical system, the octahedron and rhombic dodecahedron being common forms. It occurs in Sweden, Norway, the Ural Mountains, etc., and on a very much smaller scale in England. In the southeast corner of Dartmoor, a band of this kind of ore deranges a compass as it is carried past its vicinity, and sailors say that there is a place in Cardigan Bay where, on passing a reef of rocks, the needle is influenced, and set oscillating. A large mass of this deposit in the southenst extremity of the Island of Elba
has a similar effect; in Sweden, too, deposits are discovered by means of this property. Meteorites frequently contain a percentage of iron greater than magnetite, associsted with nickel and chrysolite in some cases; but the rarity of their occurrence precludes them from being classed as iron ores, by which term we understand a mineral containing iron in sufficient quantity to be economically and advantageously extracted.

## OsCILLATING PUMP.

The accompanying engravings represent a new form of oscillating pump, the novelty of which consists in the use of a section of a hollow cylinder, oscillating on its longitudinal axis, in connection with a stationary packing and suitably arranged valves. By this construction it is claimed that increased efficiency of working parts is obtained, and that the to pumps of this class, are dispensed with


Fig. 1 affords a perspective view of the device, and Fig. 2 a representation of the intorior portions. $A$ and $B$ are the two sections of the shell or outer casing, each provided with a flange and bolted together to form an oblong cylinder with closed ends. C is the induction chamber, in which are valve opening upwards. The leather forming these valves is in one piece, passing over the abutment, E, thereby packing the oint between it and the shaft, F. G is a plate supported on prings in a groove in the abutment and serves to hold th eather in close contact with the shaft. H is a sectional hol low cylinder connected to the shaft, $F$, by plates through which are ports, closed by the valves, I I, opening upwards. The joint between the sections, $A$ and $B$, is packed with eather, the inner edges of which are turned up as shown a $\mathrm{J} J$, and, resting against the periphery of the cylinder, H . serve also as packing between said cylinder and the casing


K is the discharge opening leading from the uir chamber formed by the upper portion of the section, $A$ The outer onds of the shaft, $F$, are squared to receive a handle, as hown, by which the cylinder, $H$, is caused to oscillate in its bearings. By this means, through the action of the valves, I, the water is drawn into the interior of the cylinder, whence it passes through the opening, $L$, and finally escapes rom the discharge, $K$.
The invention, as is evident from the illustration, is very imple in construction. The cylinder, $\mathrm{H}, \mathrm{is}$ turned off with great facility, and as the two sections of the case are cast separately, each in a single piece, little is required beyond attaching the lower valves and bolting the flanges together.

By removing the top section, the entire working parts are exposed for examination and repair.
Patented November 12, 1872 . For further information ad dress Messrs. Murrill \& Keizer, machinists, No. 44 Holliday street, Baltimore, Md.

## HEW GYROSCOPE GOVERNOR.

The accompanying plan of a recently invented gyroscopic governor, which we find in Engineering, is simple in form and very sensitive in action. The device is contained in a casing in which the steam from the boiler enters, as shown. Motion is obtained from the bevel gearing, the horizontal wheel of which is keyed to a spindle which passes through the top of the case. This spindle is made in a single piece with the tubular portion represented as extending down into the pipe through which the steam passes. The upper end of this tu

bular casting is closed, and being caused to fit tightly, by the pressure of the steam, against the lower extremity of the socket through which the spindle enters the casing, a steam-tight joint is obtained without employing a stuffing box.
A brass sleeve, sliding freely on the tubular casting has formed in it a number of ports which, when the sleeve is in a certain position, correspond to similar orifices in the casting. When the two sets of ports correspond, the steam has clear passage to the engine, but as the sleeve is raised the apertures are more or less closed until the steam way is shut off altogether. Upon a spindle which passes transversely through the sleeve and casting, is mounted a heavy "flyer," of the form shown in the cut. The spindle is attached to the sleeve and rises and falls with it, oblong holes being made in the casting to allow of such motion. At the center of the spindle is a quadrant which gears in a rack inside the tubular casting.
Suppose the various parts to be in the position indicated by the dotted lines, and the steam way full open. When the governor is set in motion, the flyer will become nearly horizontal, and in assuming such position will cause the spindle and its quairant to partially rotate. The effeet is to cause the latter to climb up the rack, lifting with it the spindle and consequently the filer and sleeve. This motion, of course, closes the steam ports to a grester or less degree. It will be seen that the principle of the device is to oppose the constant weight of the flyer and sliding sleeve to the centrifugal force.

British Iron Manuracture in 1872.
According to Iron, the most noteworthy events connected with the British iron manufacture, for 1872, were the practical introduction in England of two American inventions by which the business is being rapidly revolutionized. We allude to the Rotating Puddling Furnace of Samuel Danks, of Cincinnati, Ohio, and the Chemical Puddling process of James Henderson, of New York city.
Henderson, of New York city.
The latter consists in treating the molten iron with fluorine by which all impurities are quickly eliminated. The common cinder ore, which the ironmasters in this country have heretofore been accustomed to haul out at much expense and throw away, will, when remelted and Hendersonized, yield fifty-five per cent of the very finest quality of iron. The great masses of this refuse, which surround the vicinity of nearly all iron works, are, by this new process, converted into deposits of precious value. One establishment in this country is said to have enough of this refuse at its doors to yield a profit of six millions of dollars over all expenses of re-working. The Henderson process produces pure iron, no matter what may be the impurities of the pig, whether phosphorus, sulphur, manganese, carbon or silicium. Even from iron pyrites the process brings out pure metal.

Ebony wood weighs eighty-three pounds to the cubic foot; ignum vita, the same; hickory, fifty-two pounds; birch, orty-five pounds; beech, forty; yellow pine, thirty-eight white pine, twenty-five; cork, fifteen ; and water, sixty-two
THE Managers of the Nashville Industrial Exposition an nounce their third annual display. to take place during the whole of the month of May, 1878. Buildings have been rected specially for this exhibition, and the departments have been increased in nuriber and extended in range. For further information, ser our advertising columns.

## HON-RADIATING stEAY EEGINE.

The illustrations which we herewith give have been pre pared for the inventors, Messrs. Moy \& Shilly, by Mr. N. P. Burgh, and show the machinery as fitted in a 17 tun yacht. We wish it to be understond, says The Engineer, from which we quote, that for the present we prefer to reserve all expression of opinion as to the merit of the invention other than is contained in the statement that the principle adoptad by the inventors is apparently consistent principle adopted by the inventors is apparently consistent with the conditions essential to obtaining high economy of
fuel. The difficulties which the inventors will have to con-
tend with lie in deritang such a mode of construction as will cylinders. The boiler and cylinders are together included prevent the engine from being destroyed by the high tem- within an iron casing lined with fire brick, which also inperature and excessive dryness of the fluid by which it is cludes the furnace, as will be readily understood from a worked, which fluid is essentially what has been well termed, glance at our engraving, and the course taken by the proby the late Professor Rankine, "steam gas," which is a very different thing from ordinary saturated steam.
It will be seen that the engine proper is constructed on the compound principle with two cylinders. These with portion of the boiler, are made in one casting. The heating
race boiler, are made in one casting. The heating
ducts of combustion, will be easily comprehended. By thus putting the cylinders in the boiler, and the whole boiler in the furnace, radiation of heat is of course practically pre rented, and for this reason the title of non-radiating engine has been selected by the inventors.
The engine we illustrate is nominally 10 horse power, but

reat that it can be worked up to 100 indicated horse power.
The high pressure cylinder is 6 inches in diameter, an the low pressure cylinder 15 inches in diameter, the stroke of the pistons being 12 inches, and their depths or thicknes 6 inches. because the lowest working pressure of the steam is 200 lbs . on the square inch, and the highest pressure, 400 lbs. on the square inch in the small cylinder. It will be noticed that the pistons have no rings or springs, but grooves are formed in them to keep them tight on a well known prin ciple. [Patented by Wm. S. Gale, of New York city, July 1, 1857.] The cylinders have wrought iron liners for the purpose of renewal and strength.
The steam valves are cylindrical, with the ports cut out a equired; the steam or cut-off valve is fitted in the larger o exhaust valve for the high pressure cylinder, while, for the low pressure engine, two single cylindrical valves are usedhalf cut in two for the exhaust. Mr. Burgh has had some experience, he informs us, in the working of those valves, and, with careful proportions, they answer well under steam of high pressure.
The next features worthy of notice in the arrangement ar the dimensions over all, in proportion to the indicated hors ower. The diameter of the boiler or casing inclosing the cylinders is 2 feet $5 \frac{1}{3}$ inches, and the total depth from the dome to the stufting boxes is 3 feet 3 inches. The tubes are each $1 \frac{f}{8}$ inches outside diameter, 2 feet long, and 144 in tota number, making an area of 122 square feet heating surfac for the tubes only, to say nothing of the surface of the cylin der casing, to which the tubes are secured.
Another matter the inventors claim is that, in large vessels, the stoking, with inverted engines, is on the second deck, o it may be often ou the weather deck, so that hot stokehole low down in a shipare eliminated.
It will probably be found in practice that the heating sur face provided is too small; but let opinions on the subject of proportion be what they may, it is certain that the scheme, as a whole, is sufficiently novel and promising in numerou respects to entitle it to the prominence which we have giv en to it.

## salt Water for New York City.

New York city, it is well known, is almost surrounded by salt water, as it occupies a tongue of land, some fourteen miles long and about a mile broad, the sea water flowing up along both sides. The city is at present supplied with fresh water, for extinguishing fires and all other purposes, by the Croton Aqueduct, 42 miles long, which conducts the Croton river into the city, But this supply is becoming rather in adequate, especially in cases of fires, and the idea of using the river water is now being studied.

