# （2） <br> ふスく $\xrightarrow{2}$ .$c$ cic MIENTIFIG A MERICMN <br> （Entered at the Poet Office of New York，N．Y．，as Second Class Matter．） 

a WEEKLY JOURNAL OF PRACTICAL INFORMATION．art．SCIENCE．MECHANICS，CHEMISTRY and MANUFACTURES．

| Vol．XLIV．－No．2．］ |
| :--- |



THE MANUFACTURE OF BOLTS AND NUTS－RUSSELL，BURDSALL \＆WARD PORT CHESTER，N．Y．－［See page 21．］

# Sriontific American. 

# ESTABLISHED 1845. 

MUNN \& CO., Editors and Proprietors.
published weekly at
NO. 3 ' ${ }^{\prime}$ PARK ROW, NEW YORK.
0. D. MUNN.
A. E. BEACH.

## TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included....
One copy, six months, postage included
$\$ 390$
Clubs.-One extra copy of The Scientific American will be supplie me proportionate rate. Postage prepaí.
Remit by postal order.
MUNN \& CO., 37 Park Row, New York.
The Scientific American Supplement
Is a distinct paper from the Scientific American. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size
with Scientific American. Terms of subscription for SUPPLEM 5500 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.
Combined Rates. -The Scientiftc American and Suppirmpent apers to one address ordifferentaddresses as desired.
The safest way to remit is by draft, postal order, or re Address MUNN \& CO., 37 Park Row. N. Y.

Scientific American Export Edition.
The Scirntific Am mrican Export Edition is a large and splendid peri large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the Scientifi AMuRICAN, with its splendid engravings and valuable information: (2, Commercial, trade, and manufacturing announcements of leading houses. erms for Export Edition, single copies 50 cents. Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed an ouncements published in this edition at a very moderate cost. The Scievtific Am bilican Export Edition has a large guaranteed circ CO., 37 lark Row, New York.

NEW YORK, SATURDAY, JANUARY 8, 1881.


TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
NO. 262.
For the Week ending January 8, 1881 .




III.
feetion 6 figures... MEDICINE.-Apparatus for Hospital Disin-











## THE ELECTRIC LIGHTS ON BROADWAY, NEW YORK.

In our issue dated December 25 mention was made of pro parations going on for the experimental lighting of a section of Broad way with electric lamps. The promises of the company making the test-the Brush Electric Light Company, of New York-were fulfilled somewhat ahead of the tim fixed, and on the night of December 19 the twelve blocks between 14th and 26th streets, including a portion of Madi son square, were lighted by sixteen lamps on a single cir cuit. Although there were already in use in this city, in private establishments, something like a hundred Brush lamps, this was the first application of them to street light ing here, and the experiment naturally attracted much at tention. The company proposes to continue the exhibitio of the lamps for a month or more, keeping a careful record of the several elements of cost, so that an authoritative decision can be arrived at touching the economy of the system and its ability to take the place of gas in the lighting of our streets. That the electric light is very much cheaper than gas, quantity for quantity, is already abundantly demonstrated and pretty generally recognized; the question to be determined now is whether the vastly brighter illumination demanded when electricity is used, and is really needed for the satisfactory lighting of our streets, can be had at a price which the public is willing to pay.
The difference in the degree of illumination obtained under the two systems is far greater than is popularly supposed. In the section of Broadway lighted by electricity there ar sixtcen lamps-each of 2,000 candle power-each having a east twice the illuminating power of all the gas light hitherto used there. Anywhere in the electrically illuminated district it is possible to read type of the size used in the Scientific $\Lambda$ merican, and the light is purer and more steady than any gas light. Yet the popular impression a first was that the electric light was a trifle dim, and that the lamps should have been placed nearer together
The company making this experiment was organized unde the laws of this State some time last fall, its field of operatio being limited to Manhattan lsland. As already noted, the Brush system of lighting had been adopted in quite a numbe of our larger mercantile establishments, and many other merchants and manufacturers favored its introduction, but did not require lamps enough to warrant the purchase of separate generating machines. The success of the system elsewhere made it probable that it would be as favorably received here, and that its general use might be extended not only to the larger shops, warehouses, factories, etc., but also to the public streets and parks. Accordingly the New York company was organized to develop the field. The district selected for the first central station includes a large number of prominent hotels, club houses, theaters, and other places of amusement, and covers what has become the chie shopping district of the city. Seeing the favorable issue of he first street experiment, it is safe to infer that the future progress of the electric light in this city will not be slow. At this writing the wires have been set up as faras 34 th street, and it is expected that the company will be officially invited at an early day to submit a bid for the lighting of the square mile of territory around the central station.
Ample preparations are making at the preliminary station or the extension of the system. Already half of a double Corliss engine of 200 horse power has keen set up, with three dynamo machines, each capable of sustaining sixteen lamps of 2,000 candle power. Foundations are being pre pared for half a dozen more machines of the same size, and one 40 -light machine. With the latter type of machine the power required is four-fifths of a horse power to each lamp; with the smaller machines it is a little more, though i is estimated that the completed engine will be able to supply 250 lamps of 2,000 candle power each.
The lamps are of simple construction, very plain in ap pearance, relatively inexpensive and easy to keep in order The street lamps are provided with two sets of carbons, each good for eight hours' burning, and so adjusted that when one set is exhausted the current shifts to the other No clockwork is employed in feeding the carbons, their movement being effected by a simple automatic electric arrangement, which secures a constant adjustment and a remarkably steady light.
It is evident that the contest between gas and electricity for the lighting of our streets has now passed from th heoretical to the practical stage. It is tolerably clear, too that popular sympathy has a decided leaning toward elec tricity. It is to be hoped that on the score of cost the test will result as favorably as they have in respect to the qualit of the light.

## GROOVE TRACK PAVEMENT

In his much repeated lecture on "Lost Arts," Mr. Wendel Phillips describes an ancient roadway-Assyrian, if we recol lect aright-which was made of stone blocks grooved for the wheels of wagons.
Something similar would seem to be proposed by the Groove Track Pavement Company, of this city, which has applied for permission to place in lower Broadway and the streets leading therefrom to the ferries a complete equipment of five sets of tracks, with three tracks in each set to suit the gauge of every kind of vehicle. The petitioners also ask the privilege of constructing an experimental set of tracks in Union square, as "an entering wedge" toward laying in every street in the city such tracks as would per mit the use of compressed air as a motor for all sorts of vehicles. Whether these tracks are to be accounted publi
highways does not appear, though if they are not it is obvi ous that the public would not long be left with any usable portion of their own streets, should the petition be granted The petitioners further ask for the privilege of running light and convenient vehicles for carrying passengers and baggage, at a speed not exceeding 20 minutes from Union quare to either of the ferries; vehicles to be run at inter vals of two minutes; and the fare to be 5 cents, to include the carrying of 50 pounds of personal baggage. The fare they say further, is to be prorated with all connecting mnibus and horse railroad lines that desire this arrange ment, and excluding and prohibiting all other vehicles from arrying passengers, except such as now run in Broadway. n consideration for this decidedly valuable grant, the Groove Track Pavement Company proposed to keep the streets in which their tracks were laid well paved, tracked, and cleaned rom dirt or snow, and to pay into the City Treasury one cen or every full fare collected, this amount to be allowed to taxpayers occupying the property bounding the said street by a corresponding reduction of their taxes.
The scheme is put forth ostensibly for the relief of the blocked and crowded condition of Broadway. It is clear that it would put an end to blockades-by driving off the treet all vehicles not owned or licensed by the Pavement Company. The business firms along Broadway would doubtless prefer an occasional " block."

## AN UNWISE PHYSICIAN.

There have been no nobler instances of self-sacrifice than those recorded of physicians who, to save a patient or to in vestigate a disease, have taken extreme risks at the cost of heir lives. There is, however, a reasonable limit to such experiments, and no physician is warranted in subjecting himself to needless hazards. If the object aimed at can be gained without incurring any special risk it is obviously the part of wisdom to choose the safer way. The spirit which mpelled young Dr. Sanford to choose the more dangerous way, and so lose his life, at Greenpoint the other day, was beyond question commendable; but his act was the reverse of justifiable.
As the case is reported, Dr. Sanford had been attending a child afflicted with malignant diphtheria, watching the patient day and night: At last the air passages became blocked, and he doctor resorted to the use of the knife. He made an opening in the windpipe, inserted a small rubber tube, and with his mouth drew out the poisonous fluid. By this act he prolonged the child's life several hours, but put an end to his own life.
This is not the first fatal instance of the sort which has occurred in this country, and two or three cases of the same nature have been reported in France. The infectious character of the diphtheritic excretion is well known, and Dr. Sanford knew that his life would possibly, if not probably, pay the forfeit for his professional zeal.
Ought he to have taken the risk? More specifically: can e justify his taking the risk?
We have no hesitation in auswering, "Certainly not!"
For the simple reason that the deadly matter could have been as promptly and as surely drawn off by purely mechanical means. The emergency was not a sudden one, or one that could not have been provided for beforehand. In any apothecary shop the doctor might have bought for a few cents a rubber bulb that would have served the purpose of an aspirator as well as his own mouth, and it would not have suffered infection from the poisonous mater drawn into it.
Our natural admiration for devotion carried to the point f self-sacrifice is apt to make us forget to ask whether the devotion might not better have been manifested in a more rational and equally effective way. In Dr. Sanford's case we think it might.

## INTERNATIONAL EXCHANGE OF FOOD FISH.

While the German carp is being domesticated among us, converting our shallow fishless ponds into reservoirs of whole some food, several useful fish of this country are being in troduced into German waters. Recently 250,000 eggs of the delicious white fish of our great lakes were shipped by the U. S. Fish Commission to the German Fisheries Association, of Berlin. The eggs came from the United States hatcheries at Northville, Mich. The 700,000 eggs of the California salmon, shipped to Germany, France, Holland, and England some months ago, all arrived in good condition. Brook trout have also been sent to Germany, where they can scarcely fail to thrive. Germany has sent us the carp, in return, and also the golden ide, a beautiful and promising fish, which is under cultivation in the ponds of the Maryland Fish Commission.
It is expected that the Berlin Association will send, in addition to the species which have already been received from them, eggs of the saibling or charr, the large and handsome trout peculiar to the deep lakes of Northern Europe. It is highly esteemed as a food fish, and in Lake Constance it sometimes attains the weight of twenty-five pounds.

## TEMPORARY DEAFNESS.

According to. Dr. H. Augustus Wilson, a very common cause of deafness is the hardening of wax in the ear and the unscientific plan that people adopt for its removal. They generally succeed in making a bad matter worse. The ear is not so exquisitively sensitive to the presence of foreign matter as the eye, and hence those who work at the ear with hairpins and toothpicks are likely to injure themselves irre.
parably. Only the softest materials and the gentlest pressur should be used in cleaning the ear. In a recent clinical lec ture, the full report of which we give in the Scientific American Supplement, Dr. Wilson gives, in popular form, some very useful and practical information touching the re moval of ear-wax. If the ticking of a watch can be heard at a distance of 28 inches the heuring is good. Each ea hould be tested by the watch separately. Noises in the head, sometimes ringing, frequently are due to hardened wax in the ear. Sudden deafness is sometimes caused as follows: A small mass of wax, from ill-health or uncleanli ness, becomes hard. A continued secretion of wax then blocks up the ear tube still more. An injudicious attempt is then made to remove the wax by introducing, perhaps, match end, a pin head, or a pen holder, which instead of re moving pushes down the wax and packs it against the tym panum; or by a sudden draught or the act of swallowing he wax is suddenly pressed upon the membrane, and loss of hearing immediately ensues, because the membrane can no longer vibrate. The removal of the wax is in some cases especially those of long standing, somewhat difficult; bu with gentle treatment and patience may finally be accom plished and the hearing fully restored. The best ordinary means for removing wax, when not badly compacted, ar half a drachm of sodium carbonate dissolved in an ounce of water, applied lightly, by means of a bit of absorbent cot on or sponge attached to a suitable handle. When the wa is much compacted it may be softened by means of water quite warm, and a syringe

## A Remarkable Boiler Explosion.

The first explosion of a stationary boiler in this city, for a period of five or six years, occurred about midnight, De cember 17, under decidedly peculiar circumstances.
It was a new vertical tubular boiler, which had been tested within a year to 150 pounds, and was registered at 100 pounds. It was set upon a fire box of quarter inch ron, in a newly constructed brick boiler house, in the rea of No. 123 West Twenty-sixth street.
The engineer claims that when he left the boiler that vening the water was within a few inches of the top of the boiler, the fire was dying out, and, as he intended to build fresh fire in the morning, he opened the furnace door and closed the damper and ash pan. Wood for kindling the ext day's fire was in the boiler house. On going away fastened the outer gate with a chain and padlock
About midnight the neighborhood was startled by an ex plosion, and when an examination was made, the boiler house was found to be wrecked and the boiler gone. Two hours later it was discovered in the rear of No. 441 Sixth Avenue, something like 200 feet from where it belonged It was unbroken, and had fallen on end after its long flight over a number of tall buildings.
As the gate which the engineer locked was found to have been tampered with, and the kindling wood was missing, it was suspected that some one had taken refuge in the boiler house, or entered it maliciously, and had fired up, leaving the furnace doors closed on going away. The two steam auges, which fell through a skylight two blocks away registered 70 and 80 pounds respectively.

## Coal OII in Italy.

A Naples correspondent writes to a contemporary: "It is a noteworthy fact that mineral oil similar to that of Penn sylvania has lately been pumped in the Valley Cocco, in the Abruzzi, and also at Riva-Nazzano, near Voghera, in Pied mont, and it is believed that after a few more months' dig ing the oil spriugs themselves will be found. The Ameri can mode of extracting the oil is used, and some expert Canadians are employed on the work by an Italo-French company formed at Paris. The pumps are worked by steam, and the whistle of the engine is now heard where not long ago the shepherd's pipe was the only sound that broke the silence of the valley. As long ago as 1866 some Italian were ready to seek for petroleum in these localities, bu were forced to desist from want of means. An illustrious geologist has asserted that there are many valleys in Italy rich in this oil, and several specimens of native petroleum exist in the geological cabinet of the museum at Milan Companies are being formed to prosecute this industry which must prove very profitable, for there is a tax of 50 per cent on the American oil, and expenses of transport equal to 20 per cent. If the Italians themselves do not enter into the speculation, it is certain that strangers will not be lon in doing so.'

Francis T. Buckland, well known in this country and in Europe as a writer on natural history, died at his home in London on December 19, 1880, at the age of 54 . He was the eldest son of the Rev. William Buckland, D.D., Dean of Westminster. He was a student of Christ Church, Oxford where he took his B.A. degree in 1848. He inherited strong taste for natural history and physical science, and devoted himself to the study of medicine, and in 1854 be came assistant surgeon to the 2d Light Guards, retiring in 1863. He was a voluminous contributor of papers on pisciculture and physical science to the London Times and our exceilent contemporary Land and Water. At his own expense be established the "Museum of Economic Fish cul ure" at the Royal Horticultural Gardens, and did other things for which he was publicly thanked by the Royal College of Surgeons.

## THE EXPANSION OF STEAM.

## f prof. r. H. thurston

In studying the actual performance of steam engines we ave seen, as was stated in the reply to the question, "What s the proper point of cut-off in steam engines to give maximum economy in dollars and cents?" that the best point of cut-off is determined by so many and such variable condi tions that we can only ascertain what is the best rate of ex pansion by experience with each class of engine.
The experiments made many years ago by the Navy De partment on various kinds of marine sidewheel engine working at moderate speed and having unjacketed cylin ders, the steam pressure being 25 to 30 pounds by gauge proved the point of cut-off giving maximum economy to be at from four-t
till so worked
With the higher piston speed customary with screw engines a little greater expansion may be attained. The irregularity f wheel which is due to short cut-off is one of the retard ng elements which exists in less degree in the latter case though a serious drawback in the former, so serious that many engineers would hesitate to expand more than $21 / 2$ imes even with steam at 30 to 40 pounds where the engine is of long stroke like our river beam engines.
In the case of the ordinary unjacketed stationary engine with drop cut-off and a speed of about 300 times the cube root of stroke measured in feet, the best examples that I have known have expanded about 3 times, neglecting clear ance, when steam was carried at 40 or 50 pounds, as wa common at their first introduction, 4 times when carrying steam at 60 to 70, and about 5 times with 100 pounds of steam. For such cases I should therefore be inclined to proportion engines, when designing them, to cut-off at about $1 / 2 \sqrt{\mathrm{P}}$.
With engines of very high piston speed, with engines of high speed and steam jacketed, and with compound engine in which the expansion is so divided as to reduce losses by internal condensation and to make the frictional resistance less, I should make the design such as would assume an ex pansion of about $3 / 4 \sqrt{\overline{\mathrm{P}} \text {. }}$ Thus the Porter-Allen engine, the pioneer of high speed engines, may, it is said, work wit maximum economy at a cut-off of about one-eighth whe steam is carried at 100 pounds per gauge. Yet an enginee f great experience, Mr. D. K. Clark, puts the point of maximum economy for the single cylinder jacketed engin with steam at 55 pounds at but one-fourth, the expansio ratio for the unjacketed engine with steam at 75 being put at 3 .
The best figures for compound engines are about these: Elder \& Co.'s compound marine engine, with steam at 5 o 60 , expanding $31 / 2$ times, and giving a horse power for little less than $13 / 4$ pounds coal per hour. (Donkin's station ry engines: steam, 50 to 55 , coal, about 2 pounds expan ion, $131 / 2$ times, and Leavitt's pumping engine: steam, 90 expansion, $131 / 2$ times; consuming 18 pounds steam-illus rate successful practice with greater expansion.)
United States steamer Bache (Emery's design); steam, 90 pounds; expansion, 7 times; using $20 \frac{1}{3}$ pounds steam (o feed water) per horse power and per hour; and steame Rush (same designer); steam, $82 \frac{1}{3}$; expanding $61 / 4$ times using $181 / 2$ pounds steam per horse nower and per hour, are good cases.
In the latter case the designer concludes that it is of little advantage to carry steam pressure much above 100 pounds nd puts the economical points of cut-off at or more than one fifth stroke for 80 pounds, and two-sevenths to one-quarte for the lower pressures used, and gives as a fair working rule for number of expansions $\frac{\mathrm{P} \times 37}{22}$ for good single engines. He thinks this too high for ordinary engines and too low for compound, conclusions that it will be well to compare with my own.
Other such figures might be given, but these show that he best point of cut-off for engines constructed by the best builders is only known by actual experience, and is fa within that which would give a terminal pressure equal to the back pressure line of the indicator diagram. Ignorance of this fact has caused the loss of many hundreds of thou sands of dollars by builders and users of steam engines, who have vainly striven to secure economy of fuel by extreme expansion; and the loss due to too great expansion is usually greater than that caused by too little.
With increased piston speed and velocity of rotation, with increased efficiency of steam jackets and with increased dryness of steam, such as is obtained by superheating, we get nearer and nearer the ideal conditions of expansion, and no one can say where we may reach a final practical limit. We only know that progress is very slow in that direction nd we are still very far from the ideal limit.
My own conclusion is, therefore, as already stated, that ongines, as they are built to-day by the best builders for marine or for mill work, with unjacketed cylinders and moderate piston speed, do their best work when expanding bout one-half the square root of the steam pressure. Wer to choose the style of engine I should select the "com pound" condensing engine for all work demanding very regular or very slow speed, and where a double engine ha its special advantages, as in pumping or on shipboard; I would superheat moderately, steam jacket carefully-heads even more carefully than sides-and expand $3 / 4 \sqrt{\mathrm{P}}$ to
$\sqrt{\mathrm{P}}$, the latter at high speeds and with thin inserted cylin der barrel.
Where I could be confident of good work, and where a single engine might be allowable on other grounds, as in mills, I should probably select a high speed engine, steam jacket it completely, superheat $50^{\circ}$ to $75^{\circ} \mathrm{Fah}$., and expand $3 / 4 \sqrt{\mathrm{P}}$, using a condenser, where water could be had, whenever the engine was of moderate or large size.
Where compelled by limited means, or where the exceptionally low cost of fuel or other circumstances make it best to use the unjacketed cylinder and the less expensive forms of engine with drop cut-off, I would expand as in the first case above, $1 / 2 \sqrt{\mathbf{P}}$. And finally, if using the plain oldfashioned slide valve, I would set it to cut-off by the lap at three-fourths and raise the link in regular work so as to cut-off at about four-tenths or five-tenths, cushioning heavily and running fast. With that valve gear the limit is fixed, without reference to pressure, by the construction. High piston speed is of advantage in all cases where it can be adopted. Where the steam jacket becomes comparatively inefficient, as at very high rates of expansion, the remedy would be to design engines with thinner cylinders and heads, trusting to ribs for strength, and 1 should be inclined to use the inserted cylinder, as have some of the British makers for many years past.
The use of wrought iron or of brass cylinder linings pro perly secured would permit more rapid transfer of heat, and would in some cases, I have no doubt, prove of advantage. Non-conducting linings, as used by Smeaton and later by Emery could they be made to stand, would perhaps be still better.
As engines are actually built, every intelligent builder, if possessed of sufficient experience, knows pretty nearly what is the best point of cut-off for his engines, and is himself the best authority on that subject. The degree with which that point approximates to that found for a theoretically perfect set of conditions is also a true gauge of the value of his engine and all engines might be graded by this comparison. It is, perhaps, the best method of determining the economical value of any given type of engine under any given set of conditions.

