a Weekly journal 0f Practical information, art, science, mechanics, Chemistry, and manufactures.

## THE BATTERING RAM AS A TUNNEL BORER.

Mr. Charles Bergeron,C. E., in a recent issue of the Engineer, contributes a paper on the St. Gothard Tunnel, and more especially relating to the modes of drilling which have been adopted. The Dubois and François perforators, which are of more simple constrution and of higher efficiency than the similar machines employed at Mont Cenis, have been mainly employed, but more recently the McKean apparatus has been sustituted. Compressed air is furnished at a pressure of from five to eight atmospheres, by means of three powerful turbines of 220 horse power each, forming a total amount of 660 horse powe:, at each end of the tunnel With such powerful engines, M. Favre, the contractor expects to execute three blastings by dynamite per day, advancing each time 4.8 feet at each end of the gallery, the entire ex tent of which it is believed will be completed in less than five years.
Mr. Bergeron, in considering the plans of M. Favre for the use of dynamite, points out a number of different operations, as well as objections incident to the employment of the same, and thinks that there is a way of accomplishing the work in less time and with a much smaller amount of trouble and inconvenience.
In making their long subterraneous aqueducts, it is stated
In that the Romans used a battering ram to pierce the way through rock. This engine consisted of a long wooden beam suspended at its center of gravity and heavily weighted. A number of men on each side, acting together gave it a swinging motion, so that $i$ it struck with great force any obstacle in its path. When the instrument was to cut hard rocks for tunnels, the metallic head was armed with points like a stonecutter's hammer, intended to divide and reduce the stone to fragments or dust. Captain Penrice, an English engineer, some time ago conceived the idea of constructing a rock drill on the same principle, and to employ steam or compressed air for pushing, like a steam hammer, a perforator of four or five feet diameter. This was tried in the Vaugirard quarries near Paris, and made five feet advancement per hour; and since, another has been
built, 3 feet 6 inches in diameter, which, it is asserted, will penetrate a distance of from two to three feet in similar time. By suitable mounting of the cylinder on the trunnions of a gun carriage, it can be made to take all the positions of a marine or siege gun, and strike the rock with blows of eight or ten tuns weight. The hammer weighs two tuns and a half. The engraving of the apparatus will render its construction clear. $A$ is the framing, suspended on the wheels, B B. The end wheel serves to direct the carriage, and the whole is moved forward by the aid of the hand spize, Fig. 6, inserted in the holes, 00 , in the wheel, B. D is the steam cylinder, mounted on trunnions, and its angle is determined by the segment, $N$, and pinion and handle, M. Eis the valve chest; K , the hand levar by which the valve is actuated; $\mathrm{H}^{\prime}$ is a heavy balance weight; H is the ram head fitted with cutters, shown on an enlarged scale in Figs. 2, 3, 4, and 5. The holes , 0, are used to extract the cutters when worn. J is the air pipe, to which a flexible pipe is attached. By moving $K$ backwards and forwards, $H$ will be made to act as a battering ram on the face of the heading in a way that will be obvious.
The gun carriage may be placed upon a turntable; and jets of water, projected against the place where the hammer is striking, wiil serve to carry off the rubbish. The peration would suppress the transport of the latter by wagons; and the work, it is stated, would be continuous, which is not the case when blasting the rock by gunpowder or dynamite.
In connection with the St . Gothard tunnel, we note that, p to November 30, 1873, the drift had reached an extent f 3,353 feet. The total length of the bore is to be 47,680 feet.
Pure glycerin should not produce, when locally applied, a burning sensation, which it always does when the fatty acids are not all extracted. But even absolutely pure glycerin, when undiluted, is a water-extracting body. It should therefore, when used as a cosmetic, or for medical application, be always diluted with water.