A meeting of the municipal Committee to consider plan on this subject, was lately held. One proposition was to provide a series of floating fire engines to patrol around the city, and throw up water from the docks when required
Thomas Miller's plan was that water should be drawn rom the river and forced into a column or receiver by $\varepsilon$ pair of heavy duplex pumps. The water would be carried into the sewers by the overflow when the column was fall, an when the pumps were working at full speed the thirteen inch supply pipe would provide more water than the $22 \frac{1}{2}$ inch fire nossle could draw off. A house would be built around the base of the column for the purpose of keeping hose carts ready for use at any time. The upper part of he building would be reserved for the use of the emplosees The streets could be excavated, pipes be laid from the rive and the whole plan be carried out within eight months, at cost of from $\$ 160,000$ to $\$ 180,000$
William Nelson, Jr., proposed that pipes should be laid from river to riyer every ten streets below Fourteenthstreet beneath the surface of the river, so that there would alway be a supply of water. The cost would be about $\$ 10$ a foot.
Captain Hugh McKay submitted a plan whereby salt water as the tide ebbs and flows, may be forced into towers or reservoirs, placed on the wharves.

## A simple Method of Warming Greenhouces,

The London Grocer suggests that greenhouses, containing half-hardy plants and in which no regular method of heat ing exists, may be warmed even during a hard frost by light ing and distributing a dozen or so common pil lamps, at con venient localities. In selecting these lamps they should be ohosen with vases large in proportion to the size of the fla wick, in order that they may continue burning all night without refilling or other attention. It will be readily unde: tood that, whether one or many lamps are used, the tota mount of heat given off is proportionate to the quantity of il burned, provided the combustion is complete. And in using a lamp, all the heat of combustion is utilized; none goes up the flue as with stoves or fire places.
The same journal, we notice, refers to Pratt's Astral Oil as a very carefully and skilfully refined petroleum product. As this material, in addition to other advantages, possesses that of safety, it would be especially suitable for use as above de scribed.

SwEDEN is taking her place among inventive nations Some very incinious and useful inventions have recentl been sent to this country to be patented. Daring the pest week we have filed in the Patent Office applications from two diferent parties, natives of Sweden, and have since reoeived instructions to prepare a third case, the latte the invention of a Swedish lady, residing in Stockholm.
a Large Water Whemh.-A correspondent, R. H. D. Theal 551 feet in diameter and 10 feet wide

## Cheap Pontage Coming.

We recently chronicled the passage of a law abolishing th ranking privilege, as a result whereof a reduction of post age was expected. We are glad to say that the House o Representatives has recently passed a bill reducing the post ge on all letters from three to two cents. We earnestly hope that the Senate will also pass the bill, so that it may ome a
The bill also provides that newspapers shall be prepaid a the office where mailed.

## The Way the Forente Go

Some idea of the vast extent of the lumber trade and the apidity with which our great forest trees are being consumed may be had if we notice the products of a single saw mill in Michigan, that of A. W. Sage \& Co., in the Saginaw Val ley. This firm does business in Brooklyn, N. Y., and in everal other cities. The mill alluded to cuts and turns out as high as 370,000 feet of lumbor in a single day. Five en gines and eight boilers, yielding six hundred horses power gether with the services of 300 men buildings are very extensive, lighted with gas, and supplie with every convenience for work that ingenuity can suggest.

Danks' Rotary Puddler.-At a late meeting of the Na ional Association of Iron Manufacturers at Philadelphia, Mr. Samuel Danks addressed the members in regard to the ractical benefits of his rotary puddler. He has lately re turned from England, where, after encountering considera be opposition, he succeeded in introducing about fifty of his furnaces, with a prospect that his invention will be gen rally adopted. In the United States, these furnaces are in uccessful operation in Cincinnati, Chattanooga, Tenn. and at the Millville Works, Pittsburgh, where a new mil as just been added at an expense of $\$ 500,000$, intended to ontain five of these furnaces.

Ten Thousand Reapers and Mowers a Year from one Concern.-The new reaper and mower works of McCormick and Brother, at Chicago, at the junction of Western Avenue nd Blue Island Avenue, occupy an enclosed space of twenty hree acres. In 1847 they made 500 machines; but they no manufacture 10,000 machines per annum. The presen uildings cover three sides of a square, are five stories high ave a front of over 1,000 feet in length, and there is also hree story middle building. On the lake and canal, the work ave a front of 1,300 feet.
The bar at the Mouth of the Mibsisbippi-EE. K. R. writes to say that Mr. C. W. Stewart is in error as to th number and inefficiency of the dredge boat employed in keeping a clear channel through the bar. Only two boat re employed, and the channel is kept free to a depth of 17 eet at mean low water.
AT a recent meeting of the Royal Astronomical Society, paper by Mr. Hind was read, relating to the solar eclipse of he year 2,151 , which, it appears, will not be total in London hough very nearly so. It will be total, however, in Shef field. Mr. Dunkin suggested the possibility that no consid rable proportion of those present would see the eclipse in question; and the meeting appeared to agree with him.

The navigable balloon of M. Dupuy de Lome, the distin uished French engineer, is varnished with a composition ade up of 3 equal parts of gelatin, glycerin, and tannin號 12 parts of pyroligneous acid. The varnish has been on fourteen months and is in perfect condition.

If the total length of railroads in all countries is 146,24 English miles, as has been computed, it is not surprisin that their maintenance, together with the new construction takes more than half the iron production of the world. Europe has 48 per cent and America 47 per cent of the whole.

Not only will the repeal of the franking privilege save so much, directly, to the Department, but it will lead to the suppression of a large portion

The Commissioner of Patents has granted a patent to George C. Campbell, for putting a mixture of corn meal and ye meal into a package, as a new article of manufacture.

Facts for the Ladies.-Mrs. D. W. Torrence, New York, uses ;rhe heeler an hoon Lock-silich machine ior her owa lam y a wise, ana be See the new Improvements and Woode' Lock-stitch Ripper.

## WHERE AND HOW TO ADVERTISE.

Tms, that a hint to them is so weli undertood by old entabisied busines usiness, or having for sale a new article, or wishing to sell a patent,or ind manufacturer to work it: apon such a class, we would impress the impo hrough wich to do it.
In this matte discretion is to be used at first; but experience will soo etermine tha papers having the largest circulation among the class of persons mos, likely to be interested in the article for sale, will be th heapest and bring the quic Kest returna. To the manufacturer or all knd or proposals for all tinds of englneering worko, we belleve there is no ther source from which the advertiser can get as apeedy returnaas throig we advertiong columne of the Solientific amizicar.
We do not make these suggestions merely to increase our advertising pa The sout ontirect persons how to increase their owa businesb reek, which io probably greater than the combined clrculation of all the other papers of ite kind publiohed in the world, and ten times greater than that of any other pubication of iteclase. A business man wants something aore than to see his advertisement in a printed newapaper. He wants cir oletion. If it is worth 8 cents per 1 e to advertise in a paper of thre Are thoaread.

## patent office decibions.

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decibions of the courts.
United staten Circuit Courto-southern Diatrict or New York.
 [In Equity.-Before Blatchford, Judge.-Decision December 50, 1872.] La TCB Pond, Judpe:






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## NEW BOOKS AND PUBLICATIOHS.

The Yale Nadght-ical Almanac for 1873. C. C. Chatfield \& Co, 460 Chapel Street, New Haven, Conn. Price 35 cents.
An amusing ittle pamphlet, something after the "Josh Billings' Allminas
atyle, illastrated with humporous oketches of student life at Yale. Graduates atyle, illantrated with humorous oketches ofstudent iffe at Yale. Graduates
and undergreduatos of that venerable inotitution will doubtiess And the and undergreduatos of that venerable inotit
book of especial fintereot and entertalnment.
zatent Gurcrican and fantigu cetatents.

## Condensed Milk Can Holder.

ticle of manufacture, which is a mug or cup adapted to hold the nemall tin cans of condensed milk used ou the table, the object belng to provide means for using the said milk cans on the table without exposing their unsightil
ness, it having a ncat external inish.
Francis E. Habersham, Old Church, Va.-This inventio Francis E. Habersham, Old Church, Va.-This invention has for its object
to furnish an Improved machine for platiting cotton seed. The rame of
the machine consists of two long side bars connected near their ends by
two short cruss bars. The axle revolves in bearings attached to the side two short cross bars. The axle revolves in bearings attached to the side
bars, to the ends of which are attached the wheels so as to carry the sald bars, to the ends of which are attached the wheels so as to carry the said
axle with them in their revolution. The seed hopper is placed just in front of the axle and is his ind in position which allows the hopper to be shaken to shake down the seed. to the cen-
ter of the axle is securcd a plate with three or more arms. Upon the outer ends of the arms of the plate are formed saw teeth. As the machine is drawn forward the armed plate is revolved, and as its arms enter the hopper
blocks upon them strike an inclined plate attached to the inner surface o blocks upon them strike an inclined plate attached to the inner surface of
the rear side of sald hopper and depress sald rear side. As the blocks slip from the inclincs the clasticity of the spring ralses the hopper with a jerk, shaking down the seed. As the arms of the plate move down through the
hopper, the saw tceth draw out a quantity of the seed. To the center of the front cross piece of the frame is adjustably attached an o
opening a deeper or shallower furrow to recelve the seed.