## Lecture Experiments.

ombining and illustrating the glowing of platinum in a Current of illuminating gas with the rendering luminous of a bunsen burner flame, when the gas is previously heated.
An ordinary Bunsen burner is increased in length to the extent of, say, 3 or 4 inches, by adapting a platinum tube to the upper end, of such a caliber as to snugly fit. On placing the latter in a horizontal position, and opening the cock, the ordinary flame is first obtained; thereupon, with another burner, the platinum tube is heated to bright redness, the non-luminous flame now becomes the ordinary luminous one. The change is most marked when the cock is not more than half open. Now remove the second burner and place the first upright; the platinum then begins to glow at the upper edge, which glowing soon passes down and extends nearly throughout its entire length. On closing the cock and opening, after incandescence has entirely ceased, t will again glow as before; this time, however, without lame at its extremity
C. Gilbert Wheeler.

Laboratory of the University of Chicago.
Propelling Boats Without Wheels or Screw.
Attempt has been made to propel boats on canals and riv ers by conducting a column of water through a pipe and eject
An Englishman now claims to have got over the difficulty by showing that "the forceexerted by one fluid pouring into or against another depends on the contact of surfaces, and not on the sectional area of the flowing mass, after the flow ing mass be once set in motion." Instead, therefore, of tubes with large orifice, he makes use of tubes with narrow outlet, a mere slit, and thus obtains a large superficial con tact by ejecting water through a series of narrow openings.

## New York to Philadelphia in One Hour

The distance between New York and Philadeiphia, in an air line, is 81 miles, over a comparatively level country. In a recent paper before the Franklin Institute, Mr. W. Barnet Le Van maintained that an air line road could be constructed between the two cities, on which trains could make the dis ance in one hour, and that the enterprise would pay. The ine he proposed would cross no roads at grade, and would have but two curves of 10,000 feet radius each.

FOR articles of rubber which have become hard and brit tle, Dr. Pol recommends the following treatment: Immerse the articles in a mixture of water of ammonia one part, and water two parts, for a time varying from a few minutes to an hour, according to the circumstances of the case. When the mixture has acted enough on the rubber it will be found to have recovered all its elasticity, smoothness, and soft-

Chian Turpentine in Cancer.-At a recent meeting of the Medical Committee of the Middlesex Hospital, London, it was resolved that no more Chian turpentine should be ordered for the treatment of cancer, as, after a prolonged and careful trial, it had been found that its results wer perfectly negative.-Lancet.

## Durability of Rails.

Tbe tests of the durability of steel rails on the Grea Northern Line of Engiand, show that the hardest rails do not wear the best. In one instance a hard rail was worn away one sixteenth of an inch by a traffic amounting to $5,251,10$ Ons. A softer rail near by was worn the same amount by $8,402,000$ tons. In another instance the total was $15,531,000$ tons for a hard rail, and $31,061,000$ for a soft rail, the wear and tear being the same-one-sixteenth of an inch. Analysis showed this last rail to consist of $99 \cdot 475$ per cent of iron and minute quantities of carbon, phospho rus, silicon, manganese, sulphur, and copper.

## BRUSH HOLDER.

The engraving shows a brush holder for sustaining and keeping the brushes used by an artist while painting separate from each other, particularly when the brushes are charged with paint.
Usually the brushes are held in the hand of the artist, and often with more or less dif ficulty; but with this device the handles are nserted through the grid and into the bag, he grid serving to keep the heads of the brushes apart from each other.
This invention was recently patented by Edith A. Pope, of Boston, Mass.

The Safety of Steamboat Travel.
The annual report of the Supervising In spector General of Steam Vessels corrects the prevailing impression that last summer was uncommonly prolific in steamboat disasters. There is charged against the year but twenty six accidents involving loss of life, against thirty-two for the year before.
During the year the total number of ves sels inspected was 4,536 ; total number of officers licensed, 16,661. The total number of lives lost by accidents from various cause was as follows: Explosions, 22; fire, 52; col lisions, 66; snags, wrecks, and sinking, 14 accidental drowning, 25 ; miscellaneous casu alties, 6; total lives lost, 185. The report concludes as fol- the Direct United States cable from Ireland to Torbay, and lows: "I respectrully invite attention to the small percent age of lives lost as compared with former years, when the number of passengers carried was much less. Out of perhaps $220,000,000$ passengers transported on steam vessels during the last twelve months-a daily average of ove 600,000 -but 185 lives have been lost through causes incidental to steamboat travel, 103 of which number were passengers; and I feel warranted in asserting that the fact that only one person was lost out of every $1,100,000$ persons carried argues a degree of intelligence and skill on the part
of the licensed officers of steam vessels and the officers of this service unsurpassed and scarcely equaled in any other service."

## apparatus for demonstrating mechanical prin

 CIPLES.An ingenious apparatus for demonstrating certain me hanical principles is slown in the accompanying engravin from La Nature. It is the invention of Mr. Jean Mocenigo. The curved track is about five feet long. The car carries two shallow cups designed to catch and discharge mall balls of lead or other material dropped from the ylindrical reservoirs at the ands of the track
When set free at one end of the track the car by itself descends to the bottom of the curve and is carried by its momentum part way up the opposite slope; then it reurns, and continues the to-and-fro motion until brought orest at the bottom by the ombined resistance of fric tion and the air. The amount of this resistance is measured by means of the balls employed to keep up the oscillation of the car.
The discharge of the balls is effected by the impact of the car upon the light springs underneath the spouts at the ends of the track, one and only one ball being let go at a time. The car thus loaded runs to the bottom of the curve, where the ball is dropped, the increased mo-
mentum from the added weight just sufficing to carry the empty car to the summit of the other slope and set free another ball, by which its gravity is re-enforced for another excursion. In this way the to-and-fro movement of the car may be maintained for any length of time.
It is obvious that in one complete excursion of the car the It is obvious that in one complete excursion of the car the
force applied is equal to the combined weight of car and
ball falling through a distance equal to the height of th end of the track above the middle; the work done is equal on the lifting of the car alone through the same distance the ends of the track being on the same level. The differ ence between the power and the effect is the measure of th power consumed in overcoming friction, the resistance of th air, and the force of the spring by which the ball is discharged

## Atlantic Cables.

The lengths of the several cables between the United States and Europe and their locations are given as follows: The three Anglo-American cables now in use run from Ire land to Newfoundland, 1,850 miles, and from Newfound land to Sydney, over 300 miles-a total distance of about 2,150 milcs each; the Anglo-French cable from Brest to Duxbury by way of St. Pierre, is about 3329 miles
last month. It is said that the cable is so rotten that no at empt to repair it will again be made.
The cable of the Direct United States Company was laid in 1874, and has been broken twice: the first time, January , 1879, on the ocean side near Torbay, and in February, 1879, in the Rye Beach and Torbay section. Buth breaks were repaired, and the cable is said to be now in good condition. The cable of the new French Company has been down about a year. It was broken May 2, 1880, near the Island of St. Pierre, and repaired the same month; the section between Cape Cod and St. Pierre was broken Novem ber 21, 1880, and is now repairing.

## ENGINEERING INVENTIONS

An improved car coupling has been patented by Mr. Wil n on having pivoted within it a spring-actuated hook-headed jointed coupling bar, and of the combination therewith of a stirrup fitted within the draw bar, embracing or set about the coupling bar.
Mr. John W. Carley, of Cotton Gin, Tex., has patented an improved machine for boring wells, prospecting, and mining shaf 1 s , post holes, and various other purposes where earth is to be loosened and removed. It is so contructed as to operate continuously, excep while sections are being added to the shaft and belt, the earth being removed as fast as it is lonsened.
Mr. John G. Herold, of Moberly, Mo., has patented an improved nut lock for railroad rail joints, by which the nuts are prevented from becoming loose and dropping by the jar of the engines and cars passing over the rails; and the invention consists of a flanged locking strip or picce with beveled underside that is fitted into the angle of the fish bar. The flange extends up between the fish bar and inner face of the nuts into the space formed by the interposed washers of the nuts, while the top of the locking strip in front of the flange is notched below the nuts for retaining the corners
An improvement in surveying instruments has been patented by Mr. Thomas M. Jackson, of Clarksburg, West Va. The invention consists in attaching a level detachably to the body of the telescope of a plain transit instrument by means of two armed or hinged clamps whose upper or free ends are secured together by thumb and binding screws, the telescope being also provided with laterally projecting pins that indicate the proper position of the clamps and prevent it from shifting.
An improvement in baling presses has been patented by Mr. William Duke, of Longtown, Miss. The invention consists in constructing a rotating baling press with plates and rollers interposed between its friction surfaces to dimin ish the friction when the press is operated
An improvement in that class of railway car trucks in which the brakes are not applied to the flanged running wheels, but to small wheels which are mounted on the axle between the truck or running wheels, has been patented by Mr. George Bressler, of Altoona, Pa .

An improved vehicle wheel has been patented by Mr. John Ladner, of Charlestown, Mass. The invention consists in constructing a vebicle wheel with friction rollers placed in a countersink in the hub, a ring oil chamber having holes in its inner wall, the plates that close the outer end of the hub, and the guard plate attached to the inner end of the bub, whereby the fric. tion is lessened, the bearing kept lubricated, and the escape of oil and the entrance of dust are prevented.

An improved drilling machine for artesian and other wells has been patented by Mr. Patrick Sweeney, of Leadville, Colorado. The invention consists of a drum for the drill rope loosely mounted on a shaft and provided with a rising curved flanse on each end and with two studs on one end, the studs engaging with a cross bar on the shaft, and the ris-

## MOCENIGO'S APPARATUS.

 le projections of $t$whe din over six years and another over seven years. The can Come, under the management of the Anglo follow ing May, and several times since the same accident has oc curred. It was last repaired in August, 1879, having been curred. It was last repaired in August, 1879, having been
broken February 22 in that year, but it was again broken
hus causing the drum to move forward and backward on the shaft, whereby it is alternately engaged with and disenaged from the cross bar, thus raising the drill and the permitting it to drop.
An improved drilling machine for artesian oil wells has been patented by Mr. Frank Knowlan, of New York city.

The construction and operation of this machine cannot be clearly described without engravings.
An improved rub-iron for car trucks has been patented by Mr. David E. Small, of York, Pa. The object of this in vention is to provide an ordinary car truck with an improved rub-iron which will adapt the truck to carry either wide or narrow car bodies, or such bodies as are used upon broad or narrow gauge roads, so that the car body, with its cargo, may be transferred from the truck of a wide gauge to the truck of a narrow gauge road.

## Volcanic Thunder Storms

A paper on volcanic thunder storms, by M. Faye, was read before the French Academy of Sciences, on November 2. It is stated that in paroxysmal eruptions the enormous amount of steam ejected causes volcanic thunder storms, which are very different from ordinary thunder storms. The volcanic storm has no gyratory movement; it is confined to the column of ascending clouds, and no flashes occur without the presence of ashes. Altogether, the phenomena resemble very closely those of the Armstrong elec tric machine. As observers have failed to mention any hail attending these thunder storms, it is probably because no hail is formed. Its absence is due, M. Faye thinks, to the lack of gyratory motion already noticed.

## TIDAL OUTLETS FOR SEWERS

On this page we show a plan from Mr. Rawlinson's "Suggestions" for a main sewer outlet to the sea, or to a tidal estuary on a flat shore.
The object sought to be attained by this plan is to permit the rise and fall of the tide in such a manner as not to disturb the flow of sewage, or drive back sewer gases during windy weather or during the rising of the tides.

In Mr. Rawlinson's plan, the sewer is much smaller than many outlet sewers, being oviform, $3 \times 2$ feet, with an area of 4.594 square feet, equivalent to a circle of 1.654 feet diameter.

The main is carried to a man hole chamber, at which a flap valve is placed over the inlet. There are two outlets, one from the bottom by an 18 -inch cast iron pipe, leading to a point below low water, and terminating in a bell-shaped end opening downward, the other from the high water level by a $\not \approx 4$ inch pipe of cast iron, so constructed as to discharge between high and low water mark.

The man-hole chamber is ventilated at the top.
At some distance back from the chamber an 18 -inch cast iron pipe is led from the bottom of the sewer to the bottom of the man-hole chamber, which is above low water mark. It is there trapped, so as to prevent the passage of air if the pipe is not running full.
This pipe is intended to carry off the dry weather flow of the sewer without opening the flap at the chamber inlet, and thus allowing the entrance of wind from the outlet. A ventilated man-hole is placed over the upper end of the pipe.
This is, upon the whole, a neat arrangement. Its chief defect, if it can be called a defect, is in the reliance upon a flap valve. All automatic appliances are rather unsafe in a sewer, being liable to be clogged and their action impeded by the slime and foreign material, which cannot be prevented from entering the sewer. In this case the flap seems altogether useless, for the flood-water overflow, which is the lit
only inlet for wind at the seaward end, might just as well
be carried to low water level, and seated in the same manbe carried to low water level, and seated in the same man
ner as the low water outlet.-The Plumber and Sanitary Engineer.

## JENKINS' PACKING AND VALVES.

The engraving shows two forms of valve patented by the late Nathaniel Jenkins, and now a well known standard article familiar to manufacturers and steam engineers throughout the country. These valves are provided with disks of Jenkins' compressible packing instead of the usual metallic surface. 'rhis packing bas been in every-day use for twelve years, and has been indorsed by first-ciass engineers and mechanics throughout the country. It is found to


## JENRINS' IMPROVED VALVES.

render the valve perfectly tight under all pressures of steam, oil, or gas, and it is not injured by sand or grit, nor will foreign substances lodged between the valve and seat pre vent it from closing.

Should it become necessary to repair one of these valves it need not be removed from its place, as the disk can be replaced in a few minutes, at a small cost, and without the aid of a mechanic. No regrinding is required as in other valves.
The improved packing is applied to various purposes, and is largely used by our best engineers and manufacturers. It is made up in sheets, gaskets, rings, and washers, and when used in a joint subjected to steam or heat it hardens, forming a body which, the manufacturers claim, will last for years, as it does not burn out or decay, and if care is taken, the joints may be often broken without injury to the packing. The same material is also made up into pump valves, which, we are informed, have given general satisfaction, being especially desirable on account of itsheat-resisting qualities It is used in pumps for handling oils and acids, and
may be used where rubber valves have failed, a special form of the packing made which is adapted to valve stems rendering the stuffing boxes steam and water tight.
Messrs. Jenkins Brothers, of No. 11 Dey street, New York city, and 104 Sudbury street, Boston, may be addressed for further information in regard to these inventions.

## AGRICULTURAL INVENTIONS.

Mr. William H. Ryer, of La Crosse, Wis., has patented an improvement in sulky plows. This invention consists in the mechanism for raising and lowering the plow upon the frame, and in certain other features of construction, which cannot be described without engravings.
Mr. George W Fink, of Pleasant Plains, Ill., has patented an improvement in that class of check row seed planters in which the seed-dropping mechanism is actuated by a rope stretched across the field; and has for its object to simplify the construction, lessen the weight, and increase the plify the construction, lessen
reliability of the seed-dropping mechanism.
a combined listing plow and seed planter, patented by Messrs. Leonard A. Cooper and Oliver F. Bostwick, of Atchison, Kan., is so constructed as to open the ridge or clear a space for the row of hills, open a furrow to receive the seed, drop the sced, cover the seed, and roll down the soil.
Messrs. Richard E. Caviness and George McCormick, of Beckwith, Iowa, have patented a check-row corn planter of the kind that is operated to drop the seed by a line stretched across the field.
An improved cockle mill, for separating cockle and other small seeds from wheat, has been patented by Mr. James M. King, of Walnut Station, Minn. It is simple in construction and effective in operation.
Mr. George C. Winslow, of Kalamazoo, Mich., has patented an improved harrow and cultivator tooth which is not only yielding to obstructions, but one capable of adjust.ment for greater or less tension, as well as adjustable to greater or less depth and inclination.

## The "Frigate" Mackerel

A notable event in the history of our coast fisheries was the sudden appearance, last summer, of the "frigate" mackerel in immerse schools about Block Island and the adjacent waters. These fish are very common about the Bermudas, the Azores, and on the coast of Europe, but were never before seen in the waters of the United States. It was estimated that many of the schools in the vicinity of Block Island contained from 80,000 to 100,000 fish each. Considerable quantities of the fish were taken, but they were found in small demand as a table fish. They will probably prove valuable chiefly for the oil which they contain, and for use as a fertilizer.

Beatty's Organ Factory.
In another column of this week's issue we publish a new advertisement from the Hon. Daniel F. Beatty, Mayor of Washington, New Jersey, the well known manufacturer of the Beatty organ. An appropriate gift for a holiday present would be one of his 14 stops $\$ 65$ organs. Mr. Beatty extends a cordial invitation to all who desire to purchase either a piano or an organ to visit his manufactory at Washington, New Jersey. Every organ he sells he makes in his own factory. Read his advertisement and send for his holiday newspaper and catalogue, which he sends out free.