## Uniform Mean Time.

The extent of the territory of the United States forbids the adoption of one mean time for railroad use, found so convenient in the countries of Europe. It is therefore the practice, on our railroads, to run by Portland time, New York time, Altoona time, or by the mean time of some other center of railroad traffic. The Pennsylvania Railroad and some of its dependencies, extending from New York to St. Louis, use Pittsburgh time, which is transmitted by electricity from the Allegheny observatory, an astronomical clock of the best construction being used. This clock is regulated by a telescope, aided by other mechanism, such as the chronograph, which records, by the aid of electricity, the time that the clock keeps, to the hundredth part of a second. The telescope shows its return, every twenty-four hours, to the point of observation of a fixed star, so that the earth itself becomes the regulating clock of the observatory. Four lines of telegraph, says the American Exchange and Reviex, enter the observatory, one of which connects with the railroad wires. The circuit is led through the standard clock, in which a wheel with sixty teeth revolves once a minute. One of the gold terminals of the wires is in contact with a jewel, which is moved slightly every second by a passing tooth. At this instant the circuit is broken, and, by filing away some of the teeth, certain beats may be omitted, to designate the end of the minute, while another piece of mechanism holds the circuit open for the last minute in each hour. The action is purely automatic and continuous, and the clock beats are repeated, through the twenty-four hours, in the principal offices at Pittsburgh, with which they are united by a line specially devoted to their use. At a certain hour the current is awitched into the main circuit, and then the clock may virtually be heard ticking in New York and Chicago, and at every intermediate station, at the same instant. The system has been in use, as the official standard of the Pennsylvania Central Railroad and its eastern connections, for some years : more recently it has been extended to the western roads. The aggregate length of main and branch lines thus supplied is several thousand miles.


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## the state of the iron trade.

The present condition of the iron trade of the country is fully set forth in the recent report of the American Iron and Steel Association. Rather a discouraging view is taken of matters on the whole, and to the panic is ascribed a state of affairs on which no immediate improvement is predicted The question of British competition is dwelt upon at length and judging from the tone of the English industrial journals, there seems foundation for the belief that the foreign iron masters expect a reduction of duties in their favor, and, in any event, can afford to reduce their profits and continue shipments. The report strongly deprecates any reduction of tariff and advocates an increase, pointing its argument by citing the fact that during last year the British ironmasters sent to this couniry 371,164 tuns of iron and steel, valued at $\$ 25,000,000$, and this while our own blast furnaces and rolling mills were lying idle. In other words, we paid to foreign manufacturers, prices for their goods which our own producers would, in the time of their distress, have been glad to have accepted.
In discussing the effects of the panic, it is stated that the home iron trade was moreinjuriously affected than any other industry. During December,signs of a revival appeared and some pig iron changed hands at a very low rate, but many of the sales then effected were merely speculative. January has been dull, and the present month has opened with no brighter promise. The stoppage of railroad orders is considered as the principal cause of the depression, for the reason that fully half of our iron production and importation has ordinarily been required for locomotives, bridges, car wheels, relaying tracks, etc. Until the railroad companies re-enter the market, there can clearly be no general improvement in any branch of the iron business. Subordinate causes of the continued dullness may be found also in the interruption caused by the panic in all operations largely requiring iron, and in the enforced economy of the people in dispensing with minor articles of iron manufacture which they could temporarily do without.
At the close of 1873, there were 650 blast furnaces in the country, which were either making pig iron or were prepared to make it. From 385 of these, reports have been colber of the furnaces not heard from were out of blast and had a proportionate quantity of tuns of pig iron on hand or unsold on January 1, 1874, the total number of stacks at unsold on January 1, 1874 , the total number of stacks at
that date, out of blast, would be 233 , or thirty-six per cent of the whole number. The total amount of pig iron on hand or unsold would be 520,726 net tuns, and the number of men out of employment, 21,141 .
Fifty out of the fifty-seven rolling mills have sent returns. Of these 17 were running, December $31,1873,10$ on full and 7 on half time ; 33 were standing ; 11,490 men were wholly unemployed, 10,150 were at work at half time; 37 mills were not selling rails, and there were 36,744 net tuns of rails on hand and unsold at the above date.
This expo:ition of the state of the two leading branches of the trade is, at best, far from encouraging. Over 30,000 hands are wholly unemployed; and this aggregate does not include ore and coal miners, not directly connected with furnaces or mills, and who are also thrown out of work from the same causes. The iron ore statistics of the Lake Superior region show an increase in the amount shipped for 1873, as against that of 1872 , of 211,002 tuns gross. Much of the ore, however, mined was not shipped, owing to the panic. At the beginning of 1873, the price at Cleveland, fo first class Lake Superior specalar ore, was $\$ 12$; during the price will be as low as $\$ 9$. Iron Mountain ore will be $\$ 8$ price will be as
delivered at St. Louis