## Improved Head Block for Saw Mills. Charles Leddel, Morristown, N. J.-In this improved log set

Charles Leldel, Morristown, N. J.-In this improved log setting apparatua
there is a long toothed rack on the back side of the log beam, parallel with it and movable in the direction of its length. This rack gears at each head block so that by its movement the log beam will be moved forward or back alike on all the head blocks. The pinion shaft at the head of the carriage
riscs as high or highicr than the hight of the largest logs, and has a ratchet wheel on its upper end, with which whecl is a pawl lever and other nechanand to prevent the back pressurc of the log from turning the ratchet whee all being arranged so that the aforesald wheelmay be worked by the sawse to set tnc log and shift the log beam back for a new log. The invention also
comprises a knee for sctilig out the log to saw tapering stuff, worked inde comprises a knee for sctting out the log to saw tapering stuff, worked inde pendent of the aforesaid apparatus, which is for setting the log to be sawed
into stuff with parallel sides. The device also comprises a novel arrangement of a scale and movable polnter to show the distance of the doga from the saw and guide the operator in setting the log.
Improved Reel Rake for:Harvester.
Munson K. Church, Stamford, Canada.-This invention has for its object to furnish an automatic trip for opening the gate or operating the leve that controls the rake or a liarvester, and which is so constructed that it
can be set to open the gate cach time, at evcry second, third, fourth, fifth
or sixth time a rake passes the table.

Improved Organ Case. George Woods, Cambrligeport, Mass., assignor to himself and George $P$.
Carter, of same place. This invention consists, irst, In a construction o
the front projection ol the organ, calculated to expose the keys and stop very promincntly to view, when scen from the ends, thereby greatly increasing the beauty of the instrument. This constrnction is also designed
to dispense with the projecting frunt. The invention consists, secondly, in keys, also of the ledge orprojection below, whereby the sald "key slip" and
ledge are extended around the corners so as to show the aforesaid end
views in a manner to lend additional fentures of beauty to the instrument ; vews in a maniner to lend additional features of beauty to the instrument
and, tuirdly, in a construction of the fall or cover whereby it is adapted to the pecularities of the organ front above nentloned

Improved Cotton Press.
akely, Ga.-This invention is
John T. Williams, Blakels, class of cotton presses wherein two followers are simultaneonsly operated
In opposite dircetions by means of toggle levers. When the windlass is
turned by hand or otherwise, a pin will be moved In opposite directions by means of toggle levers. When the windlass is
turned by hand or otherwise, a pin will be moved with the band forward or
backward, according to the direction of rotation of the windlass, When backward, according to the direction of rotation of the windlass. When
the pin is movel backward-that is, a way from the press-It will cause the will cause the toggles to draw the followers apart to allow the removal o
the bale and the insertion into the press of fresh materlal to be pressed.
New Combinell Water and Liqnor Cooler.
an improved cooler whel shall be so constructed as to enable liquors to b cooled by the same fec that cools the water. The body of the cooler, it
which the water and iccarc placed, Is made with double walls, the space be $t$ weensaid walls being filled with suitable non-conducting substance. The body of the cooler is provided with a faucet, through which the ice water is
drawn out, as required. In the cover are formed holes leading into sockets the npper ends of which are attached to the cover, and which are made of such a length that thelr closed lower ends will not touch the bottom of the
cooler, so that there may be a space for ice water between. In the bottoms of the sockets are placed cofled springs, upon the upper ends of which rest
the bottles that contain the liquors to be cooled. To the cover, around the holes in which the bottles are placed, are secured rubber ringe, so as to at
snugly upon said bottles, and prevent the entrance of warm air into sald

## 1 Improved Breech Loading Fire Arm.

Francols Guyury, Paris, France, assignor of one half his right to Ernest
Dubois, of same place.-This invention relates more especially of breech loading fire arms in which the breech is closed by a bolt, which ha a briling movement in the e ilne of the brarrel for opening and closing the
breech, and a movement abont its axis for the purposeof locking or unlocking it. The invention consists in the provision of an arched shield or cover
which is susceptille of being turned laterally by the arial movement of the which is susceptilie of being tarned laterally by the axial movement of the
breech bolt for uncovering the breech recelver, in which position it is re
tained when the breech bolt is drawn back, and agatn returned to its norma position by a reversc movement of the bolt when the breech is beingclosed.

Improved Grate Bars.
Improved Grate Bars.
James A. SInclair, Bridgeport, Ohio.-The invention consists in plvoting
one end of each bar to a vibrators eross plece, whlle the other end aldes one end of each bar to a vibratory eross plece, whille the other end sildee
loosely in grooves of another cross piece. The object and effect of this mode loosely in grooves of another cross piece. The object and effect of this mode
of putting together a grate is to allow convenicnt room for the expansion and contraction in the bars themselves, and
maintaining the interstices clear of all deposit.

Improved I_nbricating Compound.
Henry R. Hutchisison, Empire Iron Works, ky . -The object of this inven thon is to furnish a compound for lubricating car axies and simillar frictiona
surfaces, which shall prevent the friction and heating of axles and boxes and he lasting and durable when applied. It consists of tallow and mincra
oill, melted and burnt until the more volatile or light portlon man oil, melted and burnt until the more volatile or light portion has been
consumed and all watery particles vaporized and expelled, and the melted tallow or ofl is reduced to the required consistency. It is then allowed to cool untlit thecomes semi-fuld, when pulverized snlphur, pulverized plum.
bago, animal charcoal and hydrated lime are added. Thc composition te mixed oy grinding, when it ts ready for use.

## Improved Furnace for Locomotives.

Thomas Davies, Cleveland, o.-This invention relates tea a new and usefn
mprovement in the furnaces of locomotivc steam bollers ; and consists in the means employed for supplytng atmosphertc air to the fire box. An arch door one half the depth of the firc box, the crown of the arch belng fug beneath the tube section. The doors or apertures are placed just below the arch. This arch confines the admitted air and forces it to mingle with the smoke and gaseous products of combustion.

Improved Manger for Horses.
Joseph C. Higgins, Millatone, N. J.-The object of this invention is to so construct a manger for horses that the horse will be prevented from biting or gnawing it, and from what is known among horsemen as "cribbing:" and
it consatats in pivots or journals in the ends of the manger by which the on which it freely turns.
Improved Chill for Casting Smoothing Irons.
same place.-This invention relates to a new form of mold fort Drake, of smoothing iron in, with the ebject of obtaining a chilled surface for the entire Iron. The inventor obtains the desired result by making the mold
jolnted and applying the hinge at one end. so that it can be freely opened to oInted and applying the hinge at one end. so that it can be freely opened to
release the fron and handle when Anished. The Invention also consists in providing the mold with a certann advantageous form of handle, which relleves the hinge from strain during expansion.
Improved Cigar Thek Cutters.
Le Grand Scholfeld, Providence, R. . ., assignor to National Cigar Machine Company, New York city.-This invention consists of a machine for auto matically feeding, adjusting, cutting, and discharging cigars, in which the by it into or upon a cutting bed, when a plunger pnshes them along the by in into or upon a cutting bed, when a plunger pnshes them along the
Ight distance for presenting the "tuck" ends to a pair of cutters, which cut off the sald end, and there a discharger ejects them from the bed, the aid discharger at the same time opening a discharge passage by raising a
ovable side of the bed, used to prevent the elgars from bonnding off when ovable side of the bed, used to prevent the eigars from bonnding off whe

Improvement in Producing Chlorine.
Louls Emile Aubcrtin, Paris, France.-This invention relates to a new pr drochloric acld to pass over sesquioxide of chrome, heated, by preferenc oahtemperature of about $600^{\circ}$ Fahrenhelt.
Improved Trnck for Moving ${ }^{7}$ Buildings.
william E. Walker, Albion, Iowa.-Two broad truck wheels
heaxle with a space between them, which admits the sand board. Thit sand board rises up to the surface of the wheels, and the board bolster rest
thereon. The upper end of the king bolt projects above the bolster and hereon. The upper end of the king boit projects above the bolster an
plate, and is a little tapering, and is intended to enter the under side of the sill of the bullding to be moved. The regulating arms are attached to each
end of the boister, to which they are flrmly secured by fron straps. Stay races are so attached and connected with the axle and sand board that th bolster may be turned to the right or left, as may be desired, to vary the di-
ection of the bullding. By means of holes in the bolster, the bolster mas eattached to the sill of the bullding by screws. The trnck woll run on rack, latd for the purpose, of planks or timber. Chains are attached to the ends of the axie, or to the linch plns and to the regulating arms when the
ine of motion is straight. When it is necessary to turn in elther directio line of motion is straight. When it is necessary to turn in elther direction
one of the chains is let out and the other one is taken up, so that the bolster s held stationary in any desired position. Four, more or less, of these

Improved Machine for Making Baskets.
-This invention has forits object to furnish an Improved machine for use in making splint marthe hoops, enabiling the baskets to be made rapidily. The Invention consist re latd, and which should be of the size required for the basket, so that the II woven spilints may be cut of to the desired size before the sides ar made of the exact shape and size of the bottom of the basket. To the cen er of the form is secured a bar so arranked that it will always move upand
lown in a vertical line. The upper end of the bar is plvoted to a lever, to lown in a vertical line. The upper end of the bar is plvoted to a lever, to
he free end of which is attached a cord that supports a weight sufficiently onventence in romoring the basket. The lever is locked to hold the form down armiy upon the woven spints by a bar to rest upon the sald lever and ress it down. The sides of the basket are turned up over the edges of the orm, and are held in place by haps haged to the table. A form, whic ides up and down upon the bar, 18 made of such a shape and size as to round it is placed the inner hoop of the basket. After the corncrs of the basket havc been woven, and the form and Inner hoop lowered into place, Che outer hoop is placed around the mouth of the basket, and is secured in in a screw hole in the end of its other leg is inserted a hand screw, which is in a screw hole in the end of its other leg is inserted a hand screw, which is
screwed against the said outer hoop. The outer and inner hoops are then cnred to each other and to the body of the basket by nalls driven in hrough the outer hoop.
ron band of the form.
New Machine for Chamfering and Crozing Barrel Staves.
Joel W. Jones, Middleport, Ohio.-This invention consists in certain imrovements upon machines for crozing barrei staves. The machine is con posed of the end cutting saws, chamfering cutter heads, and grooving saws
also of stationary curred beds on which the staves are held and carred dur Ing the operation br projecting pins on rotary feed disks ; and also of a ar rating feed dash, which places the staves upon the curved bed in the re uisite order. The grooving saws cut a square crozing, which will be adapt-
ed to recelve the full edge of the barrei head and insure greater Armness ed to recelve the full edge of
and durabillty of the barrel.
Improved Wheel Plow.
his invention has for its object to furnish an improved wheel plow, simile in construction, convenient in use, easily controlled, and effective in peration. The wheels revolve upou the journals of the axle and the on hat is to rnn in the furrow is made silghtlylarger than the other. The ax machine is at work, may run level. The axle frame consists of bars which forma rigld frame, rigldyy attached to the tongue. TTe plow beams are
curved downward, upward, and downward, and to thetr rear ends areat ached the plows. Thearms of the U shaped gulde bars are slotted longit Anally, so that the plow beams may have a free vertical movement while
belng held against any lateral movement. By this construction the plow ane raised from the ground by operating either a foot lever, or a han and thus holds the plows ralsed, in which case, by moving the foot lever ilghtly with the foot, the plows will drop to the ground. Suitable arrange
nents cause the plows to work shallower or deeper in the ground.