## THE ALBION COAL MINES. <br> ву в. с. нотет

The series of startling disasters by which these famou mines have lately been overwhelmed with loss, and perhaps with utter ruin, serves to recall a memorable visit I made to these same collieries only three months ago. They are worth describing, independently of
y recent distressing events.
The Albion Mines are located in Pictou County, in the province of Nova Scotia, about 100 miles north of Halifax and one mile from the village of Stellarton. The entireccal field of the province, so far as explored, occupies an area of about 685 square miles; but the portion lying in Picton County is a basin by itself, irregular in form, inclosed by much oldeer geological formations, and covers only some 35 square miles. Although thus limited in extent, as compared with other fields, it possesses great value on account of the extraordinary thickness of its beds. According to Hon. Mr. Gilpin, Inspector of Mines for Nova Scotia, to whom I am indebted for much of my information, as well as for personal attentions, the section of measures in the district of the Albion Mines has a vertical thickness of 2,450 feet, holding 100 feet of coal, lying at an angle of 18 degrees.
The group on the western side of East River exists in seve ral seams of varying thickness and quality. Those most ex tensively worked are known as the deep seam, which is reached by the " Cage Pit," and the main seam, pierced by he "Foord Pit." The deep seam is nearly 23 feet thick the main seam actually attains the enormous thickness of 35 eet, although the portion worked does not exceed 22 feet was conducted to a spot where the workmen had cut through the entire seam and had taken out a section 35 feet high for exhibition in the Provincial House at Halifax, where
I afterward had opportunity to verify the statement by actual I afterward had opportunity to verify the statement by actua measurement. For 22 feet it is clear coal, without a parti cle of foreign material that I could discover; and the balance has only here and there an intruding stratum of slate or clay.
It should be stated that all the coal thus far found in Nova Scotia is of the bituminous variety; no anthracite having yet been discovered. It has much firmness, however, and though burning freely does not readily slack or crumble. These qualities make it a favorite steam coalson the Atlan tic and other steamers. It has also been extensively used for domestic purposes, and it is admirably suitable for coking. Large quantities were formerly exported to the United States for gas making. Analyses made by the London Gas Company, in 1879, gave 10,300 cubic feet of candle power gas, and 14 cwt . 2 qrs. of good coke per ton of coal. The as is also represented as remarkabily free from sulphur and other deleterious ingredients, when the purifers were at tended to.
These mines were formerly owned by the General Mining Association, of England, which also owned other mines in the Provinces; but a few years ago they sold out to what is known as the Halifax Mining Company, chiefly, however London capitalists. The Acadia Company, working what is regarded as an extension of the main seam at Westville, is the only American company in the region. Some idea of the importance of this field may be had from the official statement that the area of the Halifax Company alone contains $67,365,000$ tons of available coal. The entire coal produce of Nova Scotia for 1879 was reported to be 788,271 tons; of which aggregate the Albion Mines produced 171,534 tons, being a larger quantity than was taken that year from any other single mine in the Dominion. In the year 1862 the yield was about 200,000 tons, and the current year promised to exceed even that showing. The company, under the able management of Superintendent James Hudson, has a line of steamers of their own, and were filling large orders in Mont real and elsewhere. With the improvements recently made, a daily extraction of 500 tons had been reached from the Foord Pit alone, besides what came up from the Cage Pit; and other enterprises were under contract that would operate to increase even this very large yield. Several fine engines had been sent over from England, just prior to my visit, the design of which was to introduce compressed air as a substitute for horse power on the underground railways. T facilitate work further the principal inclines had been regraded. In fine, everything pertaining to the mines was in as perfect order as human ingenuity could compass; and the terrible disaster that now has wrought such havoc was wholly unexpected.
The upper works of the Cage Pit present nothing of unusual interest; but after descending a shaft 300 feet deep, one is led to the head of a wonderful inclined plane, half a mile long, up and down which cars are drawn by a steel rope. The rope itself is a heavy load to be hauled up many times a day, without taking into consideration the string of cars full of coal. Another curiosity that the foreman took some pride in exhibiting was the system of lighting the portion of the mine near the engine. This wasdoneby utilizing a natural supply of gas flowing from a crevice in the wall. I asked the question, if there was not a degree of danger attending this; but was reassured on being told that the gas was
thoroughly headed up in a reservoir, and that those very jets had been burning seven years. Yet when tidings came of the explosions in and flames issuing from the neighboring pit, it occurred to me that such a steady stream of gas as I saw must proceed from a hidden and dangerous source. Un doubtedly it was so, though there may have been no immed conflagration.

Before entering the Foord Pit I gave some time to an examination of the works above ground. In doing so I had the company of Mr. Gilpin and Mr. Joseph Hudson (the son
of the superintendent). They showed me the old engin of the superintendent). They showed me the old engine
"Hercules," the first locomotive run on any railroad in British America. It was still in use; and the man who ran it on its trial trip, so long ago, is still employed by the company. A duplicate engine of the same age, called the "Sam" stood on a side track near by, in good repair and daily
In proximity to these antiquated affairs was one of the latest and most highly improved English locomotives; the contrast furnishing an instructive object lesson in the progress of modern mechanism.
We found the patriarchal engineer himself at his post of duty in the pump house, running the gigantic steam pump by whose powerful strokes a volume of water is continually discharged as large as a man's body. The buckets, about wo feet in diameter, are brought up in three successive lifts of a little more than 300 feet each, making 1,000 feet in all At the time of my visit the water from the old workings had been nearly exhausted, and the great pump was relied on to raise the water from both the main and deep seams. Who could then foresee the bursting in of a flood in September from an old and long disused pit, and another on the 12th of October, drowning six men besides several horses? Or that later explosion of fire-damp, making it necessary to pour into the mine all the water that could be obtained? This pump was at that time considered equal to all emergencies hat might arise.
The ventilating fan, of the Guibal pattern, having, I be lieve, a diameter of 30 feet and a width of 10 , was in a build ing by itself, and was run by steam acting on a crank turning the fan at the rate of 40 revolutions a minute, with capacity of 50 or more, and drawing from 65,000 to 70,000 cubic feet of air from the mine. So strong was the suction that ingress to the fan house could be had only through an air-lock. The object was twofold, to withdraw inflam mable gases from the pit, and to supply the men working there with fresh air. The Cage Pit is ventilated by a fur aace. The atmosphere, as we afterward ascertained, is kept as pure as could be desired by either method under ordinary ircumstances.
The actual conveyance of the current thus forced under ground to the places where it is most needed is by shuttin off the old passages not now worked by brattices or thin par titions toward the working faces, and in many cases by air proof cloth curtains hung in such a manner as to guide tho current, even to the extent of splitting it and making the subcurrents travel in opposite directions. But, as recent events have shown, the best precautions cannot prevent the sudden release, at times, of hidden magazines of explosive material stored up in the coal, which by superior force overpowe the ventilation, and, as in the Albion disaster, destroy the fan itself, hurling its fragments to a distance and demolish ing the building covering it
The original method of entering the mine was, of course by the inclined plane, through which the horses are still let in; but the drawing arrangements of the colliery at present are clustered around a pit, and the coal is drawn to the sur face in cages. The cage is an open framework of steel bar holding a double deck, two trams being carried on each deck It is raised by a steel rope fastened to the top bar; and while one cage is lifted another is lowered. The cages are guided by vertical rails to hold them steady in passage.
The loaded cars are run from the cage on to a wide plat form, where they are first weighed, then dumped and re turned. The steel rope is 6 inches in circumference and 1,200 feet in length. It runs over a drum 22 feet in diame er, revolving at a rate wholly under the control of the en sineer. Entering an empty cage with Mr. Hudson, we wer let down the vertical shaft, 1,000 feet in 70 seconds, and found ourselves among the swarthy miners. The number mployed varies according to circumstances. The published statement in 1879 showed the number at work underground to be 384 , of whom 84 were boys; there were 200 surface workers, of whom 37 were boys; a total of 584 employes. The horses used were 35 below and 17 above. The cutter numbered 259, and the average per cutter per annum was 662 tons of coal.
Those whom we conversed with seemed contented, and said that they made a comfortable living, getting from $\$ 1.25$ to $\$ 1.75$ per day, besides rent and fuel at greatly reduced rates. They surprised me by their intelligence, of which here was at least one ready explanation, viz., they were many of them, faithful readers of the Scientific american and some of the very men who have since met a terrible fate spoke most warmly of the pleasure and profit they derived from its contents.
A few feet from the bottom of the shaft is the lamp cabin where stood Mr. William Dunbar, a man 70 years of age who for 40 years had been a miner, aud during most of tha ong period had been responsible for the safety lamps. He xplained to me the improvements made in the old-fashioned Davy lamps, whereby the gauze is protected by a glass cylin when the air is dangerously charged with gas, the light is infallibly extinguished. As an additional precaution each lamp is locked when given out, so that a careless workman cannot get at the blaze to light his pipe, or for any othe purpose. When Mr. Dunbar handed me my lamp he wa in fine health, and boasted that mining agreed with him well. the victins me to see it stated that the fine old man is amo
the explosion, dealing out lamps to the men, when the flames burst in at his back door. He rushed out the front door and fell on his face. His oil-soaked garments instantly caught fire, and though by his own efforts and the aid of others he inally extinguished them, it was not until he was so badly burned as to be beyond recovery.
My guide and I traveled around in the mine for what he said was about six miles; finding, of course, considerable sameness of scenery, yet seeing many things novel to one more used to exploring natural caverns than such artificial excavations. My main anxiety was to keep from heing run over by the horses which went at full trot through the darkness as fearlessly as if above ground. Their stables were below, but extensive and comfortable; and the horses were seldom taken to the surface, except in case of sickness, till hey died. At the time of the explosion 17 horses werefound dead in their stalls. Suffice it to say that our trip was without accident.
The only indication of the presence of deleterious gas observed by us was an occasional hissing sound, like the singing of a teakettle, caused, as we perceived, by leakage of gas through fissures in the seam, but not in quantity sufficient oo make an explosive mixture before being carried off by the current of ventilation. Everything seemed as safe as could be desired. No serious accident bas occurred since the great fire of 1861, when the East River had to be turned into the mine to extinguish the flames.
In order to an understanding of the late calamity, some idea should be given of the method of working the field. The entire excavation, judging from the official survey I saw in the possession of Mr. Hudson, must equal 100 miles; and the tramways alone extend for about 20 miles. There is also an underground connection between the Foord Pit and the Cage Pit, as a workman told me who had gone through it. Most of these workings are now abandoned and closed up by masonry. The system adopted is a form of pillar working, ribs of solid coal being left between the "bords," or openings at right angles with the main or gate level; and these again are intersected by bords parallel to the main level. The result when spread on a chart looks like an irreguar checker-board. The side passages are usually at a steep lope from the main level, and advantage is taken of this to arrange for delivering the coal to the tramways by a system of counter balances, the full cars as they run down carrying the empty ones up to the place where the coal is being cut. The pillars vary from 16 to 18 feet in thickness, and the borors are about 20 feet wide; hence it is evident that, as mining proceeds, only about one-balf the coal in the field is removed, the remainder being left as a support for the roof. The custom of "robbing the mine" has not here been introduced; by which is meant taking out the pillars, one at a time, and letting the roof fall to the floor. The practice is attended with some danger, and also shuts off access to portions of he field lying beyond the passages thus closed.
The Foord Pit is divided into the north and the south stope; the one to the north extending for a mile and threequarters, and the south stope for more than a mile, numerous bords being worked in each. The explosion of November 12 took place in the south portion, at half-past six o'clock A.M., when 150 men had just begun their day's labor. At first it was supposed that this entire number had been destroyed; but those in the north stope escaped uninjured, and the number of the lost as last reported was thought not to exceed 50 men and boys, of whom, however, 33 are married men
The first to volunteer to explore the mine was Mr. Joseph Hudson, who, together with Mr. Tupper, overman, and Messrs. Poole, Greene, and others from the Acadia and Vale collieries, ventured in for a quarter of a mile, four hours after the explosion. They found the stoppings on the south side blown off, and did something to facilitate ventilation, but peril from accumulating gas was too great to allow of their remaining more than two hours or so, and they came to the surface at noon to await further developments. At the same time the men at work in the north stope came up to dinner nd learned the fate of their companions.
The alarm spread until the mines were stopped in all Pictou County, and the people came in crowds about the pit. Attempts to flood the mine during the day were made, and many thought the danger over. But at 10 P.M. an explosion more violent than ever shook the ground, tore off the oof of the fan house, and the descending fragments riddled the roofs of adjacent buildings. The report was heard a long distance. This was followed by another explosion at A.M., and similar outbursts were repeated at intervals till he ruin of the mine seemed inevitable. Volumes of smoke poured forth from the shafts, showing what a conflagration was raging below. Fire engines from Pictou and New Glasgow were brought and set to pumping water into the hafts. Men were set to work to fill the main slaft with spruce boughs, clay sods, hay, etc., to stop the air from the mine; and for the same purpose the shafts of the Cage Pit were closed up, and orifices into old mines in the vicinity. A trench was opened from East River to the fan shaft, hrough which it was hoped to extinguish the subterranean fires.
No one seems to know how the fire originated, though several theories have been suggested. In Mr. Gilpin's report on the Department of Mines for 1879, he gave a warning note to increase the systematic ventilation of the collieries, and not to reason that " because fire-damp is present only in traces a very slight circulation of air is all that is quired " He arso sirculation of air is all that is
safety-lamps in general use. But the mystery of the calamity at the Albion Mines is that every precaution imaginable seems to have been taken, and all the machinery made after the best patterns, and yet in vain. The deposit of coal is too valuable to be abandoned, being one of the finest in the world, and it is probable that at some time operations will be resumed. But it is certain that this cannot be done for a long time to come.
Meanwhile there are left to the charity of the public, it is said, " 33 widows, 110 orphans, and 700 men, representing a population of 2,000 people, thrown out of employment in the face of a Canadian winter." An appeal on their behalf has been sent out by the managers of Nova Scotia mines, clergymen, and others. The case is certainly one that calls for an immediate and generous expression of popular sympathy.

## AMERICAN INDUSTRIES.-No. 64.

## the mandfacture of bolts and nuts.

Perbaps there is no other one cause so potential for the heapening of production nowadays as the minute division of labor carried out in every leading branch of manufacture. And the cost of making is not only thereby greatly reduced, but the quality of the product is improved in yet greater proportion. The industry which forms the subject of the first page illustrations in this paper affords a conspicuous example of this course of development in modern manufactures. There is hardly a large manufacturing establishment or a respectable machine shop in the country which has not the available facilities for forging bolts, turning screws, or making nuts, yet it is comparatively seldom that one of either of these is made by the mechanics who put them in their machines or the manufacturers who use them in a thousand different articles of which they form an indispensable part. The reason is obvious: the manufacturer who has constituted this his especial business can not only make them far better than an ordinary mechanic, but so much cheaper that it seems like wasting time to do even trifling work of this kind in a general machine shop, the ready-made bolts and nuts being of such uniform good quality that a flaw or a weak spot can rarely be found in them, and of almost every desired size required for use in all kinds of work.
It is now nearly forty years since two of the present proprietors of the great bolt and nut factory of Russell, Burdsall \& Ward, commenced business in this line, at a point on the Byram river just within the Connecticut State line, alout two miles from the village of Port Chester, N. Y., and twenty-five miles from New York city. The site selected was one of romantic beauty, in a picturesquely wooded dell, but their location here was for the purpose of utilizing the water power which over forty feet fall in the Byram river afforded. The contrast between their business of thirty-five years ago and its extent to day is well illustrated by the two views, which show their factory as it was then and is now. Then one horse and wagon was sufficient for the bringing of all their iron and the shipping of all their products from Port Chester, and every detail of the work not only received the personal attention of the proprietors, but the most important portions were the results of their own skill and handicraft. Even greater, however, than the difference in the amount of business, is the contrast between the way of making bolts and nuts at the commencement of their manufacture and that which is followed to-day, the many elaborate machines now used producing results which were hardly imagined possible at that day, and a large proportion of these machines, cither in all their parts or in important improvements, being the invention of members of the firm.
The iron used is received in the form of bars or rods, both square and round, and in great hanks or coils, a large stock being always kept on hand. Iron only is worked here, and a considerable proportion of the goods are made from the best charcoal irou. In the main bolt making room, shown at the bottom of the page, there is probably as great a variety of machines for making bolts, and the capacity for as large a production, as can be found in any single estab lishment in the world. Nearly all the iron is worked cold, an improvement which has, within a few years past, been finding steadily increased favor, from the great additional strength which this manner of working gives to the goods, as against the former method of making all the blanks by the old-fashioned method of forging. Care is necessary, of course, that a bar of cold iron be not submitted to too many manipulations, but there is never any danger of this kind in the methodical operations of bolt making, where every blow the iron receives, and every time it is to be submitted to pressure, are accurately determined before the commencement of the work. The increase in strength in bolts, from working the metal cold, is estimated at between 50 and 100 per cent, and the effect in general is to give the iron a good deal of the qualities of hard steel.
For this cold working, however, powerful machines are necessary, as every portion of the labor of forming the fron is done by them, the labor of the hands being contined almost exclusively to the feeding of the machines. There are different patterns of machines here for doing the same work, but in the making of a blank for a bolt, either the wire or rod is fed into the machine so as to pass between a pair of feed rolls, which hold the metal by friction, and convey it into a steel tube or die in the central part of the machine, where the length of the bolt is accurately determined by an adjustable gauge, and is cut off in lengths sufficient to allow enough surplus metal for the forming of the pattern
of head the bolt is to receive. As it is cut off it is grasped between tingers and carried to the opposite end of the die, where it is pushed back into a hole having the form of the bolt head, where a bammer strikes it and forces the surplus stock into the desired shape, after which the blank is driven from the die and drops into a box beneath.
When these blanks so headed are of square iron, they are taken to another machine, where they are suspended by their heads in a long row, between two parallel tines, from which they feed themselves into the machine, where they are grasped, one at a time, by fingers, and each one is held between the jaws of powerful revolving cam formers, being advanced and withdrawn three or four times, until the square iron is perfectly rounded, either entirely up to the head or so as to leave a square shank. The fingers then drop the rounded blank to one side, and, reaching back, pick up another one, to go through the same operation, the whole process impressing one with the idea that the machine is almost possessed of reasoning powers, so careful, deliberate, and intelligent seems to be its imitation of the motions which a workman would go through in performing a simiar part of the work.
The forming of the point and the cutting of the thread are done by other machines, in which are the same feeding device and similar automatic working, these operations, however, sometimes requiring two machines, while for some goods only one operation is necessary. When the blank is fed into the jaws, which seize the end bearing the head, it is advanced against a tool which forms the point, if that part is to be completed here, and, this work being done, the blank is then passed to a chasing tool, which cuts the thread as in an engine lathe, varying the number of cuts to the size and the amount of metal to be removed. This machine, as also the blank formers and headers, are so arranged as to guard against accidents as completely as if they were ossessed of intelligence. If any one part ceases to operate, or to properly fulfill its functions, the machines will stop of themselves, or have self-adjusting contrivances to remedy the difficulty; if the blanks are too long or too short they cannot be worked, and if too great strain is brought on any part, from any displacement of the machinery or the intro duction of forcign matter, the machine stops and makes a oise readily distinguished from that caused by regular working.
The above describes the main features of all the boltmaking machines, although, from the great variety of goods made here, no less than from the many improvements which bave been successively introduced by the firm, there are many differences in the details of the operations in swaging and finishing. All of the work, however, is performed by machines which work autnmatically, and some of the machines here for forming particular patterns of bolts are different from those in use anywhere else. The firm have a arge machine shop, in which they make their own machinery, and besides several patents which Mr. Ward has obtained, they have made other improvements, not patented, more especi:lly valuable in the making of goods of which hey have the almost exclusive production.
In the nut-forging shop, represented in one of the illustrations, the bars are heated, the workman keeping one bar in the forge fire while he feeds the heated end of another into the jaws of a machine which cuts off the required length and punches it, while at the same time the nut is formed by hammers striking it rapidly on the bottom, top, and sides, to compress the metal and give the nuts the de sired shape. This machine works very rapidly, and the goods are certain to be perfectly uniform in quality and shape, whether the nuts are square, hexagonal, or any other form.
The packing room, represented in one of the views, occupies a large department, for here are put up in paper boxes each day no less than 125,000 bolts and nuts of the maller sizes, the larger ones being generally shipped in bulk. This work is done principally by girls, who, in long practice, acquire a degree of manual dexterity in this part of the work which is surprising to any one who has not previously noted the results of such training.
It would be impossible to enumerate, in anything less than an elaborate catalogue, the number of different kinds and patterns of bolts and nuts made at this establishment. Every standard article in this line forms a part of their regular production, in all- the lengths and sizes ordinarily used. A large business has been done from the first in car riage, tire, and sleigh bolts of every description known to he trade; stove bolts are made in large quantities; plow bolts are an important specialty, and bolts for mowing machines, cultivators, and elevators, with nearly all kinds of machine bolts, knob screws, etc., are a portion of the staple goods regularly manufactured. Besides these, however, the firm do a large business in the making of special sizes and lengths, to order, for use in particular departments of manu facture, their long experience, and the high quality of their goods, which it has always been their first care to maintain, giving them special advantages for filling the large trade of his kind which comes to them.
The Library Hall is a building erected by the firm for the purpose of affording their employes better opportunities of self-culture. It contains a choicely selected library of about 2,000 volumes, and the scientific portion of the books were chosen by Prof. Youmans with especial reference to the needs of such a class of working readers. There is here, also, a warmed and lighted room, intended to make a comfortable place in which the hands can profitably and pleas-
antly pass their spare hours. No intoxicating liquors are to be had within two miles of the establishment, and it is the design of the proprietors to make the surroundings of those who live in the immediate neighborhood, and who earn their living there, so pleasant that there will never be any call from their hands for a place where liquor can be bought. The firm have no city warehouse, but do all their business from the factory at Port Chester, N. Y., where the partners reside and give their personal attention unremittingly to the work of the establishment.