The totai number of miles of railroad in operation, January , 1874, was 71,109 , as against 67,104 a year back. Increase, 4,005 miles built, or considerably less than the figures of 872, when 6,427 miles were constructed.
The report gives extended statistics of the comparative tatus of the British iron trade. The total export of 1873, of iron and steel, was $2,959,314$ tuns, estimated at $\$ 188,897,940$ less in amount than for either of two previous years, but
reater in value. The export to the United States has fallen greater in value. The export to the United States has fallen off fully one half; the figures for 1872-3 and 4, being 840, 085, 795,734 and 371,164 tuns. During the latter part o 1873, there was a decline in the cost of fuel a it is believed will witness lower prices for iron in the British market than prevailed during the previous year. The vessels built on the Clyde were 194 against 227 in 1872 ; the tunnage, how ver, exhibits considerable increase. The coal trade is said to be a retlex of the iron business, with declining prices as he rule.
The Iron and Steel Association is now in session at Phila delphia, and all the great establishments are fully repre sented. Such a gathering of capital and influence has never aken place in any iron convention, heretofore held in the United States. A memorial has been prepared for transmis sion to Congress, which prays for the repeal of the substance of the ten per cent reduction act, passed in 1872, affecting a large number of staple articles, suggests amendments to the bankrupt act. protests against proposed alterations in the tariff laws, against changes in the customsduties to be effected
by laws now pending in the House, advocates the establish ment of a department of industry, with subordinate bureaux of agriculture, commerce and manufactures, and discusses financial topics and a protective policy
Two objects of considerable interest have thus far been exhibited. One is a twisted steel Bessemer rail from the Joliet Iron and Steel Company's Works, which is a beautifu iece of work, the rail being made into a complete spira without developing the slightest flaw or fracture. The other is air ingot of steel, weighing 1,000 pounds, made direct
from the ore, for the first time in this country, by the Blair from the ore, for the first time in this
Iron and Steel Company of Pittsburgh.
The proceedings of the convention bid fair to be of con siderable importance, and will be made the subject of future comment in these columns.

OZONE-A NEW AND CORRECT METHOD OF SUPPLY.
The use of ozone as a disinfectant in hospital wards and ublic buildings has amply demonstrated its virtue as a purifier of air exhausted by breathing or poisoned with emanaions from corrupt or decaying organic matter. The only bar to its more extended use has been the lack of a simple nd trustworthy means of generating it, safely and continu usly, by a process not involving scientific skill or costly

The latest means suggested certainly bears the palm for simplicity, cheapness, and accessibility to all. It consists imply in the exposure to atmospheric action of common phosphorous matches moistened by water, the alleged result being the production of nitrite of ammonia and ozone-both ctive purifiers of air
Knowing the efficiency of moistened phosphorus as a gen rator of ozone, the author of the match method, Mr. Sigis mund Beer, of this city, set out one day to procure a quan ty of that substance to use in sweetening the atmosphere of a room whose musty smell had successfully resisted the power of ordinary disinfectants. Failing to find any phosphorus at the drug stores in his neighborhood, it occurred to Mr. Beer that possibly lucifer matches might furnish the needed element in a condition suited to his purpose. He tried them, dipping them into warm water for a few moments, then suspending them in the obnoxious room. Their effect was prompt and salutary ; and thereafter, by continu ing their use, he was able to enjoy "the luxury of pure and efreshing air," notwithstanding the room was in the base ment of an old cellarless house on made land, the air of which was further tainted by a quantity of moldy books and papers. In a paper lately read before the Polytechnic branch of the American Institute, Mr. Beer narrates a num ber of subsequent experiments with the same simple materials, the success of which convinced him that he had made a reritable discovery of great importance.
Touching the safety of the method he proposes, Mr. Beer is confident that no overcharging of the air with ozone or ther injurious matter may be apprehended from the use of matches in the manner he describes. Both the ozone and the nitrite of ammonia are generated slowly, and their force is swiftly spent by combination with the impurities they are intended to remove. It is obvious that the supply of the purifying agents can be easily regulated by increasing or diminishing the number of active matches. In the room bove mentioned, six bundles of matches were kept activeome near the ceiling, others near the floor-by daily watering. In another instance a single bunch is mentioned as having ufficed for quickly purifying the air of a room in which several adults and children were lying sick, but in this case
the air was fanned against the matches while they were carthe air was fanned against the matches while they were car-
ried about the room, thus hightening their activity. How long a match retains its ozonizing power, Mr. Beer does not say. In conclusion, Mr. Beer claims that, whatever may be said of his theory of match action, the fact is indisputable hat, in the use of matches as he suggests, we have a handy, wholesome, and inexpensive means of freeing our houses from noxious exhalations and the long train of evils attendent on the prevalence of bad air. The matter is easily tested and certainly well worth trying.