## Improved Horseshoe Nail Machine.

Albert D. Bingham, Vergennes, Vt.-This invention consists of a machin comprising two pairs of rolls with dies and one palr of plain rolls, or it ma
he hammers bet ween the two pairs with dies. The first pair have groove of the width of the body of the nall to be formed and sultable depth for the thickncss, with depressions at sultable Intervals to form the necessary en argements for the heads, but only the same width as the shanks. The sec nd pair are plain and arranged at suchdistance apart as not to affect the
shank, bat to flat down the head to some extent; and the third have gro
the b ton of the blanks. These are to be formed from a rod or bar of suitable ize, the blanks betng connected at the heads and points when they escape o be used for cutting them apart and trimming or finishing the points at

Improved Folding Chair. Bed, and Ottoman Combined. Eugene Fauh, New York city.-This invention relates to a new foldin bedstead, which when folded together will produce an ottoman, and there-
ore be in the moat contracted form posslble, and which when extended can have its head plece raised and its foot plece lowered to form a convenie asy chair. The invention consists in forming the bed in three jointed sec olded under them respectively, each leg when extended betig stifened by jointed braces that connect it with the section to which it is attached, so that a strong and rellable support will be given to the bedstead.

Improved Knitting Machine.
Hugo Gunther, New York elty, assignor to himself and Charles Lapprian Rsame place.-In this machine the needle bed is extended downward, an no the grooves in the same, for the reception of an additional series of needles up, the downward motion of the latter beting produced by wing cams directly moring the same in the ordinary manner. The Invention con
sists, also, in a new arrangement of cams in the lock of the slide or carriag the knitting machine, in which arrangement the npper or wing cams ar et as usual to move the latch needles downward while in the lower part or
he lock. The $\mathbf{V}$ shaped driving or raising cam ts set further down thater he lock. T latch needles. This whil, of course, allow power to be appled to the setting
needles, so that, when ralsed, they will move the latch needles. The latter ill thereby be greatly protected, aud if any injury to done by the elevatin $m$ it is only don placed.

Improvement in the Extract of Yucca. Louls G. Fellner, Las Vegas, New Mexico.-This invention has for its ob
ject to furnifh yuccatin or extract of yucca root, so prepared and pnt ap hat it will be protected from moisture, and may be put into market as a ritcle of commerec ; and it consists in yucca root ground, steeped in wa er, and pressed. The liquid thus obtained is evaporated to the proper con
Istence, and then molded in forms. Yuccatin cleans the skin, hatr, wool, nd other animal substances from forelgin matters without destroying theif oftness. Samples, neatly prepared by Dr. Fellner, have been sent to thit
oflce, and from what he says of his extract it seems to have pecullarly od propertics.

Improved Pedal Attachment for Pianos.
Charles W. Held, Jr., and Alphonso M. Baugh, Brooklsn, N. F.-This in
ventlon consists of a vertical bar ad justably attached to the pedal frame with a vertically adjustable foot rest supported on it, having pedais upon it and rods extending from the pedals down upon the ordinary pedals throngh
aitable guides, and having certain controlling springs, all constituting very simple and efflcient attachment, to enable chilaren to work the pedala ithouthred as not

Improved Die for Capping screws.
Geor furnish an improved die for capping screws. By sultable construction and, should the slot in the screw head not be exactly trne, the sald clrcl lece can adjust itself to said slot. By this construction, also, 2 spring will llow the gulde or circle plece to yleld and be forced down into the rest
hould the slot in the screw head be shallow, or otherwise defective or wanting, so that no part of the die need be broken.

Improved Scroll Saw.

| Frank $\mathbf{H}$. Hardenbergh, Hawley. Penn. The invention relates to $n$ new |
| :--- | construction of saw blade for use in scroll sawing and other fine work, and consists in illing a double set of teeth on the cutting edge of the saw by a

erics of obliqne incisions in opposite directions, whereby the saw is made more effective, and whereby it can be sharpened on an ordinary grindstone

## Hiram Kellogg, Floyd, Iowa.-The invention consista it

| Hiram Kellogg, |
| :--- |
| ends of the spokes | hub, so that sald rings can be set closer together on the hub the more the elloe is expan:led, and the spokes placed more in line with the rim, to b

Improved Exhanst Valve for Air Brakes.
Rilley, Terre Haute, Ind., assignor of onc half his 1 ight
William Rilley, Terre Haute, Ind., assignor of onc half his 1tght to Charles R. Pcddle, of same place.-This invention has for its object to furnish an
mproved valve, designed espectally for the escape of air or steam from the brake cylinders upiton railroad cars, to allow the air or steam to escape in.
stantly and simultaneously from the cylinders of all the cars. By suitable construction, when the engincer admits the air or steam it presses open the agress valve, and passes into the cylinders, and at the same time holds the
exhaust valve frnily to its seat. When the engineer lets off the air or steam from the Inlet pipes, the pressure in said pipes will be instantly reduced, rom the inlet pipes, the pressure in said pipes will be insiantly reduced,
and the expansion of the air or stcem within the cyllinders forces open the exhaust valve and allows the sald air or steam to cseape into the air through
the openings. By this construction, the air or steam will escape instantly rom all the cyllnders, withdrawing all the brakes at the same timc

Improved Balanced Slide Valve.
y, Museatine, Iowa.- This invention consi
Thomas Becsley, Musearine, Iowa.-This invention consists of two valve nary valve seat, with a sllde valve upon each seat connected by pressure bars at therr ends, which project beyond thelr scats, by temper screws, whtch
adjust the valve so as to work steam tight on the seats, and so as to relleve hem of the pressure of the steam on the valves, which is mainly sustalned

Improved Crib Attachment for Bedsteads. Edwin F. Bryan, Sa vannah, Ga.-This invention has for its object to fur orm a table or support to recelve articles required by an Invalid. It is simple in construction and conventent in use, belng readily detached when not required.
Improved Soldering Iron.
James D. Norton, St. Louls, Mo.-The object of this invention is to imchange the copper; and it consists in a shank which screws into the cop er, and in a sleeve screw which screws to the copper, and in a holding nut and and used as this arrangement a varitety of coppers mas be kept on eadlly detached, so that a new one or a different form may be put on.

Improved Grocers' Sample Case.
N. Barker McCreary, Phelps City, Mo.-This invention relates to a new plces and other goods and the prices of the same, and for rotecting the contents against injury from atmospheric infuences, insects, etc. The in-
rention consists in providing the box with a sliding ghass top, through which he contents can be inserted, removed, and inspected, and in combining it end Improved Ejecting Apparatus for Bottles.
S. Ward, New York city.-This invention consists
William S. Ward, New York citts.-This invention consists of a simply
ontrived force pump, let into a perfumery or other bottle or vesuel, with ts stem or piston rod passing through the cork or stopper in such manner that by suddenly pushing the rod down a small quantity of the fuld in the he purpose, constituting a simple and convenient contrivance for perfam. ing the handkerchief and otherarticles, and calculated to prevent the waste perfume which takes place when the stopper is removed

Improved Sliding Snpport for Clothes Lines. ted bar provided with one or more pulleys, the same belng in practice so applied that two lines pass through the slot. The improvement consists in
adapting the support hy dividing or cutting through one of the sides to adapting the support hy dividing or cutting throu
forma spring, wherchy it can be pressed inward.

Improved Flinting Machine.
David R. Saunders, Houston, Texas.-This invention relates to a machine gage wich is attached to the bed plece, by means of which the widt the fluted part is regulated. By the use of the kage the futes in the article are made to terminate in a straight line, and the nluted part may be located
wherever it may be destred. The article to be fluted may be spread over the Wherever it may be desired. The article to be futed may be spread over
bed, and the gage adjusted thereon to govern the position of the roller.

John Love, Cusseta, Texas.-This Invention consists in the mode of apply nlently fastened and adjusted relatively to each other.