## decisions relating to patents

## Supreme Court of the United Sta

ball et al. vs. LaNGLes et al.

1. Reissued letters patent No. 4,026, granted to Hosea Ball, June 14, 1870, for an improvement in ovens, declared o be invalid, it being for a different invention from that covered by the original patent.
2. The Commissioner of Patents is invested by law with authority to determine whether surrendered patents are invalid by reason of defective or insufficient specifications or by reason of the patentee's claiming as his own invention or discovery more than he had a right to claim as new, and whether these errors have arisen by inadvertence, accident, or mistake, and without fraudulent intention. His decision as to the existence of these prerequisites is conclusive, and not subject to review by the courts.
3. The Commissioner, however, has no authority to grant reissue embracing new matter or a broader invention than what was revealed in the original specifications, drawings, or models.
1 The question of identity of invention is to be determined by an inspection of the two instruments.
4. Where an original patent described an interior baking chamber as provided with perforations in its sides and back, whereby its interior bad communication with the fire space only indirectly through side and back flues, Held, that a reissue removing the restriction as to the location of the perforations, so that the interior of the chamber may commuicate directly or indirectly with the fire space, is void for containing a different invention.
Appeal from the Circuit Court of the United States for he District of Louisiana.
Mr. Justice Strong delivered the opinion of the court.
We cannot doubt, says the court, that the purpose of the eissue was not to cure defects in the original specification, or any deficiency in describing the invention, but to cover other devices which the patentee had not in mind when he irst applied for his patent, and which may have subsequently come to his knowledge. Thirteen years after the patent was granted had elapsed before he applied for any reissue. However this may be, the reissued letters are so clearly for a different invention from that for which the patentee first applied, containing new matter, and so much broader, that we are constrained to hold that the Commissioner of Patents had no authority to grant them, and consequently that they are void.
The complainants' bill was, therefore, rightly dismissed, and the decree of the court below is affirmed, with costs.

## Large Telegraph Wires.

At the recent meeting of the American Electrical Society in Chicago, Col. C. H. Wilson read a paper on the use of large telegraph wires. He held that the employment of arge gauge wires for the quadruplex circuit was an advan tage. A No. 4 wire recently laid between New York and St. Louis, was giving entire satisfaction. The question had been raised whether, in the desire to increase the conductivity of the wires, there was any limit to their size. There was a limit, and the conductivity could be increased by employing different conductors, copper instead of iron wire, for instance.
In a discussion which followed, Mr. Somers advocated the use of large wires, and said that their employment had simplified the quadruplex problem.

## Phosphor Bronze Telegraph Wires.

M. E. Bède, formerly Professor at the Liége University, has recommended the use of phosphor brouze for wires instead of iron, phosphor bronze having four times the conductibility of iron, and being from three to four times as strong as steel. Aerial lines had the advantage of being easily inspected, but the disadvantage of being liable to accident, while underground lines were almost free from accident, but difficult of inspection. That inventor would render great service to telephonic communication who should devise a cheap method of constructing underground lines, that should at the same time permit of easy and complete inspection.

## Lard Butter.

The success of butter made from beef fat (oleomargarine butter) has led to the use in Chicago of pork fat or lard for the same purpose. It has been reported that large quantities of this fraudulent butter have been shipped to England, seriously injuring the market for genuine American butter. The report is disputed by exporters, though it is admitted that sample lots have been sent by New York and Cbicago dealers. Obviously if lard butter is wholesome and of good flavor it can be sold on its merits; if bad it should not be sold at all. In either case its sale as genuine butter would be a fraud and should be prevented.

## IMPROVED HAND AND BENCH VISE.

The tool shown in the annexed engraving is especially adapted to the use of mechanics, inventors, jewelers, and adapted to the use of mechanics, inventors, jewelers, an
amateurs, and it may be either used as a hand vise or benc amateurs, and it may be either used
vise. The jaws may be thrown by vise. The jaws may be thrown by
a single movement into any dea single movement into any desired angle. As a chuck for the lathe or bit stock, it will hold drills, awls, bits, turning tuols, etc. It may also be used as a wrench which is capable of being turned in any position. Pattern makers and metal workers will find it very convenient for holding scrapers, stubs of files, and cutting tools.
The front jaw has a tubular stock at right angles to the face of the jaw; in this the bar of the back jaw slides, and is prevented from turning by a slot and feather. The crew that moves the jaws turns in the tubular stock. A clamping eye surrounds the stock, and receives a screw which presses against a follower in the eye, and clamps the stock in any position in which it may be placed in the clamping eye. The clamping screw is forged in one piece, with the ferrule at the end of the handle by which the vise is held. The clamping stand, by means of which the vise is secured to a bench, is shown in Fig. 3.
In either instance the vise can be made to hold any article that is to be filed, turned, bored, or otherwise worked, or the jaw may be used to
hold any cutting or boring tool or bits, so that this tool is of general utility, especially upon all sorts of tool or hand work.
The cavities or countersinks in the clamping eye will receive the inner end of a boring bit or tool, the body being held by the jaws of the vise, and the tool, when used as a chuck in a lathe, can be arranged in line with the axis of motion or at an angle, as may be required, and will perforate, bore, or turn the interior or exterior of a cylinder or other article of greater or less diameter, according to the angle of the tool ard its length. Graduations on the tubular stock and clamping eye indicate the angle of the one to the other. The jaws can be quickly and accurately adjusted to any de gree of angle required, either above or below the center right or left, and made ready for work by a quarter turn of the handle.
The solid forged ferrule of the handle of the vise is bored to receive the shank of a drill, and the addition of the drill chuck shown in Fig. 4 makes it a complete drill holder. The shank shown in connection with the drill chuck, in Fig. 4, adapts the device to a common bit brace or lathe, and the same shank may be applied to the vise for heavier work. All of the parts of the vise are of steel, drop-forged, and milled. It is well made, substantial, and durable.
This useful tool is made and sold by Mr. B. F. Stephens, 95 and 97 Liberty street, New York city.

## IMPROVED AWNING AND VENTILATOR

The novel window awning shown in the engraving is capable of being readily put into various positions to shade the window and to effect a proper circulation of air in the apartments.
Window awnings, as commonly made, are oniy capable of
shading the window, and as they are closed at the top it sections, $d e$, either of which can be opened or closed, as makes an effective funnel for drawing into the room heated may be required. The only difference between the old air from the building and pavements and foul air from the street and gutter, without affording any means of exit.


Fig. 4 may be required. The only difference between the old frame and the new one is. that the latter has two bars instead of one, and is attached to the middle of the window frame instead of the lower quarter. The new awning also has an extra cord and pulley, and requires a little more canvas than the old style, but this is more than compensated for by the readiness with which it may be applied to a window, no fitting, cutting, or nailing being required, and the inventor states that when the durability of this awning is considered it is much cheaper than the common form.
The various ways in which this awning may be arranged are shown in the annexed engraving, which is taken from a photograph, and accurately represents the invention as applied to the building at the corner of Gay and Baltimore streets, Baltimore, Md.
Fig. 2 shows the old style of awn ing with improvements attached. Fig. 3 shows an adjustment made by loosening a central cord, opening the top, and closing the bottom, placing the awning in an inverted position. Fig. 4 shows the awning having one of its sides dropped on its inner surface, With this arrangement, when the wind blows along the side of the building, it is gathered and directed into the rom. Its action in this case is similar to that of a wind sailused on vesselsat The frame, A, of the improved awning, shown in Fig. 1, $\mid$ sea. Fig. 5 shows the upper half of the window exposed; consists of the upper and lower bent bars, $a b$, pivoted to- the reverse of this is shown in Fig. 11. Fig. 6 shows an argether at their ends, and secured to the window frame by rangement that is often desirable, especially after the awning has been rained upon, as it allows air to pass around its entire surface, drying it rapidly, and thus avoiding mildew and decay. The awning, when drawn up into small comand is shown in Fir. It may, in the same manner, be pass, is shown in Fig. . It may, in the same manner, be drawn down and secured at the bottom. These positions render the awning perfectly secure against any wind storm. In Fig. 8 both sides of the awning are dropped on its inner surface. This arrangement is desirable in many ways, especially when the awning is used on the south side of a business street, as it will effectually protect the eyes from light reflected from the buildings opposite. Fig. 9 shows a desirable arrangement when the sun is at or near the meridian. The central cord, in this case, is fastened on the outside of the awning Besides the arrangements shown in the engraving, the awning may be placed in eight other pothe eng
sitions.
In devising this awning the inventor takes advantage of the tendency of heated air to rise and of cooled air to descend. The awning, when inverted, permits the foul air to escape from the room, and allows the descending column of cooler air to enter the room, thus equalizing the tempera. ture, so that there is but two or three degrees difference between the internal and external air. The inventor has proved the efficiency of the awning when thus arranged, not only in thoroughly ventilating and cooling the apartment, but means of thumb screws, $c$. The awning cover, $B$, is at tached at its upper and lower ends to the bars, $a$ and $b$, and at its lateral edges to the window frame by buttons or rings.
This construction practically divides the awning into two
also in excluding the noxious vapors that rise from the street and gutter at night. The great advantage possessed by this awning over others, in this respect, will be appar ent without explanation. It is also effectual in excluding


DR. DWINELLES WINDOW AWNING AND ROOM VENTILATOR.
dust during wind storms while permitting of perfect ventilation.

The inventor says that by the aid of these room "ventilators" every bed-cbamber can be made a sanitarium during summer epidemics.
The germs of diseases, animal and vegetable parasites, fungi, albuminoid ammonia, etc., which are swept from the streets and gutters by servants into the air and carried into our sleeping rooms for hours before our waking, will find an effectual check by the use of these inverted "awn ings," rendering us many times less liable to sickness for it is a well known fact among physicians that per sons are more liable to take disease during their sleep.
These room ventilators ar so constructed that their en tire surface can be brought under the immediate inspec under the immediate inspec tion of the eye, and withi er. By drawing up the lower part of it and letting the up per bar fall through the lower one, the canvas is turned inside out, bringing its upper outer surface close to the xindow, where it may be freed from dust, spots, or tains, and cleaned with suit able washes for preserving its colors and making it last three times as long as the old style awnings, which are nailed securely to the top and sides of window fames, putting al


## PARASITE FISH

fish gradually squirm out of his mouth. It dropped into the water, and after several attempts to swim, sank to the bottom, and shortly died. It was about eight inches long, tapering down to the tail, and in color clearly resembling the fishes from the Mammoth Cave. A delicate dorsal fin extended the entire length of its back, and its whole appearance was eel-like. Suspecting that the fish was a phenomenalparasiticoccurrence, we collected otherholothurians, and in many of them, after cutting open the thick skin, . found the same fish, and in every case it died when exposed to the open water, showing conclusively that it could not live out of the stomach of its protector. Careful examination of the reef, covering a period of eight or nine years, failed to show one of these fishes in any other condition than the above, and its habits, methods of increase, all are as much an enigma as have been some of the habits of our common eel. The fish, doubtless, takes its position in the holothurian when young, and either feeds upon the entrails of the animal or upon the food it takes in; either conditions are possible, as the holothurian, if deprived of a part of its internal machinery, every day could easily reproduce it, and would probably offer no objection, as we have frequently seen them disgorge their entire internal system, and reproduce a new set of the outer surface of canvas beyond the reach of The clear water within is rarely over four feet deep, some The holothurian in which this fish is found has for its any protection, and which, tor), after it has been rained portions being pure white sandy bottom, while other parts specific name Floredana, and is a large dark-brown sca upon, though the sun may shine for days and dry its outer are overgrown with large tracts of coral, astreas, meandri- cucumber, with the feet scattered irregularly over the body, surface, the space between the awning and upper sash is na, etc. Here is the collector's paradise. Among the huge and with smaller tentacles than in Pentacta of our northern filled with choke damp air, containing minute fungi, causing heads of meandrina, numerous rare and beautiful fishes coast. The alimentary canal is often found filled with the cloth to mildew and decay in a short time, also emitting move lazily about. The branch coral swarms with radiates pieces of shell, corals, etc. It is about three times as long noxious odors into the room, which is familiar to every one and crustaceans, while the sandy bottom and clear water are as the body, with longitudinal small folds, and held in place who has had much experience with the common style win- peopled severally with hordes of creatures adapted for their by a large, broad mesentery, which accompanies the intestine can be readily turned inside out, and they may be used in that condition after the outer surface has faded or worn seedy.
A number of letters recommending this invention very iohly have been shown us by the inventor; among them otice one from Dr. James A. Stewart, Health Commissioner of Baltimore, an authority in medical and sanitary science, and another from Mr. George A. Frederick, a wellknown architect of Baltimore.
It is needless to refer to the further advantages of this useful invention, as they will be apparent to any one having had experience in the window awnings or ventilators of the ordinary kind. This is a simple device that combines both in a very efective manner.
These improvements were patented August 24, 1880, by Dr. James E. Dwinelle, southast corner Broadway and Baltimore St, Baltimore Md., who may be addressed for further information.

## A Spinal Root of the Optic Nerve.

Stilling of Strasburg showed preparations to the Internaional Ophthalmolorical Conress, at Mailand, in Septem er last which beptem demonstrate the existence of spinal root of the optic erve, whichbrings the retina into direct connection with the medulla. This root passes from the external corpus geniculatum, in a winding course, deep between the bundles of the crus cerebri, and can be traced into the pons; and it appears to course down in the direction of the medulla, although its further progress cannot be demonstrated.
The existence of this branch is interesting on account of the light it throws on certain physiological relations between the medulla and the retinæ, and may constitute the hitherto cord and of the optic nerve.


SWORDBILL HUMMING BIRD-(Docimaster ensiferus.) Itrance into th cumber may be attended with some danger, as the pharynx of the Floridana is calcareous, while in Pentacta it is muscular. Another spe cies is found inhabiting the star fish (Culcita.)
Concerning the methods of reproduction of these animals nothing is known, and the fact that those observed by the writer died upon escaping from the holothurian makes the question still more enigmatical. They undoubtedly seek the protection of the holothurian instinctively when young, and a curious example of quasi-reasoning power in low organisms is evidently shown. The Rev. J. H. Murphy, in his work entitled "Habit and Intelligence," seems to regard instinct as the sum of inherited habits, remarking that reason differs from instinct only in being conscious. Instinct is unconscious reason, and reason is conscious instinct."

## THE SWORD BILL HUMMING

 BIRD.*This humming bird derives its name from the singular shape and size of its beak, which is very nearly as long as the rest of the body.
This curious species is rather large, as it measures about eight inches in length. It inhabits Santa Fe de Bogó ta, the Caraccas, and Quito, size, and their worm-like forms are seen stretched out in va- and is generally found at considerable elevations, having rious positions. While drifting over this reef we came upon an extremely large specimen; juinping over, we lifted it from the bottom, and were about to throw it into the boat when our attention was attracted by the end of a fish protruding from the mouth of the holothurian. Holding it been often seen at a height of twelve thousand feet above the level of the sea. The inordinately long bill is given to this bird in order to enable it to obtain its food from the very long pendent corollas of the brugmansiæ, and, while probing the flowers with its beak, it suspends itself in the

* Wood's Natural History.
air with a tremulous movement of the wings. Its movements are singularly elegant, and while engaged in feeding it performs the most graceful maneuvers as it probes the pendent blossoms, searching to their inmost depths. The nest of this species is hung to the end of a twig, to which it is woven with marvelous skill, and its whole construction is very beautiful.
The adult male bird is colored as follows: The head and the upper part of the body are green, glossed with gold in some parts and with bronze in others, the tints changing ac cording to the light. The wings are dark black-brown with a purple gloss, and the tail is dark black, bronzed ou the upper surface. Behind each eye is a small but conspicuou white spot slightly elongated, and there is a broad crescent shaped mark of light green on each side of the neck. The under parts are of a bronze green, and the under tail coverts are flecked with a little white. The female is of much the same color as the male upon the upper parts of the body, ex cept that there is a little white upon the lower part of the back and a narrow white line behind the eye. The throat is brown, each feather being slightly edged with gray, and here is a very faint indication of emerald green on part of he throat. The young male is much like the female, but is more coppery in his hues. The throat is white, speckled with brown, because each feather is white with a brown tip. At each side of the throat there is a large patch of green in termiugled with white.


## Corespmademe.

## Colored Lights in Parlor Theatrieals.

To the Editor of the Scientitic American:
Having occasion to assist in getting up a series of tableaux, considerable difficulty was encountered in securing a satisfactory light. Living at some distance from New York, a calcium light was difficult to procure, and, moreover, too expensive. The use of gas and reflectors had been suggested. Procuring two 14 inch glass reflectors, I experimented with gas, with poor success. While the amount of light reflected was unsatisfactory, the interposition of a sheet of colored glass, or even a film of gelatine, sensibly diminished its vol-

Compelled to fall back on colored fires, I constructed furnace of tin at small expense, that succeeded beyond expectation. A tin cylinder, 18 inches in diameter, was opened out at the side to admit a pane of glass, $16 \times 24$ inches. This glass, fastened securely in its place, constituted one side of he box, the curved inner surface of bright tin served as a reflector. A sheet iron bottom and an 8 inch heater pipe leading from the top of the cylinder out through a convenient window into the open arr, completed the apparatus. At the back of the box was constructed a sliding door large enough to freely admit the hand and closing tightly
The peculiarity of the apparatus was:
1st. The large smoke pipe which was necessary to con duct rapidly away the large volume of smoke generated; and,
2 d . The box was made as nearly as possible air tight The chlorate of potash furnished all the oxygen necessary for combustion, and all the air necessary for draught was ad mitted through the slide door, which could be closed quickly upon any indication of a back draught.
The following formula for red fire gave the best results:
Powdered nitrate of strontia.
Phellac in coarse powder.
Lycopodium ulphur, and can be prepared by any druggist.
By placing the fire in tin troughs, 8 or 10 inches long, the amount of light and length of burning can be regulated to a nicety, and by alternating red, blue, and green in the same trough, these colors can be exhibited in any desired succession.
In a furnace of this description I burned colored fires for an hour without the slightest disagreeable odor being per ceptible in the room. Hoping my experience might prov of value to some of your many readers, I remain, Yours truly,

Wappinger's Falls, N. Y., December 11, 1880 .

## Indian Ethnology

Major J. W. Powell, Chief of the Bureau of Ethnology, Washington, lately gave to the Republic in, of Omaha, Neb. information to the effect that there are now eight official parties in the field engaged in making a study of the North American Indians-their condition, their habit of life, their languages, their history, etc., as well as taking a census of them. These parties, who are roughing it with tents, mule teams, etc., are scattered throughout California, Nevada Utah, New Mexico, and Arizona, and Major Powell was then on his way to visit them all to ascertain personally how they are progressing with their work. The taking of the Indian census was begun October 1, and will probably not be finished until next spring, owing to the scattered loca tions of the various tribes. The name of every Indian is written out in full, together with age, sex, etc., and other statistics are obtained, just the same as of the civilized citizens of the United States, so far as practicable. Besides these eight ethnological parties who are doing this work there are special agents of the Census Bureau who are assist-
ing with the various Indian agents. It is estimated that the total number of Indians in the United States will foot up over 300,000. One of Major Powell's parties has just dis avered in New Mexico and Arizona a number of old ruins nd pueblos, which means old Indian villages. These are now being carefully explored. In New Mexico they have discovered, west of Santa Fé, the largest collection of ruin ever found on this continent.