## EdUCATION AND BOOK KNOWLEDGE

The high water mark of a very prevalent theory in educa ion is reached in an assertion, by one of the foremost edu cators of the day, to the effect that what a man can write out fully and fairly concerning any matter, that he knows, and no more. Whatever falls short of this simple and cer ain test, we are told, is no better than sheer ignorance.
The phrase expresses, with axiomatic terseness, the conrolling spirit of the schools; and tor this reason, we suppose, it has been echoed right and left as a settled dogma in ducation. From the primary school up to the highest, ex. epting a few scientific schools, the grand test of knowledge is verbal expression. The pupil that recites best wins the prize; and as the most credit goes to that teacher whose pupils meet the standard required most completely, the endency is to narrow the range of teaching to those things which can be most readily reproduced in formal phrases. The premium is paid for words, and naturally the teacher ives more attention to them than to the pupils' mental health or mental development.
Not that facility of verbal expression is to le despised or neglected. It is au art second to none, and worthy of proportionate culture. In many cases it is also a first rate test of knowledge; but to make it the ultimate test, in all cases, nvolves a double fallacy, subversive of the highest aim in education. It implies that all knowledge worth having can be expressed in words, and consequently can be communicated by words, either for informing another or for testing his information. It implies, too, that the possession of knowledge necessarily carries with it the power of ready and ccurate expression
The fact is, on the contrary, that relatively but a small part of what one may know can possibly be expressed in words; and much, even of that which can be formulated, may be thoroughly apprehended and practically used by one who could not begin to set it down in logical sentences.
Time was when book knowledge was thought to be the sole basis of scholarship. All teaching was book teaching, and it was no more than fair to expect students to prove bookish estimate of culture no longer satisfies. The library alone can no longer make a scholar; and every scheme of culture which pins the pupil's attention to letters is little better than a wall set round him to keep him from learning what he ought to know. That much of what passes for legitimate schooling is such a wall is recognized by everybody except the pedagogue
Men of real culture are well aware that ability to do is vastly superior to ability to say; and they believe that the development of skill and power ought to receive at least as much attention in schooling as the mere accumulation of second hand facts; but all that sort of basic culture is not merely slighted but suppressed as soon as the test of verbal description is made supreme.
There are less than fifty sounds in the English language. If they were all devoted to the service of a single sense, all their possible combinations would be insufficient to express the distinctions which that sense might be able to recognize. There are five thousand times fifty fibrils in the optic nerve, as estimated by Helmholtz, each demonstrably capable of couveying many degrees of sensation of the several primary colors. One need not calculate the permutations of two hundred and fifty thousand to realize how meager the richest possible vocabulary of sight terms must be for the expression of sight experiences. Still greater is the poverty of language when used for expressing the in inite distinctions of thoughts and things which the whole man is capable of apprehending. Relatively, indeed, our words are but a clunssy sort of currency for certain commou needs, no more sufficient for the complete expression of thoughts and feelings than bank notes are for the measurement of values. For the grosser exchanges of life, for marketable values, money answers well enough ; but how shall one express in banker's figures, or set phrases either, the value of a kindly word, a mother's love, or a cup of water to one perishing of thirst?
The killing fault with the scholastic test of knowledge is that, from its nature, it fails to reach-as it fails to encour-age-more than a single phase of culture, and that one of inferior grade. It measures verbal acquisition only, not skill or power ; and since conduct rather than words, ability to do rather than facility in saying what has been done or ought to be done, is the ultimate test in life, and should be the paramount aim in education, the word test is necessarily deceptive as well as inadequate. The glib art critic, scarcely able to draw a straight line, might have at his tongue's end a greater array of fine art phrases than a Michael Angelo; and if suddenly called on to write out fully and fairly his knowledge of sculpture or painting, the master might be beaten by the mere theorist. So, too, the veteran shipmaster of a hundred successful voyages might make off hand a foorer display of nautical knowledge than the cadet fresh rom the naval school, or possibly