## Susintss aud zersomal

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 Street, Boatoo, Sasas. Send tor ctrculara, \&ec,
Circular Suw Milsh,with LLuars, Patert Sets more than 1200 in operation. send or deaerpotive pani phee and price
her, ,ermont
We wist ho correspond with some party who
understando pleaching nad reanting olus. Any
 chantable article,will be well palicir dotug it, or for the
process. Samples sent on application to Lock Box 199,

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 Grindstones, founded 1810 -Mitchell, Phila Lecomotive builders' grindstones. of suite A complete set of the Scriviriric American
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Pumps. All kinds ine brass work donc by The Recording team Gauge Company, 91 Liberty street, New York, Traction Engines and Plows. Address W
. H. Heydrick, Chestnut Hill, Phlladelphla. Boynton's Lightning Saws. The genuin
aso challenge. Whil cut dive tumes as faet as an ax. Ix foot cross cut and buck saw, 86. E. M. Boynton, 80
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apward, can be forged and tempered. Address Colling The Berryman Steam Trap excels all others | e., Bartford, Coun. |
| :--- |

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1.-Our correspondent,T.W. Bakewell, wh ddresses us on the subject of calculating strength o
onlers, refers to a letter of Professor Henry apon the unbject. We also have been informed that Sir William
Fairbairn has furnished a letter on the same subject. We should like to be able to publish these letters, as th Inions of those gentlemen, when correctly presente the exdstence of skepticlsm in relation to the proposi-
lon of our correspoudent, on the part of nearly all wel tlon of our correspondent, on the part of nearly all wel
known englueers, w.1ll secure for them unusual atten 2. 2.-S. asks how to get sulphate of nicke 1.- H. J. H. asks: How can I give a bril atr pins?
3. F .
3.-F. C. Would like to know how to tempe
steel screw driver, that has been put in the fre by mis.
4.-A. T. Y. asks : Is there any preparation he room? 5.- -D. R. W. says: Can any one tell me of
process by which common pitch may be purifed fo 6.-W. N. asks for a detailed description of he cupola furnace designed by Henry Kriger, of Bering Germany, me
monthe ago.
7.-D. asks: How can I color ©extract of
emona light yeliow in manufacturing it? By manufactaring it from oll of lemon and alcohol,
to the light, it will fade nearly to white.
8.-T. N. says: When a bevel wheel is be
ing geared with wooden cogs, what method is adopted when turning of the outer ends, to and when the pitc circle is of the proper diameter ?
9. D . PI. St. says $:$ How can I make ort of sizing; also a cheap varnish for the same? For arnilsh
costls.
10.
10.- H. asks if there isany way to make a
ountaln something on the princlple of Hero's, as ex
 oset on a table fordec.
stream high enough."
11.-S. asks: Which is the most probably trraction, Its causes,etc.? Is the idear that the atmo of the spectrum at the poles and thereby magnetize them, at all reasonable?
12.- C. A. S. says : Given a cylinder of the
Internal capacty of 1,000
cubtc feet : 1 Iforce ordinar illuminating gas into it to a pressure of forty pounds to tain? In other words, if I had taken the gas through an ordinary meter, how many feet would the meter hav
egistered? Can you give a rule for Anding the uumbe eglstered? Can you glve
feet at any prensure?
13.-J. E. G. sars: In your issuc of February easily drawn by a long as by a short rope" that there
aodiference. Now suppose 1 recelve a dray load or each, rope and sulgar, which must be drayed ap a long
hill. The drayman loads the sugar on the wapon, then othe other; can lie haul my two loads of goods at one
tme? WIII I get the rope and sugar hauled for the price of hauling the sugur, according to your answer?
14.-D. H. S., Jr., says: Most of the wheat produced here is generally of good quality, but contains
considerable smut. In mary cases this infection hae been avolded by steeping the seed grain for 2 hours in
a solution of blue vitriol. For elght bushels of see about one pound of the copper salt is used with enough Water to cover the grain. As a preventive, this seldom
falls. Can any or your readers tell us how to remore
the smell and taste of smut, by a method praticable with considerable quantttles of wheat? We have heard if so, in what proportions and how ought it to be ap
piled? We have machinery which removea all riathl plled? We have machinery which removes all rifiht

## 

H. M. says: In view of the fact that ligh
will preserve the origtual color of white palint inside house, while its exclusion will turn it a deep yellow, we ob bleach all colors which are not of axedmineral origin Whtte lead betng already white remains unaffectedin the ight, but in the dark it gradually absorbs suiphur from
coal gas or other sources in a room and turns black ooal gas or other sources in a room and
ziuc white is not so readlly changed in color
D. B. asks: Would the sulphuric acid in it is comblned with Iron In the soll? Whereand at what
price can Fresenius' "Chemical Analysis" be had? Anprice can Fresentus' "Chemical Analysis" be had? An
iwer: sulpharic acid in combination with lime in plaste swer: sulpharic acid in combination with inme in plaste
cannot -liberate phosphorus. Free sulphuric actd de composes phosphates and is employed for that purpose ranslation of Fresentua' "chemical Analysis."
C. J. K. asks: What chemicals will keep
ater as
near as posible tofreezing point without golng nuch below it? What work on chemlitry would glve ne the most Instrnctions on freezing and thawing? An
wer: Ice floating in water is the only "chemical" tha will keep the water as nearas possible to freezing. that melts, the water will assume the temperature of the
room in which it is placed. Good books on chemistry oom in which it is placed. Good books on chemistry
have been written by Towne, Barker, and Ellot andJ. W. B. asks: How long will human boncs ir, or burled in molst earth? Answer: The prectis me cannot be stated. Human skulls have been found caves assoclated with the bones of extinct animals, in
such a way as would indicate an antiqutts of many thousand years. Thes skulls in the catacomhs of Rome
C. T. S. says: I have a fine scalc, enclosed
in a glass case. What shall i place in the case to absorb the moisture, to preycnt the steel parts from rusting gas in large quantites, and what would be the best manner of keeplug it, and how long does it remain in at con
dition to nas as pure gas? Wonld a bladder or indis dition to ase as pure gas? Would a bladder or india
rubber bag answer for a gage, attached to the ressel in rubber bag answer for a gage, attached to the ressel in
which the gas is stored, to Indicate what quantity was es from on hand? Answer: To prevent chemical baian
es taluing the instrument, in a sancer. It will absorb the molsture and Anally swell up and become air slaked; it
must then be rellewed. We give elsewhere a process for he manufacture of sulphutuve actd on a large scale.
it diflult to store it in anything but glass resels.
P. M. asks: What is the rule for finding lhe sag of a belt, pasing over two pulleys, with the
centers say 100 feet apart? The belt is to stand on the rake, the center of the apper pulley being 10 feet out o
plumb with the center of the lower one. The lowerpulle 102 feet and the upper one, 4 feet diameter. The belt is of
ionrply rubber, and $221 n c h e s ~ w i d e ~ a n d ~ t l g h t e n e d ~ i n ~ w o r k ~$ Pourply rabber, and 221nches wide and tig teenedin work ing order. In some cases it is important that this shonald
be Known. The late lamented, long. Winded Rankine areall Greek to me. Now I have a pretty fair knowledge of theoretical and practical geometry and arthmettc,
and Irlsh, English and French, but I am puzzled with and irish, Engish ad French, but am puzzled with
nearly everythlug in Rankine's works. Answer: The
rale referred to may be transiated thas: Divide the square of the distance between centers by elght time
hat length of belt which would give, by its welght, trinin equal to the tension on the belt, and the quotien centers of the two surfaces carrying the belt. If our readers desire to accomplish much in mechaulcs, and to roll the tronbles of our correspondent, they will ind it ume to mathematics and the princilples of natural phis losophy. They would also be better prepared then to
appreclate the labors of Professor Rankine, who has
W. A. A. is making a toy engine and boile
ad says: The size of boiler is $3 x 5$ inches; it is made o tin; now would I galu anything by fixing 9 or 4 half fuch
tin tabes or flues in the bottom of boller four inche long, or ia a common fat bottom better? The tubesare to
be closed at one end. How would air work, pumped into boller at bottom or top (in steam space) or will it not roposed tabes the boller as they increase the heating surface. Tube cosed at oue end are somettmes used, and where the re is not forced, do well. If the fire is forced, they ar
defective in not allowing free circulation of water. In troducing air in so small an apparatus would probably not pay for the trouble favolved. Look in a recent num er of the Scientipic American for answer to last que on. We hope to be able to help thousands of othe
J. McC. says : How can I measure a
barge according to the government measurement? barge is 124 feet long, 24 feet wide and 5 feet deep. Anower: The tunnage of a barge is legally measured by
multiplying the length, breadth and depth together, to obtain the cublc feet of contents, and dividing by one hundred to obtain the burden in tuns (tunnage law or
U. . 18 . 1855 ; "open veesels.") for registr. Thus, a barge 124 feet long, 24 feet Wide and 5 feet deep would registe $14 d^{\prime} 80$ tuns. Such a barge would carry, of " dead wetght,
about 400 tone, if loaded down to the water's edge. would have storage capacity for about 300 tuns of Canne
A. B. S. says: I wish to use exhaust steam
or heating or for bolling water. Can Immerse the end
 plpe is 0 feet. Answer: For each two feet of depth of
water, above the opening of the exhaust plpe, the engine water, above the opening of the exhaust pipe, the engin A. G. K. says: I have a boiler with 3 inch Do you know of any objection to putting in $1 \%$ or 2 Inch
ne rues between hose thabalar boiler, as frequently constructed, arises from the endeavor of the bullder to increase its power by crowding too many tabes into it, and
thus checklug the circulation of water. It often hap. thus checkiug the circulation of water. It often hap
peus that remoring tubes is funul to increase the introduction of additional $11 / 2$ inch or 2 Inch tubes futo bofler fited with 8 inch tubes would aford advantage
commensurate with the risk, which it might produce, of commensurate with the risk, which it might produce, of
burning some of the tubes, eren if it were to wilghtly
J. H. P. says: Will you let us know if there 1o any patent method of tarning an engine of from the
center without the use of a tackle? Please write what would be the cost of such a patent. Answer: Many de-
vices are in une, but we know of no purchasable patent which covers one generally adopted.
Novelity Glass CutTER.-Letters of ennow nothing of it, or who sellis it.
$\underset{\text { and surest manner of putting up long tines of ghatt- }}{\text { E. M. B. says: }}$ ing correctly; also, commencing ang the engine, how co calculate the speed of pulleys of various sizes. Ma
chines come from the maker with a driver pulles of a certain size, marked to run so manyrevolutions permin-
ute. I want to know how to calculate the size of pulles on main shaft by which the machines the size of pulley suppose the speed of main mhaft must be tnown. How can I Ind out that? Answer: Dub off the under sides of the beams to which the hangers are to be attached, or pack them up, unt11 a stretched cord, or sighting along
their line, shows them to be accurately in line the hangers in their places, and again try whether the center line of bearings is a stralght and level line, ad justing any that are found out of place. Finally put up
the shafting and set up the couplings. The best makers he shafting and set up the couplings. The best makern
use swivel bearings that will adjuat themselves to auy ilight derlation from line, and the couplings are made with an eye to the same contingency. The speed of
shafting ly, to some extent, deternined by the character ahafting in, to some extent, determined by the character
of the work driven. For heary work a speed of 180 rer of the work driven. For heary work a speed or 180 rer
olutions a minute is common, ard for light work the
ond speed rinally to litg her apeeds, In consequence of the fact
conat
that tit allows the usc of lighter belts and pulless. The that it allows the usc of lighiter belts and pulless. The
size of driver pulley fs deteruinedl by multiplylng the
diametcrof the driven dividing the speed of the driving linc of shafting bs that ividing the speced of
of the driven whaft.
W.S. B. The use of the common sewin;
machine treadle is not productive of spectal illness or discomfort if intelligently used. But there several form of improved treades and they are on sale in your city of Boston. Sou
ges,
ant there aso will there aiso find, doubtless, sewingmachines operated
by springs, without treadle. In this clty you may procure sewing machines which are operated by electitcity
If you wish for devices not ad vertised in our columna you might insert a few lince under "Bustiness and Per
J. H. asks how much space there should be
between pintou and cylinder head of an engine with an between pintou and cylinder head or an engine with an
8 Inch plston and 16 Inch stroke. Answer: The space
between piston and cylinder head, when the former is at elther end of stroke, should be as ittle as possible where
economy is almed ai In a direct acting engine of the alze given, a clearance of one elghth tnch at the backend and three elghths at the forward head is a fair allowance
with those whose workmanship is irst class. Ports are made of from one tenth to one twentieth the plston area, befng glven the greater proportional area for high speed of cyluder has, in rare ciua or cylluder has, in rare cases, been reduced to 2 per cen
of the cyllinder capactit. In good enginea, 5 per cent is a usual figure
TV. H. M. says: Is there any rule for esticonstructing cylinders of certain diameters to withstand
certain pressures? Of what tind of material and how length be to withatand futernal pressures of 18 and 2 pounds per square inch respectively? Does the length affect the strength of the cylinder? How do copper and
rass compare with fron for this purpose? Would the same cylinder withatand the same pressure externally Answer: Any work on the strength of materials will
give the desired information. We gave a list of suct give the desired information. We gave a list of such
works at page 106 of our current volume. A cylinder of works at page 108 of our current volume. A cylinder of
sheet Iron, with single riveted jolnts, 18 inches in diam. eter ands feet long, would be made nf about No. 22 or 2
iron, measured by wire gage, if intended to bear safels iron, measured by wire gage, if intended to bear safely a pressure of 16 poonnds, and of No. 20 or 21 1or a pressure
of 24 pounds. The length does not affect the power o the power of restating collapas. Copper and bruss cy inders, with joints perfectly made with hardsolder, have strength about equal to single riveted tron cyllinders,
but the joints are rather more inelastic. Copper and brass are weaker than good fron. Expending a smal amount of money in standard books will often save, in cases like this, considerable outlay in experiments whic as have heen aiready made with far greater accurrac and completeness by othera. The irst step to be taken,
before commencing experimental research, is always to scertain what has already been done by others.
B. says: A friend thinks the small steamers plifing on the Thames (England) submit to the useless
cost and complexty of having the wheels constructed or vertlcal positiou of the paddles. Answer: Some oot all, of the steamers alluded to have feathering pal
diea, and galn in speed by the alloptlon of that systeni.
T. W. anks: Will the reports of the Patent
offce, Which are to be printed every month, be for salc in the book stores? If not, where can they be got, and
hat lis the price? Answer: The publication referred by our correapondent is the oplciell Gazette of the Paten Offle, Issued weekly. It cain only be obtatued at the
Patent Omce, Washington, D. C. Subscriptlon, *i pe annum.
F. A. S. asks: Will you tell me how ti" stass (anthoxanthum oforatum) and is used for alvitn up the herb, and macerate in hot alcohol; strain throng cloth, and distll off the greater part of the spirit. The n, th, which must be purithed from
A. C. says: Enclosed please find specimely
f ore, of which I would like to have the name and value
G. S. Y. sends a mineral specimen and ask,
our opiniou of its quality. Answer: If the arttcle is a omogeneons as the fragment sent, it will undoubtedly
prove an excellent fre-clay. But "trying," on a larg
L. C. M. has read our articleon pickless pul,
ished on page 145 of Volume XXVII., and would like to nowliow to make bright green pickles, free from sulscription of the method produced in mannfactorles. huswer: In a plekling establishment of wide renown ernally with sllver, and a very strong mall vinegar, pr pared for the purpose, is uned. The pickles are perfect-
is wholesome and pure, but they have not the bright reen color, for which, many foolith people sacrifice th
J. G. B. says: On January 2, I sent you eight
smail rough totoee, requestmg you to intorm me what they are, and thetr ralue. If yon have receelved them,
and No. or No. 81 a diamond, I would Ilve to sell them, ir you would be so kind as to send them to a diamond
 damonde are at his own disposal.
J. S. and D. P. N. say: A., B. and C. wish A. and B. are tin front with a hand aplike, and C. brings up the rearend sloce. Where ehould A . and B Bbeunder the