## Sea Elephants at Heard Island.

Heard Island is a barren formation 25 miles long, 6 miles broad, area 80 square miles, a considerable portion covered with glaciers. It is situated in about lat. $53^{\circ} 10^{\prime} \mathrm{S}$. and long $73^{\circ} 30^{\circ} \mathrm{E}$., being about 2,500 miles southeast of the Cape of Good Hope, and 300 miles south of Kerguelen's Land. Heard Island is of volcanic origin. In the central part of the island mountain, known as Big Ben, rises to a height of 7,000 feet. The island was visited by the steamer Challenger in 1874, and Mr. H. N. Moseley, in his "Notes by a Naturalist on the Challenger," gives the following particulars relating to sea elephants, which are found there in great abundance The sealers said that the climate of Heard Island was far more rigorous than that of Kerguelen's Land.
In winter the whole of the ground is frozen and the streams are stopped, so that snow has to be melted in order o obtain water
In December, at midsummer, there is plenty of sunshiny weather, and Big Ben is often to be seen.
It is possible to land in whaleboats, on the average of the whole year, only once in three days, so surf-beaten is the hore, so stormy the weather.
We saw six sealers. Two were Americans, and two were Portuguese, from the Cape Verde Islands.
They were left on the island by the whaling vessels which we met with at Kerguelen's Land, their duty being to hunt sea elephants.
The men engage to remain three years on the island, and see the whale ships only for a short time in the spring of each year. On the more exposed side of the island there is an extensive beach, called Long Beach.
This is covered over with thousands of sea elephants in the breeding season, but it is only accessible by land, and then only by crossing two glaciers, or "icebergs," as the sealers call them.
No boat can live to land on this shore, consequently men are stationed on the beach, and live there in huts, and their duty is constantly to drive the elephants from this beach into the sea, which they do with whips made of the hide of he elephants themselves.
The beasts thus ousted swim off, and often "haul up," as he term is, upon the accessible beaches elsewhere, and there they are killed, and their blubber is taken to be boiled down.
In very stormy weather, when they are driven into the sea, they are forced to betake themselves to the sheltered side of the island, hence the men find that stormy weather pays them best.
Two or three old males, termed " beach masters," hold a beach to themselves, and cover it with cows, but allow n ther males to haul up.
The males fight furiously; and one man told me that he had seen an old male take up a younger one in his teeth and throw him over, lifting him in the air.
The males show fight when whipped, and are with great difficulty driven into the sea. They are sometimes treated with horrible brutality.
The females give birth to their young soon after their arrival. The new-born young are almost black, unlike the adults, which are of a light slate brown, and the young of the Northern bladdernose, which are white.
They are suckled by the female for some time, and then left to themselves lying on the beach, where they seem to grow fat without further feeding. They are always allowed by the sealers thus to lie, in order to make more oil.
This account was corroborated by all the sealers I met with. I do not understand it. Probably the cows visit heir young from time to time unobscrved. I believe simi lar stories are told of the fattening on nothing of the young of Northern scals.
Peron says that both parent elephant seals stay with the young without feeding at all, until the young are six or seven weeks old, and that then the old ones conduct the young to the water and keep them carefully in their company. The rapid increase in weight is in accordance with Peron's account.
Charles Goodrich gives a somewhat different account amely, that after the females leave the young, the old males and-young proceed inland, as far as two miles some imes, and stop without food for more than a month, and during this time lose fat.
The male elephants come on shore on the Croyets for the breeding season at about the middle of August, the females little later.
There was said to be forty men in all upon Heard Island Men occasionally get lost upon the glaciers.
Sometimes a man gets desperate from being in so mise able a place; and one of the crew of a whaler that we met at Kerguelen's Land said, after he had had some rum, that occasionally men bad to be shot; a statement which may be of or false, but which ex
the men on the matter
The "boss" said, in ans
only one fur seal skin, which he would sell if he was paid for it; but he guessed he'd sell it anyhow when he got back o the States.
He had been engaged in sealing about the island since 1854, having landed with the first sealing party which visited the island.
For his present engagement his time was up next year, but he guessed he'd stay two years more.
He'd make five hundred dollars or so before he went home, but would probably spend half of that when he touched at the Cape of Good Hope on the way. The men had good clothing, and did not look particularly dirty.
They lived in wooden huts, or rather under roofs built over holes in the ground, thus reverting to the condition of the ancient British
Around their huts were oil casks and tanks, and a hand barrow for wheeling blubber about. There were also casks marked molasses, flour, and coal.
The men said they had as much biscuit as they wanted, and also beans and pork, and a little molasses and flour. Their principal food was penguins (Eudyptes chrysolphus), and they used penguin skins with the fat for fuel.
Captain Sir G. S. Nares saw five such skins piled on the fire one after the other in one of the huts.

## MISCELLANEOUS INVENTIONS.

A tool for holding small articles or pieces of jewelry while being soldered, so as to dispense with binding wire, plaster of Paris, and the various inconvenient, troublesome, and dirty contrivances hithertofore used in such work, has been patented by Mr. Louis G. Grady, of Halifax, N. C. This invention consists in a bar or plate provided with articulated arms that carry tweezers, the parts being so constructed and arranged that the articles or parts can be placed in the tweezers and brought together and held in any required position for being soldered.
An improved time signal for railways has been patented by Mr. Horace A. Wayne, of Manlius Station, N. Y. The invention consists in the combination of a clock with hands and dial as usual, and a clock movement without an escapement, that moves the hands of the indicating dial, and having a stop lever that is released by the passing train, the two clocks being so connected that the indicator remains immovable until a train passes, when it is released and moves until its hands catch up with or indicate the clock time, and it is again stopped.
Mr. Oliver Bryan, of New York city, has patented a hot air furnace, so constructed that the air when heated will be pure, the heating surfaces can be readily inspected and cleaned, and the fire will act instantly and uniformly upon all the heating surfaces, making the expansion equal and he radiation of heat quick and regular.
Mr. Abrabam Mayer, of New York city, has patented an improved optometer or instrument for ascertaining the number and kind of glasses required by persons having an impaired sight, making the use of spectacles necessary. The invention consists in a case containing one or more sets of lenses arranged on an endless band in such a manner that a standard card, which is held on the end of an adjustable pivoted arm, can be read through the several lenses successively, so that the lenses suiting the eyes of the experimenter can be determined very easily and rapidly.
An improved furnace for burning chaff, etc., has been patented by Mr. Alonzo Moore, of Bangkok, Siam. In ordinary furnaces fuel is usually supplied at intervals, which chokes to a considerable extent the evolution of gases from the combustion. - In so supplying the fuel the boilers are exposed to sudden changes of temperature, causing injurious expansions and contractions. To overcome these ob jections is the object of this invention.
Mr. H. L. Warren, of Alma, Ohio, has patented a fan blower for thrashers, by the use of which the feeders and band cutters will be protected from the cloud of dust that onstantly issues from the mouth of the machines.
Mr. James R. Barry, of Yonkers, N. Y., bas patented a combination puzzle and game apparatus, which consists of a short rod, a stationary handle, and four or more balls or short cylinders having alternate numbers and letters formed upon them in such an order that when the balls are arranged in a particular position the sum of the various columns of numbers will be the same, and the various columns of letters will spell words.
A harness buckle, the tongue of which may be locked upon the buckle frame, and of such construction that the pull of the engaged trace or strap shall be straight, and not at an angle thereto, has been patented by Messrs. Casper L. Marschall and Anthony Marschall, of Evansville, Ind.
A calendar, to be attached to a clock and operated in connection therewith, and exhibits but one number or date at a time, and that number or date in large or plain figures, has been patented by Mr. Peter Wagner, of New York city.
An improvement in the tunnels of base burning stoves, whereby the coals can be retained in the tunnel in case a weak fire is desired or in case the fire has gone out and the ashes and cinders are to be removed, so that the coal in the tunnel can be dropped on to a fresh fire, has been patented by Mr. Edward C. Smith, of Lincoln, Neb.
Mr. Charles L. Shaw, of Nora, Ill., has patented an improvement in flood gates for streams, hollows, and lowlands liable to be overflowed by a sudden rise of water. They are so constructed that they will not wash away, and will allow the water, and any rubbish being carried down by the water, the pass freely.

Mr. Marshall Pratt, 55 Beekman street, New York city, is introducing a novel, efficient, and cheap razor strop, consist-
ing of a finely grooved wooden strop saturated with a fixed ing of a finely grooved wooden strop saturated with a fixed oil and coated on both sides with an improved paste.
Mr. Timothy B. Rider, of Fitch Bay, Quebec, Canada, has patented an improvement in the class of automatic safety attachments for steam boilers whose function is to dampen or extinguish the fire by allowing escape of water from the boiler into the fire box in case the water becomes tion low or the steam pressure too high for safety. The inventor employs a tank containing a float and lever which operate a valve that controls escape of water to the fire box, as heretofore, but he has so constructed and arranged these parts as to make the apparatus more compact, less liable to get out of order or become inoperative, and more efficient tinent. generally.
An improved disk mill for crushing and grinding differ ent materials has been patented by Mr. Carl Fink, of Berlin, Germany. This apparatus, it is said, operates much more rapidly and easily than vertical millstones or ordinary crushing mills, and the disks can be cooled in a more effi cient manner than the stones or rollers of ordinary mills.
Mr. W. Clay Lutz, of Bedford, Pa., has patented an improvement in that class of railroad cross ties in which the material used is metal.
Messrs. Hermann Koeller, of New York city, and Charles Nimmo, of Greenpoint, N. Y., have patented an improved drip oil cup. The object of this invention is to provide an improved oil drip cup for the crank connections of steam engines and other mechanism, which can be adjusted to fit any connection, and not only catches the oil that drops from the journal, but also the oil or grease that is thrown from the crank connection by centrifugal force.
An improvement in the class of dogging apparatus which is affixed to one of the knees of a head block of the log carriage, has been patented by Mr. William J. Wickham, of Forest Home, Texas.
Mr. Frederick Koskul, of Grand Rapids, Mich., has patented a process of treating metallic foil to form veneers, which consists in, first, painting or lacquering it; secondly, varnishing it; thirdly, baking it; and fourthly, subjecting it to pressure.
An improvement in steam boilers and furnaces has been patented by Mr. Joseph E. Culver, of Jersey City, N. J. The improvement relates to steam generators wherein the heated products of combustion may be commingled with the steam for use with an engine, or for heating purposes, or used separately.
Mr. Jacob R. Scott, of Nyack, N. Y., has patented improvements which relate to machines for sewing boots and shoes of the class wherein a rocking looper is fitted in the horn. The object of the invention is to provide means whereby the looper will always be held in the proper posi tion relative to the needle while the horn turns.

## New Plan for the Drainage of Chicago

A committee appointed by the Citizens' Association, of Chicago, to devise a system of improved drainage adapted to the present and future needs of the city have reported in favor of a vast sewer to drain the entire district traversed by the Chicago River. The estimated cost of the work is $\$ 6,850,000$, but it is thought that to complete it in every respect the sum of $\$ 12,000,000$ will probably be necessary. The line of the proposed sewer, as shown in the map made by the engineer of the committee, Mr. A. J. Mathewson, is as follows: Commencing at the mouth of the Regula or Mud Lake fork of the south branch of the Chicago River it runs west through the lake toward the Desplaines River north of Summit; then curving to the left it passes in a southwest direction between the canal and the river to Mount Forest, Willow Springs, Sag Bridge Station, and Lemont to the Romeo bend of the canal, Norton's tail race at Lockport, and to a point opposite lock No. 1 at Lockport; thence to point at the head of the pond of dam No. 1, Joliet, a few hundred feet northwest of Lock No. 4, of the Illinois and Michigan Canal, a distance not far from $311 / 2$ miles.
For the southwestern terminus the sewer runs about 21/2 miles N.N.E. to a point opposite Lock No. 1, with a fall to the south of about 12 feet in bottom of sewer, or $4_{100}^{80}$ feet fall per mile, and the average width of 15 feet; thence north and northeast, past Romeo and Lemont, Sag Bridge Station, Willow Springs, Mount Forest, Summit, and Mud Lake, or regular route, touch Bridgeport, a distance from Lock No. 1 of 20 miles, and an ascent of 1 foot per mile, making 29 feet fall from Bridgeport to Lockport in bottom of sewer with a width of sewer at lower end of 20 feet, and at upper end of 49 feet for compensation.
Good, substantial abutments and bridges at all crossings will be necessary throughout, and at Big Run, Norton's tail race, and Fraction Run an arch about 300 feet long, in each, will be needed to let the water from these several places pass over the top of the sewer. The eastern portion of this route is already excavated to about the proper width, but not to the proper depth. The sewer when completed should draw water from the surface to the bottom of the river, low water, datum line for the first 29 miles. A portion of West Chicago and the town of Cicero, under an arrangement with the city, may drain directly into the main sewer. The amount of ex cavation for the above sewer, by a careful approximate estimate will be $3,031,285$ cubic yards; cost of excavationearth and rock, slope wall, inverted arch in bottom, and the three arches aforesaid, $\$ 6,365,698$; contingencies, engineering, etc, $\$ 483,625$; total cost, $\$ 6,849,323$.

The Memphis Avalanche declares that all sanitarians who have examined the successful working of the new sewer system of that city, and who are familiar with the sanitary condition of other American cities, agree that Memphis is the best sewered and best drained city on the continent. The absence of sewer gas, the abolition of all privy vaults, and he thorough underdrainage of the soil, are marked features of the Memphis sewer system that are lacking in other cities The effect of this thorough sanitary revolution, the Avaanche continues, cannot but have a marked influence in decreasing the mortality rate, and it may confidently beanticipated that Memphis will hereafter be entitled to be styled ot only the cleanest but the most healthy city on the con-

How many other American towns and cities are waiting, as Memphis did, to be depopulated and threatened with general bankruptcy in business as well as in health, by repeated epidemics, before adopting an adequate system of general sanitation?

## The Atlanta Cotton Fair

A grand international exlibition of the appliances and machinery used in raising, preparing, and manufacturing otton, with samples of cotton fiberand faprics, and all othe matters bearing upon the cotton interests, is announced to be held in Atlanta, Georgia, during October and November next. At a large and enthusiastic meeting of business men in Atlanta, December 2 , the International Cotton Exhibition Association was organized with the following named officers: President, Senator Joseph E. Brown, of Georgia, and twentyfive vice-presidents from the principal cities and manufac turing towns of the country; Treasurer, Samuel M. Inman, of Atlanta; Secretary, John W. Ryckmau, of Philadelphia; Executive Committee, the Mayor of Atlanta, ex-officio, Chair man, H. J. Kimball, R. F. Maddox, W. I. Calhoun, B. F Crane, W. H. Patterson, M. C. Kiser, Evan H. Howell, and W. B. Cox, of Atlanta; Edward Atkinson, of Boston; Richard Garsed, of Philadelphia; Cyrus Buzby, of New Orleans; J. W. Paramore, of St. Louis; John H. Inman, of New York. The Finance Committee are: Robert J. Lowry, Paul Romare, and D. N. Spear, of Atlanta; Morris Ranger, of New Orleans; Thomas Dolan, of Philadelphia; William A. Burke, of Lowell, Mass.; William Gray, Jr., of Boston, Mass.; and J. H. McMillen, of Biddeford, Me.

## The Adirondack Survey, New York.

The year's field work of the Adjoondack Survey, under Mr. Verplanck Colvin, was ended December 1, when the superintendent and his assistants returned to Albany. The last triangulation station was on Bluebeard Mountain, near Lake Pharaol. The mountains had been covered with snow for two months; very heavy snowfalls occurred about the middle of October.
The measurements of the season extend the work to the southeastern borders of the Adirondacks, and cover the location of a great number of trigonometrical stations in the counties of Essex, Hamilton, Warren, and Saratoga, and the northeast corner of Washington County. The heights of a great number of mountains, until now unmeasured, with altitudes of lakes and other new prominent points in those counties, have been determined, measurements of vast num bers of air-line distances for the purpose of locating signals, mountain lakes, and land lines have been made, together with special surveys of lakes and rivers. A full account of these new measurements will be given in Superintendent Colvin's next report to the Legislature.

## Wickersheimer's Preserving Fluid.

According to the Boston Journal of Chemistry, the following is said to be the formulæ now adopted by prominen manufacturers in Berlin for this liquid, according as it is to be used for injecting or immersing bodies


Hager suggests the following as a substitute for Wickers heimer's preparation:

4 drachms.
5
11 drachm.
$121 / 2$ ounces.
Then add-

## Oil cincamon. in alcohal <br> 1212 ounces

The latter fluid is not poisonous, and possesses the desir able property of acting as an antiseptic, and also as a preventive and exterminator of moths and vermin, and is possessed of a pleasant odor. The borosalicylate may be used in connection with other solvents if desired.

Progress in Silk Manufacture in America.
During a recent visit to the silk mills of Paterson, N. J., Mr. Brocklehurst, of Macclesfield, England, a member of ne of the largest silk manufacturing firms in the world, was much impressed by the rapid progress which the silk industry is making in this country. He was especially surprised by the general use of steam power looms in weaving the more delicate and costly fabrics, an improvement only now being tried experimentally in England, and by the wide scope and variety of the work done in each and all the mills.

A Big Melon Patch.
Missouri boasts of possessing one of the largest and most productive melon patches in the United States. It is situated on the borders of Scott and Mississippi counties, and equals if it does not exceed in size and adaptation of soil and climate the famous melon patches of Georgia, Indiana, and the east. ern shore of Maryland. The St. Louis $R$ ppublican describe: it as a tract of sandy prairie, four miles wide and ten miles long, with a thin, warm soil, just adapted to the cultivation of the melon, and such melons as are raised nowhere else in that region. There is much richer and deeper soilall around there, but it is not adapted to melon culture. This land is capable of producing 1,000 melons to the acre. At a place called Diehlstadt, in Scott County, there were shipped the past season 439 car loads of 1,000 to the car, and Bertrand, in Mississippi County, shipped 180 car loads, mostly to Chicago. Tie melon county was visited by 25 commis sion merchants from Chicago, who paid as low as $\$ 4^{\circ}$ and as high as $\$ 140$ per car load, being an average of $\$ 70$ per car, the market price varying with the advance of the season and the number of melons ripening at the same time. Most of these melons were shipped over the Cairo and Vincennes and Illinois Centra! Railroads in fruit cars, properly ventilated and arranged for the purpose. These melons found their way not only to St. Louis and Chicago, but to most of the ake cities, and even to New York and Philadelphia.
Melons are getting to be such a staple of production that the cultivators are asking for increased railroad facilities to move the product at the proper season, and recently the Hon. Henry J. Deal, the newly-elected member of the Legislature from Charleston, Mississippi County, applied to Superintendent Soper, of the Iron Mountain Railroad, with a petition numerously signed, representing that they will plant 700 acres more next year in melons if the railroad will give them a side track and station at a point on the Iron Mountain Railroad three miles north of Charleston, to be called Melon Station. Mr. Soper gave assurance that he would comply with the request of the petition. Col. Deal estimates that 700 acres ought to produce 700 car loads, at the rate of 1,000 melons to the acre, making 700,000 melons. One man can attend to twenty-five acres of melons. The variety of seed used is that of the Georgia melon, which is very luscious and grows to a great size, some weighing as high as 60 pounds. The hills are planted 14 feet each way apart and from three to four seed are put in a hill. They commence shipping melons about the 20th of July, and continue to the last of August.

## Spontaneous Combustion of Soft Coal.

The Boston Manufacturers' Fire Insurance Company states that at present rates of prices semi-bituminous and soft coals are coming into more general use than they have been, especially culm or fine coal.
Members are warned that, with few exceptions, such coals are very liable to spontineous combustion, if stored when the least wet or damp in closed sheds where there is little or no circulation of air. If such coal is not protected from being wet, it is said to deteriorate
The company objects to the storage of semi-bituminous or bituminous coal in or under any building covered by its policies, or in or under any building that would expose a risk taken by this company to danger if it took fire
It is suggested that a roof may be sufficient to protect soft coal from being much wet, and that, under a roof not confined at the sides, there would probably be such a free circulation of air as to prevent spontaneous combustion.