ies for a sensational newspaper
the iron ores of missouri.
The principal pcrtion of the report of the Missouri Geological Survey for the past year is devuted to the irun ore deposits, which give the State so high a rank for mineral wealth. The geology of Pilot Knob and its vicinity is discussed by the chief geologist, Mr. Pumpelly, while Dr. Adolph Schmidt furnishes a general report on all the iron ores of the State. It is needless to add that the information thus given adds immensely to our knowledge of the character, distribution, and modes of occurrence of these interest ing deposits.
Two principal mincral species are represented in the Mis-
souri iron ores, the hematite and the limonite (sometimes called brown hematite), the former occurring in two distinct varieties, namely, specular ore and red hematite. The first variety is found in the midst of broken and partially disintegrated porphyry, and in the (geologically) overlaying lower silurian sandstone. The red hematite forms strata in the carboniferous system. The limonites occur chiefly as de posits on the second and third magnesian limestones, except in the Osage River district, where they lie on subcarbonifer ous limestone. Besides these four classes of original depos ts, Dr. Schmidt recognizes with each a secondary class of disturbed or drifted ores, making in all eight distinct classes of deposits.
The region of workable iron ore reaches north of the Missouri River at one point only, in Callaway county, where red hematite occurs in the subcarboniferous. South of the river, deposits are frequent throughout the whole southern part of the State. That portion richest in iron ores, however, is comprised in a broad belt crossing the State in a direction about parallel to the course of the Missouri river, between he 30th and 40th township lines. T? is belt is divided into three distinct regions. The first and more easterly embrace the deposits of limonite in the counties of Ballinger, Wayne and Madison, and the small but immensely productive Iron Mountain district, with its two enormous deposits of specu ar ore in porpbyry, Iron Mountain and Pilot Knol, besides numerous smaller deposits. The second or central region comprises the deposits of specular ore in sandstone, chiefly in the counties of Crawford, Phelps, and Dent. The third egion contains the limonite and red hematite deposits of the Middle and Upper Osage, a district too remote from present markets to add very much to the immediate wealth of th State
The oldest as well as richest deposits are in the iron-bear ng porphyries of the eastern district, a formation regarded as a near equivalent, in point of age, to the iron.bearing rocks of Lake Superior, New Jersey, and Sweden. The deposits occur in the most variable shapes, and of every variety of size. There are regular veins as in Sheplserd Mountain and Iron Mountain; regular beds as in Pilot Knob and in some localities east of it; irregular deposits, some of which ap proach veins by their shape, as in Lewis Mountain; whil others have proved to be but isolated pockets, as on Hogai Mountain. In all cases, however, the mode of their forma tion is thought by Dr. Schmidt to have been practically the same, that is, by precipitation from iron-bearing waters, a ore deposits are still forming in numerous localities from the waters of chalybeate springs. The geological history of Iron Mountain affords a fair illustration of the manner in which the formation of all these beds of specular ore may be inter preted.
Griginally the mountain was composed of porphy ries, which also filled the valley east and south. In process of time the porphyries became fissured, by contraction or otherwise, and during long periods these fissures were kept filled with con stantly renewed chalybeate waters, which slowly deposited the oxides of iron which they contain. As the fissures wer gradually filled, the flow of the iron solutions was lessened and finally stopped. Then the ore dried, undergoing there by a small contraction, which cracked and broke most of the veins without displacing the parts. Subsequently the por phyry was acted on by atmospheric or other waters, proba bly containing carbonic acid, which decomposed the rock, removing the alkalies and leaving a silicious clay. By the after erosion of the softened masses by rain and flood waters, the cracked and disjointed ore veins lost their support and fell to the ground, thus forming the beds of surface ore which cover the slopes of the hill and fill a part of the val $1 . y$.