S. R. K. gays: I have a manall lead pipe lead
ng down from at ank tin the second story of my house neto the cellar, to feed the waterpan or my farnace. The
lower end of the plpe to
so much tin contact with the fur. nace that the water there ts a good deal heated. Will this heated water rise, and cold water from the tank pase
 rung for some datance horizoutally, with several smail
risct and falls tin the horizoutal part, will that preven the circulation of hol water up and cold water down, in
 iuneter, as we presume this to be,such circculation conld
only take place rery glowly fudeed. A vers moderate
 drectis be likely to to take place, tle warm water belng Insplaced by the heaviter cold water, hee
at the bottom, the former ristag to the top.
C. W. W. says: Imagine a body moving in
nne direction, then its course to be suddenly changed



 hods rom each pohat, towards the other) with sumflclent
force to carry them through the interveulng space be-
 As a natural consequence both bodies are found ncar $B$ as $C$, having the preponderance, would convey $D$ back-
ward. Now according to the law of the inertla of mater, C could not have stopped internediately, if found at B. Then did $D$ stop when it changed its direction
when met by $C$ ? Answer: It matters ilttle pructlcally everthed, stops durlug an intinitesimal space of time, or does not stop ut all. The question is too nearly a meta.
physical one. In the case given, an tndentation would
 facts, it to not coucluslice. D pilght be brought to a stop
while fidenting C aud then take up its reversed movenent. finally moving backward with C. This is one of nent ly based on falie premises.
 attach it: How can I makea alyanct batters out of slags jars, copper, zinc, and blue vitriol. Answer: Why
And dicounect the local bat ters and trs the experiment? If you find that two cups
J. C. C. sents a specimen of boiler scale and
aska why it to so hard. "I had it in a bottle of oll of vitrlol for flie hours, but it would not disolive. We use
about two hundred barrels of water per twelve hours,

 makes the water in bollers form very bady, so much so
that the englues suck $1 t$ up five feet and into the cyllnders; but it doese not make the platona pound like some
water does. I have put. In surface cocks to water does. I have put.in surface cocks to draw the This scale formed on the boflers before I took ciarge of
them, $t$ on years ago, and I have tried nearly everstling that will loosen scale, with no effect. About nloe nonthe ago, the firn put in a heater and niter, by
which $I$ can get the water so hot as to require a simall Which c can get the water so hot as to require a small
stream of cold water to condens. the steam tu the feed water, so that a No. 3 Cameron pump will force it into
the bollers. There is not much new scal. forming, but
the old scale remalna na fast to the fue naperor. We have haminered as mach of as we could, but the lionll wre are so
nult that it is hard to uwe a iammer. They ure four feet a diameter, twents-eighlit reet long, with 2 wevre and hirteen inch thies in each. We blow out every two and tuin. We filter through hay packed tight. I have ried everything except takligg the fues out of the boll-
ers, and a steel square hilsed chatn to tale scale oft. Answer: The boller incrustation is sulphate of llme or of baryta is somettmes sold to purify water, but is too
xpensive for use on a large scale. If the water could be xxpensive for use on a large acale. If the water could be would help. When jon are wise the deposit of gypsum in the flues will become un-
F. I. says: I have been reading the lectures
of Professor Tyndall in your valuable paper, and am very nuch pazziled regarding his explanation of the comple tare of two primary colors was the conplementary of the and blue ray produces milte light; if so, I would be very nent part of the illuminatling power of the sun or any y experiment that the yellow and blue rays of the suil when comblned produced whitc light, but he expresely and blue plgmente are mixed. It was to mastrate this difference that he introduced the experiment.
O. A. B. says: In your article on balancing
machinery, on page ss of the current volume, you glve ormula, and proceed to compute the centrifugal foric of a crank, weight 500 poands, with its center of gravity of ofty revolutions per minute. Correcting a clerical $+(16\} \times 4,)=852$ pounds. $\Delta$ few lines below you sey: "Were tattempted to effect a balance bra plece placed opposite, at a don ble distance, but of half the weight, the connter-
balance would bare a double centrifugal force, and
ence, although a stanaing balance would be obtained,
it would not glve a running balance." Let ua try $1 t$ $=250 \times\left(8 \times 8 \cdot 1410 \times \frac{1}{2}\right)^{3}+16 \frac{1}{2} \times 8=852$ pounds. Just the it will of course glve a perfect running as a standing balance. It is thus shown that, in this in sance, a standing balance and a running balance are
secured by tne same conditions, without regard to the ots oira. And this 18 equally true in all cases, as may be it may be proved algebratcally in general. This concluslon la of course based upon the supposition that no
"couple" Is produced by what Imay call a diagonal balance. Answer: The erroneous calculation here correct and the proper statement of the la wis of centrifugalforc has already been given at page 81 and in an eariler Issue of the scranciric Arzaions. No better proor that ou readers than the fart that this problem has attracted such prompt attention, and has ellcited so many accu-
ate statements of the princlples incolved, coulic posal rate statement
bly be offered.
J. O, says: Seeing, in your paper for Janu that Imade one, on the same princlple but different in construction, several years slnce. I do not belleve in