## Photography in Engineering works.

Photography has been employed by our large engineering and manufacturing firms for a long time. An English photographic journal speaks of some of their engineering establishments having photographic studios attached to their works, as if it was a new thing. Referring to those having such a department, the editor says Sir William Armstrong, at Elswick, and Sir Joseph Whitworth, at Manchester, may be cited among others; while the eminent firm of gun-makers. Krupp \& Co., in Westphalia, employ not only a photorraphic staff, but practice collotype printing and other elaborations of the photograplic art.

The London Hatter's' Gazette, referring to the fact that China grass hats, which an American manufacturer had tried China grass hats, which an American manufact urer had tried
to introduce last season, but which proved an utter failure, adds that they have turned their large stock to a fresll use adds that they have turned their large stock to a fresh use,
and are advertising them as wall pockets. The brims are and are advertising them as wall pockets. The brims are
lined with satin of a bright color and gayly trimmed, and the crown is made to hold a whisk broom and other odds and ends. Trust a Yankec, naively adds the Gazette, for sitting down with a dead stock of a novelty which has failed to take!

Recently four colonies of bees were shipped from California for New Zealand. Each of the boxes in which they were to make their long journey was provided with an attachment at one side carrying a sponge, by means of which the bees were to be supplied with fresh water daily and the atmosphere of the bive kept sufficiently humid. Ventilation was provided for by openings covered with wire cloth and fitted with sliding doors; and a wire-covered eage was at tached to each bive for a cooling place for the bees in case the interior of the bive becomes too warm,

A Locomotive to Run Eighty Miles an Hour.
The Baldwin Locomotive Works have just entered into a contract with Col. G. A. L. Roberts, of Titusville, for the construction of a passenger engine which will be able to run eighty miles an hour, and maintain this rate of speed for 100 miles without stopping. The locomotive is to weigh 38 tons, and will comply with staudard gauge. The driving wheels will be six feet in diameter. The forward trucks and those on the tender will be made of paper, which, it is said, will endure more strain and wear than iron or steel. The wheels will all be of the pattern known as the broadtread, which will enable the engine to run on roads of either 4 feet $81 / 2$ inches or 4 feet 10 inches gauge. The most important feature of the locomotive will be the introduction of the Roberts patent cylinder and piston, which has proved capable of saving at least 20 per cent in steam pressure. The exhaust ports are in a continuous circle around the cylinder, in addition to the usual ports at the ends, and the team escapes without the waste of force necessary to expel it, as in the cylinders of the old style. The tender will be so constructed as to carry a foot of water under the coal, as well as the usual amount on the sides. There will be a water chamber on the locomotive so arranged that com-
pressed air from the air pump can be admitted in the top of the chamber upon the water, by which means a stream may be forced upon any hot bearing connected with the engine or tender. This is expected to overcome the trouble of hot boxes. The nozzles through which the steam is to pass and three times the usual size-and the boiler will be the largest three times the usual size-and the boiler will be the largest
that can be put upon the standard gauge tracks. It will be the strongest locomotive ever built, and perfect in every detail. Col. Roberts, the inventor, built a similar locomotive a few years ago, which drew the fast mail train over a portion of the Lake Shore Railway, but it was not a success, owing to its poor construction. The improvements it sug. gested will be taken advantage of in building the new
engine. It is stated that Col. Roberts, who has visited Europe It is the railway systems that country, is building his new engine for use upon the European Continent.

## Tennessee Marble.

Mr. John J. Craig, of Knoxville, Tennessee, says that the United States Government has recently opened and is now working successfully a quarry of white stone in the immediate vicinity of that city which is pronounced by competent judges to be superior to anything of the kind found elsewhere in the United States for building and all out-door purposes. It is a highly crystallized limestone marble-and as it comes from the hammer or chisel is almost perfectly white; when polished it shows a faint pinkish blush, most
delicate and beautiful; long exposure to the atmosphere seems to whiten and harden it, a sort of glass-like enamel forming over its surface and rendering it almost entirely impervious to dampness and stains of any kind. A column of this marble, which has been standing in Knoxville more than thirty years, and which has never been touched with brush or soap, is as white and clean to-day as it was the day it was first exposed to the storms and sunshine of our fickle climate. The texture and working quality of the marble is unsurpassed. It is neither too hard nor too soft, but exactly soft enough to allow the sculptor to work it without force and trace on it the finest lines of finished form, and yethard enough to retain these lines in all their original delicacy, unimpaired by wind and rain, for generations to come. The quantity of the marble is unlimited. Knoxville is surrounded by whole mountains of it. Facilities for transportation are now good and daily growing better. Car loads are being daily shipped to all sections of the country, and the absence of capital alone prevents the quarrying of it from soon developing into one of the most important industries in that singularly favored but as yet almost unknown section.

The Paterson, N. J., Artesian Well Strikes Salt Water
In the Scientific American of January 31, 1880, an account was given of the progress of the artesian well of the Passaic Rolling Mill until quicksand was struck at the re markable depth of 1,100 feet. The well was piped through the quicksand and the boring continued. At a depth of 2,000 feet water was struck, the well having previously been so dry below the quicksand that water had to be poured in to 2,053 feet, the water increasing in volume until it rose to 2,053 feet, the water increasing in volume until it rose to within 32 feet of the surface. But this water was salt: Sam-
ples were sent to Prof. Cook, the State Geologist, who caused an analysis to be made. This showed that the water contained 974 grains of various salts to the gallon, about half of which was common salt. There was also a considerable per cent of chloride of potassium, and considerable sulphat of lime, with mere traces of iodine and bromine.
Prof. Cook says he does not know what this water can in dicate, unless it be that the well has got down pretty near to rock salt. From recent indications it appears probable that f the well were continued still further the water would flow out of the top, but as the company has no use for salt water in rolling and working iron it has been decided to abandon the project of securing a flowing well. The hole will be plugged below the quicksand, or about 1,120 feet below the surface, and the water will be pumped, an abundant supply of fresh, cool, and pure water being assured at that point.

The Marysville (Cal.) Appeal describes as follows the contruction of the dam across the Yuba River, nine miles above Marysville, to restrain the mining débris and to improve,the river channel. An excavation was made about one foot in depth and sixty feet wide, the ground at that depth being frequently very solid. This excavation was made across the whole distance. In this were trenches in which were placed ogs spliced together at the ends and securely staked down. A mattress was then made upon an inclined scaffolding. Willow brush was laid on the scaffold, butt ends and tops alternating so as to be close together and bind well, there being enough large brush to hold the mass and enough small and short to fill all the space. None but assorted straight willow brush was used anywhere, those pieces with wide or spreading branches being cast away. This mattress, about sixty feet in width and two feet in thickness, was then sewed together with strong wire until it was pressed to one foot in thickness. The frame or scaffold was drawn from under by horses, and the dense mass sunk upon the stringers and was ewed down to them and otherwise securely fastened. Though the mattress was necessarily made in pieces, these were all sewed together at the ends, making it continuous. This was all covered with two feet of earth, and continued
driving over it has packed the ground. This is intended to prevent the wash from the water that flows over or through the dam.
On top of the mattress and earth, but a fewfeetbelow the upper edge of it, begins a layer of logs laid together closely, sewed with wire and sewed to the mattress beneath. On this are stringers and then two more layers of logs, all with butts down stream and top ends running into the ground up
stream. They were all secured in the same manner to stream. They were all secured in the same manner to the
mass below and loaded with dirt. The line of the butt ends of each successive layer is further up stream, of course, forming a sort of stairway from the bottom. Earth and sand are used to fill all the crevices. The length of the dam is between 10,000 and 11,000 feet, or nearly two miles, and it averages eight feet in height. There is no part of it that is not firmly wired to every other part. Statistics are not generally very effective in description, but some idea of the way in which it is all matted together may be given by the statement that considerably more than 100 miles of wire has been used, and, independent of brush, there are in the structure just 117,400 logs, averaging six inches in diameter at the butt and thirty feet in length.
Though the distance between the highlands on either side of the basin is about two miles, the present channel of the river is comparatively narrow. To connect the two sections of the dam the channel had to be vacated by turning the course of the river by the construction of a wing dam of brush across the channel a quarter of a mile above the gap. The capacity of the first attachment basin is equal to 75,000 , 000 cubic yards of débris. When filled to the level of th dam, another dam will be built on the top of the first and so on.

## A Gigantic Iron Pler Pound-net Proposed

The Long Island Fish Company, of this city, proposes to engage in pound fishing on a scale hitherto undreamed of. Already a large tract of land has been purchased at the eastern end of Long Island, extending about a mile along the coast. At this point, which is eminently favorable for pound fishing, since the fish that run along the coast here come very close to the shore, the company propose to construct a gigantic weir supported by iron piles, forming an iron pier 700 feet long and ten feet wide, with bents or sections twenty feet long. At the outer end of the pier, in thirty feet of water, will be a heart-shaped pound, the large end of the heart inshore. This heart will be about seventy feet across, and outside of it is to be a box of iron piles and netting about seventy-five feet square. The fish coming from either direction and striking the pier netting will run out seaward to the heart, and, passing out at the lower end, will find themselves in the outer receptacle. In the sections of the iron weir storage for thousands of tons of fish can be provided, where they will keep alive in their native element for a month or longer, and need not be immediately brought to market when the price is low.
The great advantage of an iron weir lies in its stability and freedom from attacks by worms. The netting fence runs down to the bottom of the water so as to stop ground-swim ming fish. The pound has a net bottom, and when filled with fish is lifted and the fish dipped out with hand nets.

## Plers at French Ports.

The construction of a new pier has just been commenced at Nice, and it is expected that it will be finished and opened to the public in about two years from the present time. The total area of the pier and pier-head will be 65,000 square feet, and the piles at the pier-head will be in water varying from 26 feet to 33 feet deep. On account of the absence of the tide in the Mediterranean and the rapidly increasing depth of the water, the length will be $300 \cdot$ feet, but the building on the pier-head, according to a correspondent, will be larger more substantial, and of a more ornamental character than is usually the case with English piers. It will contain a large central hall, or concert room, a restaurant, billiard room, and all other necessary adjuncts of a casino, and the arrangement of the bracing under the pier-head is especially designed to give ample space for two large swimming baths. Under the same auspices the construction of piers will soon be commenced at Cannes, Dieppe, and Trouville.

## NEW INVENTIONS.

Mr. John C. Wharton, of Nashville, Tenn., has patented an improved shelving which is dust proof and exhibits the articles placed thereon to the greatest advantage, and is also ornamental. The invention consists in a series of shelves provided with glass fronts, forming closed boxes or compartments, which are arranged in such a manner that each shelf projects beyond the next lower one, thus permitting receptacles containing the article to be exhibited to be placed upon the shelves through apertures in the bottom thereof. The receptacles are provided with some suitable locking device for holding them on said shelves.
An improvement in electric lamps has been patented by Mr. John H. Guest, of Brooklyn, N. Y. The object of this invention is to furnish means for automatically regulating the length of the arc in electric lamps, and to prevent fluctuations in the light by changes in intensity of current. It consists, primarily, in a thermoscopic rod combined with an electric lamp for expansion according to the intensity of the current and resistance in the circuit. The lineal expansion is multiplied by levers, which act by clamps to separate the arbons.
Messrs. Robert Quintervalle and Theodore Lindberg, of Brooklyn, N. Y., have patented an improvement in the class of fire escapes adapted to be suspended from a window of a building. It is more particularly an improvement upon such apparatus as consists of a frame that is designed to be attached to a window-sill, and is provided with a curved standard, from which a basket or other receptacle for persons and goods is suspended by means of a rope running through a sheave or pulley block
Mr. George Oliver, of the City Road, County of Middlesex, England, has patented an improved apparatus for enabling a performer to ascend to or descend from a considerable height from a stage or platform, either in a vertical or oblique direction, as may be required, or-for personating a bird, for instance, or other character suspended in mid-air. An improved clasp for pocketbooks, satchels, etc., which is simple and convenient, has been patented by Mr. John G. Klett, of Brooklyn, N. Y. The invention consists in a pringplate provided with a knob or button, and with flanges on the opposite ends, one of the flanges being securely attached to one part of the frame of a pocketbook, satcbel, etc., while the other catches on a stud on the other part of the frame, or catches on the edge of the frame itself.
An improvement in stereotype casting boxes has oeen patented by Mr. William E. Gump, of Brooklyn, N. Y. The object of this invention is to secure adjustable gauges to a casting box, and do away with the separate frames between the lids of the box, so as to save time, labor, and cost.
An improved oil stove wick-trimmer has been patented by Messrs. Martin W. Walker and George E. Williams, of Sing Sing, N. Y. In ordinary oil-burning stoves it is necessary to remove the top of the stove and the utensils on it to trim off the crust that forms on the wicks and interferes with the proper action thereof. The object of thisinvention is to avoid the inconvenience attendant upon this process of removing the crusts on the wicks.
Mr. Conrad Blattner, of St. Louis, Mo., has patented an improved permanent roll for a detachment of troops, the members of a police force, or other organized body, designed to indicate at a glance the absence, presence, physical condition, character of duty engaged in, etc., of each and every nember of the body.
An improvement in dental forceps has been patented by Mr. William P. Tisdale, of Pass Christian, Miss. The invention consists in a rod bifurcated at one end and a rod that has a head embracing the elastic prongs or bifurcations, so as to open and close the jaws which form a part of the prongs, the slide rod being operated by a hand screw. Mr. William J. Ormsby, of Cincinnati, O., has patented an improvement in that class of air-carbureters in which the ank or reservoir containing the gasoline or other carbureting liquid is placed above but in communication with the pans or trays intended to receive from time to time a limited portion of the liquid, and through which the air to be carbureted is successively passed.
An improved device for removing vitiated air from dwellings and other buildings by the vacuum process, has been patented by Mr. Janection with a stove and may be placed on the floor or otherwise suitably arranged within the room to be ventilated, and the air is drawn into within the room to be ventilated, and it passes into the pipe, a current being induced by the draught in the chimney.
An improved machine for crushing, grinding, and pulverizing the valuable ores in order that by comminution the metallic portion may be separated from the gangue, has been patented by Mr. Royal C. Grant, of Middleport, O. This machine is of that class in which a tapering or cone-like shell revolves around a core of corresponding shape.
A cheap, simple, and efficient apparatus for generating or producing illuminating gas, has been patented by Mr. Geo. H. Burrows, of Somerville, Mass.

Mr. John Q. Crosby (Hezekiah H. Crosby, administrator), f Yonkers, N. Y., has patented an improvement in the class of reels having an iron frame provided with pivoted braces or legs adapted to be folded for the purpose of transportation, etc. The invention relates to the construction of and mears for locking the reel proper or the revolving part on which the hose is wound; also, to the construction of the holder for the nozzle of the hose.

## dusiness and extional.

## The Chargefor Insertion under this head is One Dollar

 a line for each insertion ; about eight words to a lin Advertisements must be received at publication officeas early as Thursday morning to appear in next issue.

A Practical Gass Maker, having ten years' experience Aesires a situation. Address Glass Maker, Box 73 , N.Y Safety Linen $\mathbf{H o s e}$; a protection from fire for factorie

Eureka V'getable Boiler Scale Eradicator, strictly egetable, and perfectly harmless to iron. Warranted to remove scale of any thickness, and to prevent scaling
from either fresh or salt water use. Circulars and from either fresh or salt water use. Circulars and
ticulars of G. E. Brinckerhoff, 107 Liberty St., N. Y.
Machinists' Tools and Special Mach'y. See adv., p. 12 Toope's Patent Felt and Asbestos Non-conducting Toope's Patent Grate Bar. Charles Toope, M'f'g Agent 353 E. 78th St., New York.
The Sweetland Clutch. See illus. adv., p. 12
Hotcbkiss' Mechanical Boiler Cleaner, 84 John St., $\mathbf{N}$ Y., operates by circulation, trapping mud constantly,
keeping water purified. No cost save first. Engineer ake ten per cent selling other parties than employers.
Moulding Machines for Foundry Use. 33 per cen Engines repaired without loss of time. L. B. Flan ers Machine Works, Philadelphia, Pa
Soapstone and Empire Gum Core Packing. Specia The I. B. Davis Patent Feed Pump. See adv., p. 12. No one using steam can afford the loss of fuel and power consequent upon the use of inferior non-con-
ducting steam pipe and boiler coverings. Asbestos has ducting steam pipe and boiler coverings. Asbestos has
proven the most effective and economical material for proven the most effective and economical material for
the purpose. and is employed in the form of a cement and a freproof felt for a lining or insulator under hair, fell, etc. The genuine Asbestos Coverings are main
factured only by the H. w. Johns M'f'g Co., 87 Maide factured only by
For Sale.-Yacht, $5^{\prime} \times 35^{\prime}$, without machinery. Ad Thego, Tloga Co., N. Y
The Best Device to Communicate Power to Sewing
Machines in Factories, is made by J. A. Sawyer \& Son Worcester, Mass.
Wanted-Second-hand Woodworking Machines; and
sell, two Iron Lathes. R. K. Teller, Unadilla, N. Y. Jenkins' Patent Valves and Packing The Standard. enkins Bros., Proprietors, 11 Dey St., New York.
Presses \& Dies. Ferracute Mach. Co., Bridgeton, N.J A perfect Mowing Machine is an absolute necessity to a farmer. The best made is the Eureka. It has the
lightest draught, and will cut at least one-third more grass per hourt than any other mower. Simple in construction and durable. Prices reasonable. Send fo Wren's Patent Grate Bar. See adv. page 397. Exporters of Machinery for Plantations. Sugar Machinery, Coffee Euller and Cleaners. Information and tented devices. Agricultural Implements and HardThe Mactin cial pen of the age The ons successful reservoir pen in the market. The only pen in the world with a diamond circle around the point. The only reservoir pen supplied with a gravitating valve; others substitute a
spring, which soon gets out of order. 'The only pen acspring, which soon gets out of order. 'The only pen ac-
companied by a written guarantee from the manufacturers. The only pen that will stand the test of time. A history of the Mackinnon Pen; its uses, prices, etc.,
free. Mackinnon P'en Co 200 Broadway, New York. Superior Malleable Castings at
Richard P. Pim. Wilmington, Del.
Richard P. Pim. Wilm
Wood Working Machinery of Improyed Design and The " 1880 " Lace Cutter by mall for 50 cts.; discount The Tools, Fistures, and Patterns of the Taunton Foundry and Machine Company for sale, by the George Place Machinery Agency, 121 Chambers St., New York. Experts in Patent Causes and Mechanical Coun
Park Benjamin \& Bro., 50 Astor House, New York. Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, son \& Co., Pittsb'g. Pa Malleable and Gray Iron Castings, all descriptio Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch \& Shear Co. 22 Dey
4 to 40 H P. Steam Engines. See adv. p. 381 . Rarc Benjamin's Expert Office, 50 Astor House, N. Y. For the best Stave, Barrel, Keg, and Hogshead National Steel Tube Cleaner for boiler tubes. Adju Saw Mill Machalmers-Spence Co., 40 John St., N. Y. The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for
formation. C. H. Brown \& Co., Fitchburg, Mass.
Gun Powder Pile Drivers. Thos. Shaw, 915 Ridge
Best Oak Tanned Leather Belting. Wm. F. Fore-
paugh, Jr.. \& Bros., 531 Jefferson St., Phi'adelphia, Pa. Stave, Barrel. Keg. and Hogshead Machinery a spe cialty, by E. \& B. Holmes, $\cdot$ Buffalo, N. Y
Downer's Cleaning and Polishing Oil for bright metals, is the oldest and best in the market. Highly recommended by the New York, Boston, and other Fire De-
partments throughout the country. For quickness of cleaning and luster produced it has no equal. Sample
five gallon can be sent C. O. D. for $\$ 8$. A. H. Downer 17 cleaning and livegallon can be sent
Peck Slip, New York.
Peck's Patent Drap Press. See adv., page 413.
Wright s Patent Steam Engine, with automatic cut
off. The best engine made. For prices address William off. The best engine made. For prices, a
Wright, Mlanufacturer, Newburgh. N. Y.
Blake " Lion and Eagle " Imp'd Crusher. See p. 397. For Pat. Safety Elevators, Hoisting Engines. Friction For Separators, Farm \& Vertical Engines, see adv.p.413.