In the main body of the hill, the ore masses remain un disturbed, with more or less decomposed porphyry between, the ore constituting but a small percentage of the entire vol ume of the hill. The surface layer of ore boulders, pebbles, and ore sand, with very little clay, was originally from four o twenty feet thick, ard must have represented a vast amount of erosion. The Iron Mountain ore may be taken as type of all the Missouri specular ores. It is nearly pure peroxide, containing about seventy per cent of metallic iron, and is nearly free from mechanical admixture of foreign matter. Color, bluish black to steel gray. The surface or is a little richer than the vein ore and has less pinosphorus both are nearly free from sulphur. Dispersed through all the Iron Mountain ores are magnetic particles, which can be separated from the mass with a magnet when the ore is re duced to powder. No ore with active magnetism, constitut ing a natural magnet and attracting iron filings, is found on the mountain. The Pilot Knob ore is slightly peculiar ; color, steel gray to pearl gray, with a marked tint of sky blue. ts structure is crystaline to granular, with a very fine grain None of these ores affect the compass needle, though all are slightly attracted by a magnet when ground five. The qual ity is less uniform than that of the Iron Mountain ores, the principal impurity being silica. The proportions of sulphur re very small
The ore from Shepherd Mountain is a little more like magnetite than any other ore in Missouri, but in the main i a specular ore, very similar to that of Iron Mountain. It magnetic qualities are much more pronounced than those of either of the ores above described, many specimens being trong natural magnets. The ore is very uniform in chem cal composition, very rich in metallic iron, and almost en irely free from phosphorus and sulphur. It is nearly a ich as the $r o n$ Mountain ores, and much purer than eithe rich as the Iron Mountain ores,
At Buford Mountain the ore is rich in both iron and man ganese, and is likely to prove a very valuable material for
the manufacture of spiegeleisen, now so extensively used
in the Bessemer process.
The specular ores in sandstone differ from those in por phyry chiefly in their tendency to change, on exposure to at mospheric influences, into brown and yellow limonites and red hematites: rarely into spathic ore. Generally these deposits are of a lenticular shape, with circular or elliptical outlines, and may have been formed either by deposition from chalybeate waters in depressions in the sandstone, or by a gradual replacement of lenticular limestone deposits. When inclined, the beds dip with the slope of the hill
The disturbed deposits of specular ore are of two kinds: Masses of ore which have been removed from their origina position by underwashing or otherwise and deposited elsewhere in a more or less irregular manner; and the remaining portions of original deposits, from which o her portions have een removed. Ore banks having the appearance of drifted deposits are numerous in the central ore district, but they ave not been sufficiently opened to be satisfactorily studied.
The red hematites of the carboniferous formation differ rom all the other ores of the State in that they do not occur as deposits with definite limits, lying as independent and for eign developments between and across other rocks, but form and compose in themselves regular geological strata. These ron-bearing sandstones frequently extend over large areas, with varying richness. None, however, have been sufficienty opened to make it possible to decide whether the ore was formed directly after and on the surface of the underlying andstone, or whether it was infiltrated afterwards, gradually replacing beds of limestone or the sandstone itself as it happened to be more or less readily soluble.
The deposits of limonite occur neither in veins, nor in beds nor as strata, nor in pockets of regular shape, but in irreguar cracks and crevices on or near the surface of the various imestones. These cavities sometimes have very large dimensions both in depth and width, and are generally nea he present surface of the ground. So far as opened these deposits afford a denser, harder, and richer ore in the upper part than in the lower, where it is more inclined to be light, porous, ochery and clayish. This fact and the invariably talactic structure of the ore are proofs that the solutions rom which the ore was deposited was infiltrated from above. One of the largest and most coherent of these banks is the Ford Bank in the eastern district. It extends some 1,500 by 500 feet along a low flat hill; the thickness is irregular, ranging from 10 to 30 feet.
The disturbed and drifted deposits of limonite have not been sufficiently opened to enable a judgment to be formed in regard to their character. The more important deposits in the entire list are as follows, the most of them being decribed at length in the report