purer than I should use. I founcl that the power galued
in golug down one slice was used in goling up the other Ide.
J. R. E. says: Here are two of your subscriity of falling bodles. Sone would have it that large and small will fall through the same space in the same time,
without regard to the restatance of the element they pasy through, alr or water, and they tuke Parkerfor their
anthortty. The others admitt tuls all. Huroretically, it vac-num. But they say that there Is differcuce in passing
throukh the atmophere, and more through water, in comstock for owing to the resistance. Then last take Comstock for thetr anthorty. We would 11 k
to have you settle the question. Anawer: The abstract lawts of falling bodies lave been deterninued with perfect accaracy, both by experiment and by logical deduction
from known conditlons. When the falling body is uninfuenced by forces other than that of graritation, when
fulling freely as if in a perfect vacuam, the veloction be predicted with perfect certaints and precialon. th:s fact, it resulte that astrouomy, its calculation © based upon these well establisiced principles, is an cian
ectence, and that astronomers determine the mombo he heavenly todies, calculatit the pert uystatis. uld Leverrier and Adamb, a nen' mennber of the yola ystem whose Hstance is so great as, despite its tremen
lous magnituide, to have been prevfously andete lous magnitude, to have been prextously undetecte
by the telescope. In all famillar examples of the eftec of the force of gravitation, however, we fun the motion
of bodies, moving under its infueive, to be aftiected by the action of other and retarding forces, as the resistance of the alr and of frletion. In any given case, when these
reasting forces can be exactly determined, In magnitude and direction, the motion of the bodies can stIII be de-
tennined prectsely. In some cases, as that in which the Ir resists the motion of a body moving with very great veloctty, it is diffcult, or eron imposible, to calculate
he resultant motlon with elactneess, in the present atate of our mathematical knowledge. Where no reatitilg
forces occur, the veloctty of any fallug body can bedetermined by the following rule : Julttply the hight, in feet rom which the body has fallen by $64 / 3$ and extract the square root of the product. The result is the velocit tme, in seconds, that the body occuples in falling by s 2 and the product. EIves the veloctty acquired. For a modifled to an extent which will vary with each in dividual case. Generally, It may be stated that fulling
bodies of rqual size but differing denaltes will fall in congh auy resisting medium with differing relocittie, ofier greater extent of surface to the resistance of the dr or other opposing nuld, and, therefore, were retard ed to a greater extent than are the denser substances,
Where bodies of simillar material, but of different sizee, Where bodes of almillar materidl, but of dirrerent bize jn. As an illuatratlon, a uphere of two Inches diameter contalnselght times as much matter as does a aphere o he same materialan inch ace, and four tlmes the crose ection of the smaller bal!. It therefore is less retarde and $\begin{gathered}\text { ill } \\ \text { be fonnd to reach the limit of its fall arat. In }\end{gathered}$ he air this difference is seldom noticesble in the wate it is more frequently observed, and it is for a almilia
reason that a large vessel requireil less proportional atean power than does a small one driven at the same apeed.
C. H. D. says, in answer to T. who asked Draw a square a b c d, the size of hopperst the to minus the dealred size of hole to be left at the bottom,
chen draw the diagonal lines c b b d ; then measura tros the depth of hopper; from thence draw the linef $e^{\text {a }}$

which will give the length of corner poit. Fo form the
 corner post line a. Fig. 3 is the fall adze of hopper at
the top. Take the length of une q (FIg. 1), for the
boards, and dotted line c is the required width. If 1 tis not
dealrable to nae corner posta, cut the ends of the board desirable to use corner posta, cut the ends of the board
to the bevel ab (Fig. 2), and set out the clovetall squar to the bevel a b
from the end.
T. M. says to A. H. S., who asked for di
rections for bullding a warm and rat proof house: If yo ase sand to till the space between the weatherboarding and plastering of your house, the pressure upon both
plastering and weatherbuarding can be lessened by inplastering and weatherboarding can be lessened by
serting pleces of inch board between the studs, like erting pleces or inch board between the studs, lik
shelves, a foot or two abore each other, fastened wwit nalle "toed In" at each end. They bhould extend to
within one Inch of the weatherboarding so as to allo Wpace for the sand to run down and All up. The liabllity of the and to run out through cracks or warps in the
weatherboardlig may be obrlated by tacking on to the studdlng, before the boards are put on, coarse wrapplng paper, which can be had in rolls of great length and
width at a cheap cost. Nall pleces of poard verticalls hidwata cheap cos. Nall pleces of board verticall running between the floor and celling.
T. M. replies to D. M.'s question about oosteep that the solder runs down from, instead of $u$ nder, the lap ; in that case the bond is but ollght, and pet walls with a tha trough, inverted, (of convenien apet wall
length), the inner slde or
gange belng deep enongent to extend over the roof tin where it reaches up the side of
the parapet, and uall it to the joints between the bricks.
H. M. W. says: J. asks for a simple method Implest method extant, and ts cuffclently accurate Pour into a cup about 2 Inches of the coal oll to be tes
di
light a match and, when farry nto the oll. Standard oll (say of 130 degrees) onght $t$ ixed oll.
J. E. G. says: The best mode of aualyaing
such quectiona an the balance wheel controversy is to
take tue two extremes take the two extremes into conslderatiou. One wonld the cracerence, which wild be no balance whe tall, and could not be kept in ita bearings because
G. B. D. says. in answer to H. \& H. Who who ertcally withont a pump; if a plpe or any sultable con
ductor be placent horizontally the surface of the water, It will naturally fill to the distance of 400 feet as required : at this polnt a reservoir
should be sunk enttrely below the plpe; then at the highest polnt (6) feet) put in an old farlionel wooden puing of this pump aliould wort at polnt not to exceed feet above the reservorr, and the valve should be near
the bottom, so as to be always jelow the water in the the bottom,
reservolr.
A. B. says, in reply to H. C. K., who anked
por a rule for laying off wagon axles, that the length o the spindle sulould be $31 / 4$ thmes the dlameter of the butt. The length of the hub should be nearly one and a half
times its diameter. The spladie should taper juat so that the bottom side of asle may be stralght throughou
its whole length, when the ${ }^{\text {anheel stands on a plumb }}$. spoke; and erery wheel should stand on a plumb spoke
whothorthe bottom side of apindle is level or not. The prodnet ertaligs from maitidyling one ifty latith by the diameter of the wheel wing glve you the proper amount of
dish for your wheel ; then the spindle should taper one Inch In twelve. Ta lay on wooden axles, frat obtain the

elloes; then, at the hub, measure back to the center of
pokes, or to center 1 lne of spokes, if they are placed "dodging" as at $A$ B, it betng, for example, 1\% tnchee hen subtract one half the thickness of the felloe, $\%$ o? an inch, leaving $X$ of an inch as the dish of the wheel
Then mesaure the diameter of wheel, 1 beelng say 42 inch ; then the length of hub, say 12 inchés; then the dis of hnb, 6 center of spoke or line of spokes to back en belig $8 X$ inches; then the small end of front box, which
io thath case, should be $2 X$ fnches. Tifen on axle stick
 trom end of stick the distance from center of apozes to ront end of hab, in this case betng six inches, and mak or 21 Inches, thom $x$ measure hair the diameter or whee or 21 Inches, to 1 on lline $E$. Then measure up the dish o
wheel or $\mathcal{X}$ of an inch ; then draw line Ffrom point las obtalned through $x$; sald line will be perpendicular to the face of the wheel, than bringing the apoke on a plum Ine. Now on line $F$ measure each way from $x$, six inche es lay off from $n$, the butt of spladie, and $1 x$ inches from m , hay of tip of spindle ; then draw lines $O$ and $P$, which Whll be the top and bottom of apladie. Then ou line $E$ rom $x$, measare the track you wish, and then lay of Ura unch pla to used, allowance must be made for it on end of apindle. Gife as little gat ther as posalble, only be oure and give a ittile. After the wheels are on the axle hey ougat to meware not more than hair an inch farthe apart on back alde than on front, measared at the rim o
level line with conter of axle. Byfollowing these rule you can make wheels track every time apd be sure of an asy ronnlug wagon. Iron axles may be set by the abor ends, one set for etther end of apindle.
T. H. C. says that if P. S. will wash his hen pour or the ether after settling, he will And it will solve the vulcanized rubber; if so, he might as well
ive it un. Washed sulphuric cther will disolve par ubberp. Wasked sulpha
J. E. S. says, in reply to J. W.'s answer on
cranmmision of motion: ummer of 1834 , with the resolit stated in the commun
cation to which $J$. W. takes exception, howerer nem nas be to him.
A. O. вays in answer to L. H. W., who asked
ow io temper amall steel wire, one sisteenthot an fnch in dameter and less, and one inch long: Yon may follow
the method in rogue for small screws, plna and needles. at mem upon an fron plate which can be heated from en a dre like a coffee in a sheet iron drun, to be turne equired, it necessarily differs according to the degree o empering you want to impart to the steel. A yello trumente that are to remain hard, such as razors, sur Ical instruments, lancets, pen kulres, etc. Article hat are to possess elasticity and the hardnces of cases, espectally when a particular hardness is rin som as la desira ble for the edges of astronomical and physical nstruments, it nay be proper to conduct the tempering $\underset{\text { or atatistics of preses for printingearde, circulars, etc }}{\text { J. }}$ hat he uses a card printing machine that will print at answer referred to a press for all kinds of work, eve

## COMYUNICATIONS RECEIVED.

The Editor of the Scientific Americay cknowledges, with much pleasure, the re pon thinal papers and
On the Correlation of Forces. By W. R. \& On Certain Instances of Combustion occe ioned by Superheated Steam. By E. R. D On the Secrets of a Kernel. By F. R. R. On the Creeping Railway Problem. B c. T.