National Institute of Steam and Mechanical Engineer Management. The metallurgy of iron and steel. Prac cal Instruction in Steam Engineering, and a good situa Usa Vacuum Oil Co.'s Cylinder Oil, Rochester, N. Y Split Pulleys at low prices, and of same strength an pearance as Whole Pulleys. Yocom \& Son's Shaftin Presses Dies and Tol ion
Presses. Dies, and Tools for working Sheet Metal, etc
ruit \& other can tools. Bliss \& villi ims, B Nickel Plating.-Sole manufacturers cast nickel an des, pure nickel salts, importers Vienna lime, crocu
tc. Condit, Hanson \& Van Winkle, Newark, N. J., an and 94 Liberty St., New York.
For Yale Mills and Engines, see page 381
Portable Railroads. Sugar Mills. Horizontal \& Beam team Engines. Atlantic Steam Engine $W^{\prime}$ 'ks, $\mathbf{B}^{\prime}$ klyn, N. $\mathbf{Y}$ Apply to J. H. Blaisdell for all kinds of Wood and
ron working Machinery. 107 Liberty St., New York ron Working Machinery. 107 Liberty St., New York
Send for illustrated catalogue. H. A. Lee's Moulding Machines, Worcester, Mass. The Chester Steel Castings Co., office 407 Library St hiladelphia, Pa... can prove by 15,000 Crank Shafts, an .000 Gear wheels, now in use, the superiorty of thei
astings over all others. Circular and price list free. Brass \& Copper in shets, wire \& blats. See ad p. 12 The Improved Hydraulic Jacks, Punches, and Tube Eagle Anvis, 10 pound. Fully warranted Gear Wheels for Models (list free); experimental and tring, etc. D. Gilbert \& Son, 212 Chester St., Phila., Pa Machine Diamonds, J.Dickinson, 64 Nassau St., N. Y The best Truss ever used. Send for descriptive circu Houston's Sash Dovetailing Machine See ad p. Steam Engines; Eclipse Safety Sectional Boiler. Lam ppar., see adv., page 12. Magic Lanterns Stereotions and Views of all kin nd prices for public exhibitions. A proftable busines or a person with small capital. A lso lanterns for home amusement, etc. Send stamp for 116 page catalogue to
McAllister, M'f'g Optician, 49 Nassau St., New York. New Economizer Portable Engine. See illus. adv. p. 12. For Shafts, Pulleys, or Hangers, call and see stock Wm. Sellers \& Co., Phila., have introduce
injector, worked by a single motion of a lever.
Skinner \& Wood, Erie, Pa.. Portable and Stationary ted advertisement. Send for their new circulars.
Ore Breaker, Crusher, and Pulverizer. Smaller siz n by horse power. See p.13. Totten \& Co., Pittsburg. Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of SoloGreen River Drilling Machines. See ad.p.412'.
C. B. Rogers \& Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., pake413.
For Mill Macb'y \& Mill Furnishing, see illus. adv. p. 415 Mineral Lands Prospected, Artesian Wells Bored, by
Pa. Diamond Drill Co. Box 423 , Pottsville, Pa. See p. 413 For Patent Shapers and Planers, see ills. adv. p. 412.

## 

HINTS TO CORRESPONDENTS.
No attention will be paid to communications unless
accompanied with the full name and address of the writer.
Names and addresses of correspondents will not be
given to inquirers.
We renew our request that correspondents, in referring to former answers or articles, will be kind enough to
name the date of the paper and the page, or the number of the question.
Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may concl
Editor declines them.
Persons desiring special information which is purely should remit from $\$ 1$ to $\$ 5$, according to the subject, as we cannol beexpected to spend time and
Any numbers of the Scientific American Supple MENT referred to in these columns may be had at this
office. Price 10 cents each.
(1) T. S.\& S. ask: How can we make a brass solution that will plate a fox gold color, to
be plated on rough cast iron? A. Water (soft), 14 pints; be plated on rough cast iron ? A. Water (soft), 14 pints;
bisulphite of soda, 7 oz .; potassium cyanide, No. 2, 17 oz.; carbonate of soda, 34 oz.; add water, $31 / 2$ pints;
aceta e of copper, $41 /$ oz; neutral zinc chloride, $31 /$ oz. If the deposit is too red use more battery; if too white, less; if earthy or ocherous, add more cyanide; if dull and unequal, add a little arsenious acid in cyanide. They both usually need more or less correction when fresh, it improves on working. Use brass anodes and
a pretty strong battery. 2. How to make an electrotyping solution ? A. Use a nearly saturated solution of sulphate of copper in soft water. The following gives Bisulphite of soda and pure cyanide of potassium, each 18 oz .; carbonate of soda, 36 oz .; acetate of copper, 17 oz; aqua-ammonia, $12 \not / 2$ oz;; water, $51 / 2$ gals.
(2) D. D. writes: I have a lot of waste hard rubber. Can you tell me how to utilize it? Can I make any preparation that will dissolve it so that it
will harden afterwards? A. We know of no solvent for the rubber. It is of little nee except to the rubber manufacturer, whoutiizes it, when ground, to mix with
(3) C. W. D. asks if there is any method ing through a pipe of certain size, the steam pressure
being known, the steam used for heating purposes, and
thrown into well when condensed; in other words, is there any rule or gauge that will determine what hors power will pass through a pipe of given size, a given pressure, valve full open, and used as above indi
cated? A. The flow of steam cannot be measured b the horse power, and if so, it would not apply to heat ing surfaces, as the velocity of fiow must depend upon
rapidity of condensation; in other words, it will greatest in coldest weather
(4) C. \& S. ask: What size air pump hould we use for a vacuum pan of 200 gallons capacity temperature used $42^{\circ}$ C. $\%$ A. Air pump 10 to 12 inche
diameter, and 6 or 7 inch stroke, with steam cylinder inches to 8 inches diameter.
(5) F. H. B. asks for a recipe for making good cologne. A. Oils of lemon, cedrat, and bergamot iss.; oil of cinnamon, 3 vj.: rectified spirit, 3 gals; spirit of rosemary, 1 quart; compound spirit of balm days, then distill 3 gals.
(6) C. J. H. writes: In making quantita recommended for a support in the first fusion of the assay. It is often quite difficult to procure good coals for the purpose, especially when on a prospecting trip
Is there not some kind of material from which small Is there not some kind of material from which small apsules can be made for the purpose, which can b sed an indefinite number of times, and which would be qually as good as charcoal? A. We know of no sup mall bone ash cupel will answer in some cases.
(7) A. H. L. asks: Will you please specify the kinds of pitch and gutta percha to be used in mak ing cement, also the manner of melting them together
A. Burgundy pitch, melt in an iron pot with as littl heat as need be, and stir constantly. The additio of a little shellac will harden it somewhat.
(8) W. W. F. asks: 1. Can you give me list of the best practical books on the manufacturing of
chemicals and dyestuffs ? A. Consult Wagner's
"chel chemicals and dyestuffs? A. Consult Wagner's
"Chemical Technology," Watts and Richardson's "Acids, Alkalies, and Salts,", and the U. S. Dispensatory and Pharmacoweia. 2. Give the best manner of making an acid solution of bisulphide of soda, with the
difference between a bisulphide and a sulphide and a sulphate of soda. A. Acids precipitate the sulphu from the alkaline sulphides. The sulphide may be pre pared by boiling together with water for an hour 2 part
of sulphur and $23 / 4$
parts trate to small bulk by evaporation, cool, and pour the liquid from the solid bisulphide. The bisulphide differs from the sulphide only in the large proportion of sulphur it contains. A sulphate is a combination of sul
phuric acid with a base, while the sulphide is a comphuric acid with a base, while the sulphide is a com-
pound of sulphur with the same. Consult some elepound of sulphur with the same. Consult some ele
mentary book on chemistry, such as Fownes'.
(9) J. W. W. writes. I have a 20 inch by 28 inch engine, taking steam from steam drum 14 inche in diameter, placed across three flue boilers each 4 inches diameter, 20 feet long. Would I get more powe would probably get drier steam, which would be an advantage.
(10) G. B. S. asks: In which bearing would a journal run with the least friction, one of one
inch in length, or one of three inches in length, other conditions being the same in both cases? A. There ould be no difference if the shaft was strictly
(13) C. O. M. writes: I wish to take a cop per plate, and either print or mark upon it, then app some acid that will eat away the copper except where
have marked, so that I can print with it. A. Diges coarsely powdered resin with about twice its volume o pirit of turpentine in a bottle immersed in hot water for twelve hours or so; cork very loosely, and shake occasion
ally; color with lamp black or printer's ink. Apply with ally; color with lamp black or printer's ink. Apply with a camel's hair brush or pencil, and let stand over night to
dry and harden. Use nitric acid diluted with about hree parts of water. 2. How can I take an electroplat a form after it is set up? A. Take a wax or plast ast of the form, coat it evenly with pure graphite o of a battery, and suspend in a strong solution of sulphate of copper in water, facing a plate of copper also sus pended in the liquid and connected with the coppe carbon pole of the same battery. The connectio erween the wire and the film of graphite must be ver perfect and secure. When the operation is properl onducted copper deposits over the film of graphite per is thick enough, it is dried, backed up with a cop alloy or solder, removed from the mould, trimmed, an

## NEW BOOKS AND PUBLICATIONS.

Vennor's Almanac for 1881
Twenty-five cents sent to the American News Com pany, New York City, will insure the receipt of a copy
of the Prophet's almanac, containing his weather pre of the Prophet's almanac, c
dictions for the entire year.

The December number of this superbly illustrate rt journal contains engravings of a variety of artistic
ubjects, consisting of bronzes, armor, celebrated paintings, and remarkable architectural structures. The Art Interchange. Fortnightly. \$2 Whitlock, editors and publishers, 140
Nassau street, New York. This publication is devoted to household art and in door decorations in all its branches. The subjects are
illustrated to a generous extent, and the hints and dillustrated to a generous extent, and the hints and di-
rections the editors give for producing a great variet rections the editors give for producing a great variet ornamental and useful articles renders it a desirable
fireside magazine. The Christmas issue just out is an freside magazine. The Christmas issue just
[OFFICIAL.]
INDEX OF INVENTIONS FOR WHICH

## Letters Patent of the United States wer

 Granted in the Week Ending December 7, 1880 ,AND EACH BEARING THAT DA'TE [Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annesed list, also of any patent issued since 1866 , will be furnished from this office for one dollar. In ordering please state the number and date of the patentdesired and remit to Munn \& Co., 37 Park Row New York city. We also furnish copies of patents granted prior to 1866; but at increased cost as the speci flcations not being printed, must be copied by hand.
and the pressure low enough not to approact aber journal; but the boxes of the longer journal would wear the longest, as the friction would be dis-
(11) J. F. B. asks: 1. What would be the best mortar to lay fire brick in for lining the flreplace and flue from a large boiler? A. Fire-clay mortar.
What is the highest chimney in the United States and what the height? A. There is one in the vicinity of Pittsburg 275 feet high. We camnot say whether this is the highest. 3. In building a horizontal flue of brick, and lining it with an air space left between, is there any
sandstone or other stone that will stand heat well enough to use for lining on bottom and top of flue, and if so, where could it be had? A. Stone is not adapted to this purpose. 4. In building chimneys 300 feet high or higher what mortar is it proper to use outside
and inside? A. For outside work hydraulic cement; and inside? A. For outside work hydraulic cement for inside work, good lime mortar. 5. What coefficient is the most reliable to use for linear expansion of brick work exposed to great heat ? A. Clark gives for stock
bricks, not laid up, for each degree 0.00141 of an inch in 100 feet length. 6. Knowing the amount of grate in 100 feet length. 6 . Knowing the amount of grate
surface feeding a chimney, what rule will best determine the necessary inside diameter and height for the
chinney to give best results? A. Consult "Wilson on Boiler and Factory Chimneys.
(12) E. B. V. writes: 1. To R. L. J. (2), December 18, 1850, you give ink recipe same as in Sup-
PLEMENT No. 157. Can you translate the first into a cold process recipe ? A. Heat is necessary to properly extract the tannin from the galls. One-seventh the weight of the galls in commercial tannic acid will make a similar ink not requiring heat. 2. After digesting the galls by either the hot or cold process, and a clear solution obtained, which product will retain longest its original
excellence in the bottle and black color on the written excellence in the bottle and black color on the written
page, a suspended ink with gum arabic, or a solution page, a suspended ink with gum arabic, or a solution
with sulphuric acid ? $\mathbf{A}$. The fluid or true solution under ordinary circumstances. 8. In recipe ahove men tioned, would a little blue or purple aniline, soluble in water, replace the extract of logwood equally well as to quality? It would give a pleasing color. A. If you can make it stay in solution, yes. 4 Does the permanganate
or any other disinfectant absolutely prevent or only or any other disinfectant absolutely prevent or only hinder mould; that is, does the dissolved disinfectant re-
main such,and continue to act while there is fluid about main such,and continue to act while there is fluid about
it, or does it evaporate change, or otherwise become it, or does it evaporate change, or otherwise become
neutral with age 9 A . The permanganate is not used as a disinfectant in this connection; it serves to oxidize
the iron salt and render the ink darker when first the iron salt and render the ink darker when first
written with. It suffers decomposition in the reaction.

|  |  |
| :---: | :---: |
|  | Auger, R. E. Hardisty |
|  | A xle box, car, R. \& J. M. L. Macdona |
|  | Axle boxes, sand guard for car, H. R |
|  | xle clip, carriage, s. H. Carpenter. |
|  | Axles of vehicles, etc., safety nut for, H. Anderson... |
|  | Bag and twine holder, F. P. Sher |
|  | Bale band fastening, L. Miller |
|  | Bale ejector for presses, H. Riesel......... 235.294, |
|  | Bale tie, J. M. Van Derzee |
|  | Bedstead spring, folding. H. A |
|  | Beer cooler, A. Reisert. |
|  |  |
|  | Belt, galvanic, E. J. Fraser |
|  | Blind, window, P. Janssen |
|  | Boiler furnace, W. M. Fisher |
|  | Bookbinder's gold brushing machine, Zimmerman \& Waterston. |
|  | Boot and shoe heel, J. Leycuras |
|  | Bran, etc... machine for packing, w. L. |
|  | Brine agitator, J. M. Laing |
|  | Buckle, R. H. Bisho |
|  | Buckle, T. L. Wiswell. |
|  | Burglar alarm, A. F. R. Arnd |
|  | Button, composition, A. H. Nob |
|  | Can, E. Norton ..................... .......235,278, 2 |
|  | Can cover, sheet metal. E. Norton |
|  | Car attachment, street, F. L. Tripp |
|  | Car brake. A. Johnson |
|  | Car brake, G. Marshall |
|  | Car replacer, J. Park |
|  | Car, safety railway, J. Dénéchau |
|  | Car starter, A. R. Witmer |
|  | Car step, folding, J. W. Radeba |
|  | Car, tram, J. Stephenson. |
|  | Cars, heating and ventilating. A. K. Mansfle |
|  | Carriage, child's, J. C. Richardson |
|  | Casting air chambers, mould for, w. S |
|  | Casting machines, melting pot for type, J. Whitelaw. |
|  | Centrifugal machine, E. |
|  | Chuck, C. J. Olin |
|  | Churn. G. W. Du Puy |
|  | (lder mill and wine press |
|  | Clevis, W. A. Jenrings. |
|  | Clothes pounder, D. E.T |
|  | Coal, etc., drill, W. H. Phelps |
|  | Cock. cylinder. J. Ryan |
|  | Cop tube, A. Ball |
|  | Corn cutte".green, W. H. Kan |
|  | Corset, A. Fellheime |
|  | Corset. C. A. Mçee |
|  | et, C. Y |
|  | Corset clasp, D. E |
|  | Cotton |
|  | Cotton press, E. Me |
|  |  |



Ar compressor, E. A. RI.
Auger, R. E. Hardisty.
Axle boxes, sand guard. L. Macdonald.
Axles of vehicles, etc., safety nut for, H. Ande
 235.060
235.103
23,273

 Beil, electric call, Frankle \& Kelle
Blind, window, P. Janssen.
235,162
235.298
235,069
Boot and shoe heel., J. Leycuras...................................235.328
Brine agitator, J. M. Laing
uckle, T. L. Wiswell

Burglar alarm, A. F. R. Arndt.....
Can cover, sheet metal. E. Norton.
Car attachment street, F. . Tripp

Car brake. A. Johnson
Car brake, G. Marshall
Car replacer, J. Parker.............
Car, safety railway, J. Dénechaud
Car step, folding, J. W. Radebaugh
ar, tram, J. Stephenson.
Carriage, clilld's, J. C. Richardson...............
Casting air chambers, mould for, w. Smith...
law.............................
Chuck, C. J. Olin ...
Churn. G. w. Du Pu
(ider mill and wine press, A. C. Bell.
Clothes pounder, D. E. Taylor
Coal, etc., drill. W. H. .
Cock. cylinder. J. Ryan
Corn cutte". green, w. H. Kanne
Corset. C. A. McGeer.
Corset clasp, D. Essex...
Cotton gin. W. O. Watso
Cotton
Cultivator, S. C. Hunter. writen with. It suffers decomposition in the reaction.

Cultivator guard, J. T. Douglass........
Curtann cord tightener, J. Rancevau...
Damper, stovepipe. W. G. Lindsay .... Damper, stovepipe.
Die, .. E. Snediker
Diret.
Direct acting engine, B. I. Henderson.
Dishes, plate for butter, S. W. Babbitt. Doll, C. T. Dotter...........
Doll joint, G. W. sanders.
Door, sliding D. K. Miller
 Dynamometer for rotary shafts,. . H. Mather
Eaves trough support Egg beater, . R. Hughes
Electric lights, carbon
 Emerator cuhe, E. E. M. Cross
Fare register, w. H. Horn Fare register, w. H. H.
Faucet, D. C.Knight.
Feather renovator, Hatch \& Fortune
Felly, vehicle wheel, F . IT. Starr Fince, S. H. Chase,
Fiber from pine le
Stephens........
Fiber, machine for sep
table, T. Threlfall
Fiber, separating Fiber, separating animal fro............. ...............
Fifth wheel for children's carriages, L. W. Do
moyer................ W............
Fifth wheel, vehicle, M. Woodhull.
Filing box, letter, A. J. Kletzker Filinn box, letter, A. J. Kletzzer .
Firearm, magazine. A. Burgess...... Firearm, revolving. F. W. Hood
Fire escape, Kamin \& Egberts Fire escape, Kamin \& Egberts...
Fire escape ladder, J. F. H. King
Fish, preserving fresh, C. Alden. Fish, preserving fresh, C. Alden
Fisherman's reel, F. A. Loomis. Fluted fabrics. machine for gathering and pe.. Fumes. apparatus f
Glove, F. H. Busby ..................
Glove, bathing, C. L. Mayne.
Grain bag nozzle and stopper, G. T. Hedrick.....
Grain binder, J. C. McFall.
Hammers and hatchets, man:if. of, J. Yerkes...
Harrow, J. E. Marshall (r)
Harrow, spring tooth, S. C. Cobb...
Hats, finishing silk, D. .i. Easton.
Hay fork, horse. S. B. Gililila Hay stacking device, M. R. J
Heel, गlunkett \& Rollins. Heel burnishing machine, C. J. Addy.
Hoisting systent. Hoisting systen1. Z. Blanc
Holdback. W. L. Gilchrist. Hoop for catching animals and fowls, J. Keller, Jr. Horse holding device for vehicles.
Horse power, D. S \& J. D Hee Hydraulic engine, P. S. Keele ..
Ice elevator, S. V. Crok
Indigo, manuf
Iron gate, J. Young.
Jugs, lip and bail attachment
Kitchen cabinet. N. H. Dolsen
Kitchen cabinet, S. E. Jordan...
Kneading machine J. I. Lednum
Knitting machines, head for circular, J. Hegin bothom........ $\quad \ldots . . .$.
Lamder, stepe, M. C. McCollum
Lamp burner. H. J. White (r). Lamp, electric, J. W. Langley Lamp fixture, N. L. Bradley...
Lantern holder, W. B. Cculter Lantern holder, L. W. Turner. Latch, locking, G. J. Dickson............
Lead and crayon holder, C. W. Boman Lead and crayon hoider, J. Hoffman...........235, 1


Leather skiving machine, H. P. Roberts. .. Ledger and bill holder. petit,
Lid support, L. A. Thomas
Lifting Jack, J. A. Phillips
Lifting jack, E. E. Tope
Locomotive engine coupling
Loom heddle, J. L. Moss, Jr. Magnesia. manuf. of
Mallet, S. G. Howe.
Measuring reel for bagging ........................
Medicinal preparation for the hair. S. Foster.
Darling
Milk bucket and stool, combined, G. C. Bovey.
Milk can handle, G. Routh ............................ Mills, balloon for collecting flour dust in, s .
Bean................. Moulding apparatus, S. J. Adam
Net for horses, fily, S. H. Coover
Ore grinding apparatus. T. Luce
Ore separator, W. Hooper
Ore separator, W. Hooper..... .......................
Organs, octave and manual coupler for, W. D.
Paint can, J. G. Carter......................................
Paper, manuf. of building or wall, E. Thompson.
Pencil holder. combination, C. Sneider.
"Photophone," apparatus for signaling and com
municating called, A. G. Bell........
Piano tut ing pin lock, E. McBride
Pipe, J. is. Baker
Planter, corn, D.
Planter, corn, J. E. Smith
Planter, guano distributer, cultivator, and cotto.
chopper, co nbined seed, s. B . Dover
Plow, reversible, B. J. Leslie.
Plow, sulky. L. Cahill... .
Plow, sulk F, F. F. Smith.
Poke, antmal, G. E. Webb
Portable engine, A. Gaar ..
Potato digger. J. F. Myers..
Press mechanism for
fruits. etc., A. Zinsser.................
Pressure regulator, J. E. Wat...........................
Railway signal.electrical, I. Fisher..............
Railway tie, G. H. Giiman
Railway tie, metallic, F.
Railway tie, metallic, F. $A$. Williams
Railway turn table, Stock \& Royce..