1. Containing more than $2,000,000$ tuns of workable ore ron Mountain, in St. Francis county (specular ore)
2. With less than $2,000,000$ tuns and more than 500,000 uns: Pilot Knob (quartzose specular), in Iron county; Benton creek (specular in sandstone), Crawford county ; and Simmons Mountain (specular in sandstone), Dent county
3. Estimated to contain between 100,000 and 500,000 tuns Shepherd Mountain (specular and magnetic), Iron county Scotia No. 1, (specular and red hematite in sandstone), Iron county. Cherry Valley No. 1 (specular in sandstone), Craw ord councy. Laub Bank (specular in sandstone), Phelps county. Pomeroy Bank (specularin sandstone and limonite), Dent county. Iron Ridge No. 1 (specular and red hematite in sandstone), Crawford county. And the Meramee bank, (specular and red hematite in sandstone), Phelps county.

## MODERN PROGRESS OF CHEMICAL INDUSTRIES IN EUROPE.

In the course of a recent lecture before the French Association for the Advancement of Science, M. Aimé Gérard ave a very interesting and instructive sketch of the rise and progress of many of the principal chemical industries of Eu rope. Beginning with sulphuric acid, which he regarded as common pivot about which turn all the industries which call in chomical reactions to their aid, it was pointed out that, eated with rock or marine salt, the product gives us on one hand sulphate of soda, and on the other hydrochloric acid, in otber words, the primary agents for the manufacture of oap, of glass wares, of paper stuff, of bleaching matters, of dye, etc. Heated with saltpeter, it gives nitric acid, the cre tive agent of the beautiful coloring matters used for dyeing silks. Again, by the aid of sulphuric acid we clean metals, purify oils,manufacture candles,and plate and gild by galvanic action. It is quite clear that it would be impossible to obtain he enormous amounts of the product now required from the limited sources of supply of forty years ago. Then na ive sulphur, obtained from the volcanic ground of Sicily, was burned at the top of large leaden chambers, and about 0,000 tuns sufficed for the manufacture of the sulphuric acid consumed in Europe. Now 275.000 tuns would barely meet the demand. This vast drain could not be met by the Sicilian ulphur grounds, and hence were engendered the attempt to utilize iron pyrites obtained in the French mines of Chessy ear Villefranche. These successful, the industry sprea England and Germany, and now the estimated productio f Europe, of concentrated sulphuric acid from iron pyrites, is 880,000 tuns, enough to fill a canal 64 feet deep, 32 feet wide, and from 15 to 18 miles long.
In Marseilles, thousands of tuns of salt from the marshe e made into soap maker's alkali. Formerly the hydrochlo ric acid gas produced from the decomposition was lost and escaping in white clouds from the chimney of the factory brought destruction to crops and vegetation near. It was in England that the condensation of this gas was made obligat-
to that effect, resulting in the transformation of the fume into the yellow liquid from which decolorating chlorides, products which render valuable service in the bleaching dyeing, and making of paper, are obtained. It is a strange fact that the importance of these secondary manufactures ha greatly increased, and it is to the perfecting of the processe through which chemistry may manufacture these decolorat ing agents that the efforts of inventors are tending. In Eng and, Weldon regenerates manganese, which generally serve for the transfurmation of hydrochloric acid into chlorine Deacon seeks from the air itself the oxygen necessary to the transformation, and announces the production, now almos certain, of chloride of lime at $\$ 2$ per 220 pounds: an im mense progress, for, whenever we are able to extract readil from hydrochloric acid the chlorine it contains, we shall hav furnished to textile industry a means of inexpensive bleach ing, and to the paper manufacturer a mode of utilizing now waste products.
With the hydrochloric acid there is obtained sulphate of soda, and this is converted into soda and carbonate of soda To effect this, it used to be heated to $2120^{\circ}$ Fah., in a rever beratory furnace, mixed with zinc and charcoal. In front of the door stood two or three workmen, who, with huge iron pokers, kept up a continual agitation of the molten mass brutal work, but now gradually disappearing. In England rotating furnace is used, which consists of a horizontal cyl inder, 16 feet long by 10 feet in diameter, on which a smal steam engine impresses the movement of rotation about it axis. This is traversed from end to end by the flame from the hearth, and the matters, violently agitated, react upo each other without requiring the muscular force of man.
In the production of the potassic compounds, we probably meet with the most remarkable progress presented by th modern history of chemical industries. The ash left by wood, burnt in our fireplaces, is no other than a mixture of calcareous compounds, insoluble in water, and soluble salt of potash, among which the carbonate predominates. Thi mode of making potash from wood now only exists in Amer ica, Hungary, and Russia, and bids fair to become entirely tinct. The sources from which potsoh is now derived ar first, the sugar industry. A sugar beet of $4 \cdot 4$ pounds weigh contains from 15 to 30 grains of potassic compounds. From the molasses, these in concentrated form are obtained. Th molasses by fermentation is formed on the one hand int alcohol, which is obtained by distillation, and on the othe into distiller's wash, which, evaporated and calcined, repro duces in ihe saline state the potash which the beet originally held fixed in its tissues ; 6,000 tuns of potassic compounde, va ued at $\$ 6,000,000$, are thus annually obtained. But even thi vast amount would not suffice for commerce, and hence we turn to a second source, sea water. In everyquart there ar 375 grains of marine salt (chloride of sodium) and 15 grains of chloride of potassium. Imagine, now, this sea water in troduced into sa evaporation. The salt is finally deposited in a crystalin state, and when some 3 inches thick it is gathered. Forme ly the mother water, rich in potassic compounds, was $\mathrm{d}:$ ained off and wasted ; but by M. Balard's refrigerating processes, the valuable potash is now extracted. The discovery of large mines of rock salt in Stassfurt, Prussian Saxony (where it was only necessary to hew out the potash mineral, the carnallite, with the pick axe, and boil it with a little water, to obtain chloride of potassium almost pure) dealt a powerful blow to the French industries; but after a ten years' contest the latter, by the aid of improved processes, are again firml established in commerce. From 10,000 to 12,000 tuns of potassic compound are now produced yeariy at Camarque
M. Gérard continues at some length regarding ammoniaca compounds, phosphates, sulphate of ammonia, etc. A few facts relative to the progress realized, by industries which make use of chemical products, will serve as a conclusion for our resumé of his discourse. As regards paper, it is stated that the production in 1873 was 143,000 tuns. Eac Frenchman consumes annually in different forms more tha 6.9 pounds of paper, and the entire amount yearly used in France would be sufficient to encircle the earth at the equa or with a belt 192 feet wide
The cultivation of wine in France covers 60,000,000 acres Owing to the ravages of the oidium between 1850 and 1860 the production fell from 115 to 73 quarts per head per an num. Brief notice is made of the present trouble with th phylloxera. As regards the sugar beet industry, the yield for 1873 is stated at 495,000 tuns.