On Fust Printing Presses, and on an Im roved Galvanic Battery. By J. F
On the Recent Boiler Explosions By T. L. L
On the Rupture of Cylindrical Steam Boi rs. By B. W

## [OFFICIAL.]

## Index of Inventions

## FOR WHICE

Letters Patent of the United States weri Granted for the week ending January 28, 1873,
AND EACH BEABING THAT DATE
[Those marked (r) are retssued patents.]

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Frnace grate T. T. Von Bolzano......
Furnace, hot alr, H. N. Longfellow.
Furnace, J. Tliseot
Gage, damond, w. Shumard. Gear cutting machine, J. J. Greenough
Generator, $\boldsymbol{T}$. Harang.
Generator, steam, A. R. McDonal
Gan lock, safety, D. H. Mapother
Harvester, C.M. Young.
Beater car, Michaels and Broad well
Heater, fire place, W. Magill.
Hook, securty, J. K. Macdona
Hook, securty, J. K. Mach
Hook, enap, w. W. Kitch...
Horse power, A.G. Hagerstrom
Horses, check for, J. W. Domett.
Hose bridge, Orr and Geld
Inhaler, etc., E. Schofteld
Inkstand, Thurston and Wes
Iron and holder, J. Hewitt. .
Jack, ifting, J. D. Odstot (r)...........
Jug or pitcher, molasses, M. J. Bennett Lag or pitcher, molasses, M. J. Bennett... Lantern, ship's, H. Saunders............ Leather dressing compound, $F$. G. Bel ock, sash, c. T. Gibsou
Locomotive, traction, T. S. Minniss Loom plcker, W. Taylor. umber chute, Van Name and Wakefel Metal bars, breaking, w Mill, cider, J. E. Sange. Mill stones, adjusting, A. w. Winall Mortising machine, L. Houston..... Movement, mechan. 1,J. Peabody Masic leaf turner, G. I: :miny Nall separating machine, $\because$ Beveland a.kum, twisting, L. snd C. Howard Off.11, treating, $M$. Edwards offal. treating, J. J. Storer Ore w sher, J. M. Allenwood (r) Ozone apparatus, C. H. Johnson. Paper bag machine, T. Hotchkiss..........
Plllow spreads, frame for, P. W. Van Est Pttmen, adjusting, N. C. Stiles Plane for scraplng, J. Joncs. Plane edge, F. F. Baumann.. Planer, feed roll for, S. Inman Planter, hand, S. S. Stults....
Plow, J. W. Reed
Plow, E. Reese...
Plow coupling, J. K. Pitt
Plow gang,, E. Parr............
Power, transmitting, R. T. Smit Press, cheese, Broomer, Morse \& Boschert (r) Press, glass, A. M. Smith. Press, hay and cotlon, P. A. Sheare Printer's lead casting machine, J. S. Sturgis Pump handle, I. N. Frazer. Pump, steam vacuum, W. Burdon
Pamp, steam vacuum, $\mathbf{w}$. Burdon Pump, steam vacuum, w. Burdo Pump, steam vacuum, W. Burdo Pump, steam vacuum, W. Burdo Rallroad chair, E. D. Mann.. Rasiroad track, D. Mutin Rake, horse hay, C. N. Goss.... Range, H. L. Palmer.... Register, cðonting, R. P. Hind Refrigerator, E. S. Earley. Rudder for vessels, $\mathbf{0}$. $\mathbf{P}$. Tharp Sad Iron, W. A. Freeman, Jr.
Sash balance, B. F. Hartman. Sash balance, B. F. Hartma Sash rope fastentig, L. Russel Satchel, school, H. Wallis.. Saw sharpener, gin, J. M. Balle Sawing mach, gin, J. M. Balley sawing and splitting wood, A. G. Hagerstrom. Screw driver, F. B. Hunt Se Sewing machine, A. Bingham Sewing machine binder, is (r) Sewing machine lock, E. L. Gaylord Sewing machine 1uffler, T. G. Perkinn Sewing machine table top, W. Whlison
Seving machine clutch, J, Tisdale Sheet metal ware, forming, M. Bray ( $\mathbf{r}$ Shatter Pastencr, N. H. Byerley Shutter, metalic,
Sleve, revolving Sleve, revolving, A. E. Neat...
Sking, etc., machine for grainin Slate frame, W. F. Boucher. Spindics, bearings for, Taylor and Pres Spittoon, E. Mathe
stove, oookkng, M. G. Fagan stoves, device for feeding, B. Connelly Table, extension, M. Horma Table, Ironing, A. Wechsler Table, self-waittng, M. Stone........
TTeks, etc., separating, C. W. Gildde Tacks, etc., metal coating, C. D. Hun Tallow, purifyling, B. F. Sha Tan, Mquid from, L. Breval.... N. Hendric Tilting machine, G. J. Smale.... Tobacco topper, Ackley and Ranney Trap, animal, F. Flora.

## Track, Chisholm Rigel

Truck, M. L. Senderling
Truck, barrel, v . Bell...
Tug fastening,
Tarn table, $\mathbf{W}$. Thriey....
Umbrella, etc., runners, Cox and Holland Valve, O. E. McMurray
Vat, tan, C. H. Manning..................................
Vehicle wheel, N . Palmer
Vent, O. s. Camp.
Wagon, dumping, P. Bodley
Wash basins, waste trap for, H. H. Cralgle
Washing machine, S. Berry...
Washing machlne, w. P. Brook
Washing machine, B. Edgar
Watch, stem winding, C. A. Montandon..

| Watch springs, attaching, J. Shaw................... 138,248 Water wheel, turbine, Risdon and Tyler............ 188,587 <br> APPLICATIONS FOR EXTENSIONS. <br> Applications have beenduly filed, and arenow pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned: <br> 23,820.-Watch Case.-J. Boss. April 16, 1873. 23,882.-Cotton Press.-H. W. Randle. Aprll 16, 1873. 24,022.-Sewing Machine.-J. Gray. April 30, 1873. <br> EXTENSIONS GRANTED. <br> 22,809.-BAEER's OVEN.-G. C. Jennison. <br> 22,885.-Harvester.-W. K. Miller. (r) 2,266 . <br> 22,885.-HARVEster.-W. K. Miller. (r) 2,267 . <br> 22,885.-HARVEbTER.-W. K. Miller. (r) 2,268 . <br> 22,885.-Habvietir.-W. K. Miller. (r) 2,269. <br> 22,885.-HARVEGter.-W. K. Miller. (r) 2,270 . <br> 22,890.-Carpet Swerper.-N. B. Pratt. |
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## MACHINERY $\stackrel{\circ}{\&}$ MILL W0RK. william jobin mactitoorn rankine  D. VAN NOSTRAND, 23 Murray St. \& 27 Warren St., New York. NASHVILLE Inlutral Empition

DESIGNS PATENTED.
 6,977.-IRON FRyCE.-M. M Kumm, Columbus, Ohio.
6,374.-Governor BAEE.-W.B. Le Van,Philadelphia,P 6,ST5.-SEwing Macbine.-G. Rehfuss, Philladelphita,Pa
$6,976 .-C o v e r ~ H A N D L E .-R . ~ B . ~ W a r d i n, ~ P h l l a d e l p h a ~$ 6,976.-COVER HANDLE.-R. B. Wardin, Philadelphia, Pa
6,377.-Cooring Stove.-H. A. Wood, Bangor, Me.

TRADE MARKS REGISTERED.
1,107.-Writing Paprr.-A. Beach, Iowa Clty, Iowa.
1,168 - -Prening Saears.-Christy \& Hughes,Clyde,Ohio

 1,112.- -Bitrers.- W. H. Knoepfel, New York city

SCHEDULE OF PATENT FEES: On each Caveat.
on tiling each application fora Patent (17 years) On issuingeach original Patent. On appeal to Examiners-In-Chief... On application for Relssue............... On granting the Extension on iling a Disclaimer. On an application for Design (3y years) Onanapplication for Design (14 years).

## TALDE OF PATENTS

 and How to Obtain Them.
## Practical Hints to Inventors

魔ROBABLY no investment of a small sam expense incurred in obtaintng a patent even nventions are tion is but a small one. Lar well. The names of Blanchard, Morse, Bige nd others, who have amased nes from thetr $n$ eentises nd there.are thousands of others who More than Firty Thousasd inventors have avalled TWENTY-SIX years they have acted as solicitors the Publishers of the Soirntifio Anreions. They stand at the head in this class of business; and their large corpe
of assistants, mostly selected from the ranks of the Patent Omice: men capable of rendering the best service
to the inventor, from the experience practically obtained Whe examiners in the Patent Offce: enables
Co. to do everything appertaining to patents arrme and CHEAPRER than any other reliable agency. This is the
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