## .2 .2 . . . . . .. .. ns-


G. . Ilamilton (r)...
Range
Recl
Re
 Reflector, W. H. Smith ..
Refrigerator, C. Callahan
 Rocking chair, spring, w. H. Ham
Rotary cutter, J. C. Marshall.................. Rotary engine, G. Jasmagy.......
Rotary engine, A. E. Marshall .
Rubber cloth, machine for preparing light weight
F. E. Aldrich.... .................
Sadiron heater, A. C. Macallister ..
Safe, Chabot \& Charter ..........
Safe, Chabot \& Charter ..............
Salt, manufacture of, W. W. Elmer.
Sewing machine button
Harris..........................
Sewing machine, carpet, J. Hesse .................
Sewing machine gatherer and ruffer, J. B. Farrar
Sewing machines, balance wheel pulley for,
Sewing mach
Flither.
Sheetmetal.

Shingle sawing machine, O. C. Hanson.

Shre and hame $\begin{aligned} & \text { Sifter, ash, A. Kastner... } \\ & \text { Sifter coal, } \mathrm{F} \text {. Andrew }\end{aligned}$
Sifter, coal, J. F. Andrews. ...
Snap hook, Collins \& Pennima
snap hook, Collins \& Pennim
Snatch block, T. R. Ferrall.
Snatch block, T. R. Ferrall.
Snow scraper, G. F. Bond...
Spacing and dividing, instrument, A. K. Fulton..
Spark arrester, Gunther \& Kowalski .............
Speaking tube mouth piece and bell
Ostrander .....................
Stamp, hand, G. M. Steven
Steam boiler,
S. F. Brott.
Steam engine, J. H. Vaile... ......................
steaming oysters, apparatus for, R. Wells
Stove board, A. I. Griggs (r).........
Stove fireplate, J.H. Goodfellow.
Stove fireplate, J.H. Goo
Stove, oil, D. W. Goodell..
Sugar washing process
Booraem......................
Sun shade holder, A. B. Smith.
Surcingle, C. H. Trott....
Surcingle, C. H. Trott...................
Swing and rocker, combined, B. Baker
Target, bird,Jones, Legge \& Bartlett
Tea out of the original te
emptying, M. G. Griffin.
Tea pot, J. E. Jeffords
Tea pot, J. E. Jeffords........
Telegraph, acoustic, T. A. Edis
Telegraph, electric, O.Lugo
Telegraph, electric, O.Lugo...
Telephone and microphone switch, A. L. Briggs....
Telephony, magneto-electric speaking. F.Rossett
Telephong, magneto-electric speaking. F. Bosssett
Thrashing machine and clover huller,W.M.Kope

Ticket, railway, , L. L. Howar
Tidal motor, T. S. Speakman
Tile and brick kiln, E. Dave
Tiiting can, J. M. Scantlin
Tilting chair, folding, J. .E. Wa......eld
Trace fastener, D. C.O'Brien ...
Trace fastening, W. M. Valentin
Trace fastening, W. M. Valentine.
Trace or driving rein, H. Comstock.
Tramay for curves an
Trunk lock, G. Crouch
Turn tables, bearing for, Robe
Umbrella support, J. Steiner
Valve gear, engine, Perkins \& Harris
Valve, globe, T. Holland
Vehicle jacking wheel, E. Schuchardt
Vehicle spring, F. Schelp, Jr.........
Vehicle spring seat, H. C. \&S. L. Neer
Vehicle top, adjustable, I'. J. Ayres.
Ventilating apparatus, J. H. Doland.
Vise jaws, B. F. stephens..........
Wall ventilator, side, W. H. Smith
Washing machine, S. G. Marlin
Washing machine, G. M. Pursell
Water closet basin, J. Demarest
Water power, R. Thamm .
Water wheel, turbine, S. Secres
Well boring apparatus, E.
Wick, lamp, II. D'A rcus.
Windmill, A. S. Baker..
Wood, machine for bundling kindling,J. Richard
son (r)................... ........
Wood, etc., treating, c. B. Carter.
Wringing machine, C. H. Miller
DESIGNS.
Border, ornamental, E. B. Stimpsom.......12,055 to 12,058
Gimp, H. Davenport........
Key bow, G. S. Barkentin.
TRADE MARKS
Blue, wash, W. Hoffmam \&
Butter color, N. S. Capen ....
Corsets or boxes containing cor
Liniment, rheumatic, C. Kirsch:..................
Tea, C. Jevne ............ ...............
English Patents Issued to Americans
From December 3 to December 77 , 1880, inclusive.
Carding machtne. Whitehead \& Atherton Machine Com-
Carding machtne. Whitehead \& Athert
pany. Lowell, Mass.
Clock, F. A. Lane, New Haven.Conn.
Diving apparatus, S. P. M. Tasker. Philadelphia, Pa.
Doorways, method of making tight, G. B. Thompso
Felting machine, G. Yule, Newark N J.
Fire boxes, J K. Street, Camden. N J.
Screw nut, w. Courtenay, New York city
Sugar, manufacture of, M. de la Vega et al., N Y. city.
Tallow. manufacture of, M. de la Vega et al.. N. F. city
Telephonic apparatus, C. A. Randall, New York city
Telephonic apparatus, c. A. Randall, New York

## Gavertismont.

 TASE ENGNE






MACHINISTS' TOOLS.
Iron Planing Machines
BEST BAND SOR SME BLADE

## LONDON, BERTY \& ORTON, Phila., Pan. THE COLUM BIAN ON



CLOTHING IN ITS RELATION TO






TO ESTIMATE THE HORSE-POWER OF
a Steam Engine--Simple rules for estimating the horse-
power of aninh-pressure or non-condensing, enyine and
of a low-pressure or condensing engine.
Ry a


SULKY ROAD SCRAPER AND PLOW.
Valuable Water Front ON EAST RIVER,
Forriseale:
Suitable for iron works or manufacturers, where large
water taniilities are required. About 50 lots, including
land under wate
CHAS. S. BROWN, $\boldsymbol{7} \boldsymbol{q}$ Liberty St., N. Y.
PORC Sawer. AIN PHOTuable paper, detailingthe processes in-



UNIVERSAL GRINDER.


THE PERFECTED STYLOCRAFIC.

READERS' AND WRITERS' ECONOMY CO.

## CLHRRIS RUBBEER WBELS

tin the market, and is attract-
ing the attention of large
manufacturers on account of
the sreat saving of floors,
which is ten times greater
than the extra cost of this
wheel.
Adapted to all purposes,
viz., warehouse trucks, plat-
form trucks, scales, boxes,
baskets, and heavy casters.
For full particulars, address GEO. P. CLARK, Windsor Locks, Conn IINTITエITIOIN Patent and Trade Mark Exhibition IN FRANKFORT-ON-THE-MAIN, 1881.
 PATENT AND TRADE MARK EXHIBITION, which will take place in Frankfort-on-the-Main in the
 ous application, will five an excellent overtiight ove
the technical capacities in the sphere of Inventions 9 n protected Trade Marks. It is a matter of notoriety that have been brought to perfection only after a areat deal
of study and afler troublesome and expensive experi TThe Patent and Trade Mark Exhibition will facilitate
as far as possible a realization, by the inventor, of
patents and trade marks and can the the the
 natives and, foretisuers, and is evidently a more suit
able place for such an exhibition than any other city.
 Water Power, for the working or their patent objets,
will be supplied othe exhbibior at a moderate conare
 ally. ne numerous applications already reeelved require
the erection of very extensive buildings, the completion of which can no nongert be delayed. The fina 1 ternt for
the reception of applications has therefore been fixed
on the 31st of January, 1881.
 H-YORSTAND : S. Schiele. I. Blumenthal. A. Bolongaro Crevenna
 no danger, no eatra, no ins france
An THE NEW OT'IO SILENT GAS ENGINE.

50 Gandscape, Chromo Cards, etc. name on, 10c. 20 $\$ 72$ A WEEK. \$12a day at home easily made. Costly ICE-BOATS - THEIR CONSTRUCTION

 MFNT, 1. The same number also containsthe rules and
regulations for the formation of ice-borat clubs.the sail
ing and maragement of ice-bo ats. Price 10 cents.
PAYNE'S FARM ENGINES


 SCIENTIFIC - AMERICAN SUPPLE





 market. Sond forilustated catal oass ond iner in the wanted.-a practical machinist


## AIR COMPRESSORS.

 CABINET ORGANS. CHURCH, CHAPELEPABLOE: | $\infty$ | $B$ | $\square$ |
| :--- | :--- | :--- | :--- |
| $\infty$ | $\square$ | $\square$ |

## PIANO-FORTES.

Best and sweetest toned instruments in the World




 assortment of Pianos and organs that are sold direct

 w LATEST ILLUSTRATED CATALOGUE
 Address or call on DANIEL F. BEATTY, Washington, New Jersey.


TOY ENCMODEL WORKING ENGINES AND FIGURES.
 1830-81, s76 i1lustrations, by mail. 5 SER
$\mathbf{1 2 4}$ and 126 Nassau St., New York.
"BLAKE'S CHALLENGE" ROCK BREAKER.

 BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.
 DUC'S ELEVATOR BUCKET,
 THOS. F. ROWLAND, Sole Manufacturer, Brooklyn, N. Y
NEW YORK BELTING AND PACKING COMP'Y

## 

 FIMERETWEXES All other kind Mitations and Inferiorstandard BELLTAM, PACKKIN. and HOSE.
JOHN H. Adress NELV YORR
Jreas.
The George Place Machinery Agency
 $\$ 5$ to $\$ 20 \begin{gathered}\text { per dayat home samplesporth Sfirree } \\ \text { Adreses sixues }\end{gathered}$ TOHNR.WHITLEY SCO




SURFACE FILE HOLDERS.
 No.




 | Langlan and New |
| :--- |
| Langion Mitre Box |

## MACHINISTS' TOOLS.



 WAYMOTH LATHE.




Roots' New Iron Blower.


POSITIVE BLAST. IRON REVOLVERS, PERFECTLY BALANCED IS SIMPLER, AND HAS
FEWER PARTS THAN ANY OTHER BLOWER P. H. \& F. M. ROOTS, Manuf'rs, CONNERSVILLE, IND.
 $\left.\begin{array}{l}\text { WM. COOKE, Selling Agt., } 6 \text { Cortlandt Street, } \\ \text { JAS. BEGGS \& CO., Selling Agts., } 8 \text { Dey Street, }\end{array}\right\}$ NERK JAS. BEGGS \& CO., Selling Agts., 8 Dey Street,
CAS SEND FOR PRICED CATALOGUE


OTIS safry
$M$ nostriva
Maching

 Woo-woxilig Machilery Rear Universal Wood Workers. Planing, Matching,
Mouldin, Band and Scroll Saw ing Machines, etc.
BENTEL, MARCEDANT \& CO., HAMILTON, OHIO, U.'s. A.


WITHERBY, RUGG \& RICHARDSON Manufacturers
 $50 \begin{aligned} & \text { Gold. Figured, and Actress Chromos, } 10 \mathrm{c} \text {. Agent's } \\ & \text { Sample Book, } 55 \mathrm{c} \text {. SEAV Y BROS., North } \\ & \text { Sord, Ct. }\end{aligned}$ B|G PAY $\begin{aligned} & \text { to sell our Rubber Printing stamps. } \\ & \text { ples free. Taylor Bros. \& Co., Cle veland, } \mathrm{O}\end{aligned}$


INDIA-RUBBER AND GUTTA PERCHA Industries. -By Tho Thas Bolas, F.C.S. An exhenaustive
paper on the sorces and manhacture of bothundiab
rubber and uta percha. I. The Sources of India-rub-
ber





Glavtrisememtin
$\xrightarrow{\text { Inside Paze, ench insertion }-.-75 \text { cents a line. }}$


 Diamonds Carbon
 Marbon for Mining Drills

 64. Dickivine

MillStones and Corn Mills.


LIQUID PAINTS, ROOFING,


## ROOFINC.




Bookwalter Engine




 TELEPHONE And Heatrical suppies PYrometers, For towinr haeat ot


|  | Eclipse Engine |
| :---: | :---: |
|  | Furnishes steam pow |
| - 30 |  |
| . | nomical Ersic |
| (s). | awarded. inclu |
|  |  |
|  |  |
|  | asnesb |

## ERICSSON'S NEW MOTOR.

 ERICSSON'SNew Caloric Pumping Engine
dwellings and country seats.
 DELAMATER IRON WORKS C. H. DELAMATER \& C., Propriecors,
No. 10 Cortlandi Street, New Tork, N. v .

UPRIGHT DRILLS girixid H.BICKFORD Cincinnalio.

Pond's Tools, daill W. PoNo, Worcester, Mass. THE BIGGEST THING GUT. Innastrateo




 PBRIITNS
High Pressury Engine and Boiler, Etc.




## The Cameron Steam Pump,

 DESIGNED FOR USEIN MLIINES,ALSO FOR GGNGRAL MANUFACTURING AND

## FIREETMME <br> amps tarnished with Movable Linings in Iron, Composition, or Phosphor-Bronz Aadress THE A.S.CAMERON STEAM PUMP WORKS, foot east 23d Street, new york city. <br> Emery Wheels and Grinding Machines. THE TANITE CO., <br> Stroudsburg, Monroe County, Pa. <br> en we carry a stock: <br>  <br>   Livapon, Eng., Sydnes, N. S. W., 11 Pitt St.



PULSOMETER STEAM PUMP CO.,
p.o. Box No. 1633. Office, No, 83 John St., New York City

HARTFORD
STEAM BOILER
Inspection \& Insurance COMPANY.
W. B. FRANKLIN,V. Pres't. J. M. ALLEN, rres. J. B. PIERCE, Sec'y.


The Asbestos Packing Co.

 ROPE PA JOURNAL WICK BOA " SHEATHEING PAPER,
FLOORING FELT. CLOTH.
Eureka Band Saw $=2 \mathrm{w}=$
 FRANK Buftal
BOILER COVERINGS, Patent "AIR SPACE"' Method. asbentos materials.
 Dit Deal Stove Power Hammers PHILP S. JUSTICE,
 Driven or Tube Wells


 PREVENT SLIPPING. The
handsomest, as well as the safest 2 $\begin{gathered}\text { CarriageStep made. Forgedfrom best } \\ \text { Ciron, and formed with a sunken panel, }\end{gathered}$ in which is secured a plating of richly
moulded rubber. Durability war-


## COVERING



 CORRUGATED AND GRIMPED IRON


##  HA Mixilisecoinilis Exgive



## SHAFTS MULEEYSHANGETS <br> A. At Low Prices, Large Assorted Stocko



Pictet Arificicial Ice Co., Limited,


New York Ice Machine Company, Courtland St., New York, Rooms 54, 55. d

## ICE AND COLD AIR.

Low Pressure when running. No pressure at rest. Ma
chines guaranteed by C. H. Delamater $\&$ Co. Our new Stylographic Pen (just patented), having th
auplox intercharkeable point section, is the very lates

The BELMONTYLE OIL

 THE BAKER BLOWER,


Perfectly Smooth Thoronghly Seasoned CUT THIN LUMBER!! Manufactured by our Patent Board Cutting Machines
and Seasoning Presses. MAHOGANY Rosewod, Satinwood, Walnut, Ash. Red Cedar, Cherry,
Oak, Poplar, Maple, Holly Hrech. Walnut, etc., etc.., in
Logs, Planks, Boards, and veneers. ogs, Planks, Boards, and veneers.
Send for catalogue and price lists.
 qrupd

## Šrientific Amrcricam

## The Most Popnlar Scientific Paper in the World

 VOLUME XLIV. NEW SERIES. COMMENCES JAN. 1st.
## Only $\$ 3.20$ a Year, including postage. Weekly

d splerdidly illustrated paper is published weekly. Every number contains six original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery New Inventions, Novelties in Mechanics, Manufactures Chemistry, Electricity, Telegraphy, Photography, Archi
tecture, Agriculture, Horticulture, Natural History, etc All Classes of Reuders find in American a popular resume of the best scientific in formation of the day; and it is the aim of the publisher possibe abstruse terms. possible abstruse terms. To every intelligent mind
this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.
Terms of Subscription.-One copy of The Scien
tific American will be sent for one yeatr- 52 numberspostage prepaid, to any subscriber in the United Sto postage prepaid, to any subscriber in the United States
or Canada, on receipt of three dollars and twenty cents by the publishers; six months, $\$ 1.60$; thre
months, $\$ 1.00$ months, $\$ 1.00$.
Clu bs.-One extra copy of The Scrientiplc Ameriat $\$ 320$ each ; additional conievery cha of foe subscriber at $\$ 3.20$ each; additional
rate

One copy of The Scievtific American and one cop of The Scientific American Suppliment will be sent United States or Canada, on receipt of seven dollars by

## the publisher

The safest way to remit is by Postal Order, Draft, or
Express. Money carefully placed inside of securely sealed, and correctly addressed, seldom ooes
astray, but is at the astray, but is at the sender's risk. Address all letter
and make all orders, drafts, etc., payable to
MIINN ? an

MUNN \& CO.,
37 Park Row, New York.
To Foreign Subscribers.-Under the facilities of the Postal Union, the ScIENTIFIC AMERICAN is now sent by post A rect from New York, with regularity,to subscribers in Great Britain, India, Australia, and all othe
British colonies ; to France, Austria, Belgium, German Russia, and all other European States; Japan, Brazil Mexico, and all States of Central and South America Terms, when sent to foreign countries, Canada excepted, $\$ 4$, gold, for SCIENTIFIC AMERICAN, 1 year; $\$ 9$, gold, for
both SCIENTIFIC AMERICAN and SUPPIEMENT for both SCIENTIFIC AMERICAN and SUPPIEMENT for
year. This includes postage, which we pay. Remit by
postal order or draft to order of Munn \& Co., 37 ParE Row, New York.
THE "Scientific American", is printed with CHAS.
ENEU JOHNSON \& CO.'S NK. Tenthand Lom