## operations of the Patent office in 1873.

The annual report of the Commissioner of Patents, for the year ending December 31, 1873, shows the following

Of the patents granted, there were to-
Citizens of the Unitea State
subjects of Great Britain.
Subjects of France.
Subjects of other for
atatement of the patent fund.
Amount to the credit of the patent fund, January $1,1873$.
Amount of recelpts during the year $1873 . \ldots \ldots \ldots \ldots \ldots \ldots .$.



Now Bunsen gas
gas burner has been recently invented, which gives a heat of about $3,000^{\circ} \mathrm{Fah}$. A furnace of thirt burners generates steam enough to run an engine of one and

## THE ENGLISH TELEGRAPHS

The apparatus employed upon the English lines embraces almost every form which has ever been practically used, but the bulk of the tratfic is performed with the Morse ink writers, the greater part of which are worked in connection with the double current key and Siemens' polarized relay. The speed of these instruments depends mainly upon the skill of the operators who work them, being generally about the same as that of the Morse recording apparatus employed same as that of the Morse recording apparatus employed tus is about the same as that of the Morse sounder, depend ing, like the latter, upon the skill and experience of the operators. "I timed the operator at Edinburgh," says a correspondent of the Journal of the Telegraph, " and found him receiving by the bells at the rate of 32 words per minute.' ${ }^{2}$ The Hughes type printing instruments are only used to a limited extent in Englana, and the speed attained is not much in excess of the Morse sounder. The instruments are carried by weights, and the type wheels make about 120 revolutions per minute, or a little more than half the speed of the Phelps combination instrument.

Fig. 1.


Wheatstone's automatic instruments are employed upon 33 message circuits, varying in length from 159 to 515 miles each, and upon six new circuits, varying in length from 166 to 475 miles each, making a total of about 11,000 miles.
The speed of these instruments varies from 38 words per minute upon the London and Cork circuit, to 120 words per minute upon the London and Liverpool circuit. The average speed of the apparatus is about 70 words per minute, or about twice as fast as the speed of a first class sound operator. The time occupied in the preparation of the messages for transmission depends somewhat upon the skill of the operator, but an expert clerk will easily prepare them at the rate of 2.5 words per minute. The automatic system, as compared with the Morse, requires rather more than double the number of clerks to do a given umount of business, and, therefore, for distances less than 200 miles, it is cheaper to put up additional wires than to make use of it.
The automatic system finds its most appreciative use in forwarding press messages, which are transmit ted over several circuits in succes sion with only one preparation.
The single needle instrument, of which there are over three thousand employed on the English lines, is one of the simplest forms of telegraph apparatus in use, being simply a com bination of a vertical galvanometer

Fig. 2
 or galvanos.
Fig. 1 rep
Fig. 1 represents the exterior of the instrument. In the center of the face is suspended the index or pointer, attached to the magnet, which can deflect only a short distance to the right or left of its zero, on account of the stops. The alphabet is formed by movements of the needle or pointer to the right or left. A turn of the top point of the needle 10 the left indicates a dot, a turn to the right a dash. Thus A is nade by a movement to the left and one to the right; H by four movements to the left.
The interior of the apparatus consists of two helices of fine silk-covered copper wire, in the middle of which is suspended a small magnetic needle, having at the end of itsaxis a pointer, seen on the outside face of the instrument. There is also a current, changing key, the two knobs of which protrude through the front of the instrument near the base. The key is represented in Fig. 2. L and E are two levers connected respectively with the line and with earth. When they are not depressed, they both press against the upper bar, C, which is connected with the positive pole of the battery. Either lever can be depressed so as to come in contact with the bar, Z , which is connected with the nerative pole of the battery. If $L$ is depressed, a negative current flows into the line; and if E is depressed, a positive current flows into
the line. The receiving instrument at the other end of the line is so constructed that the depression of the left hand key causes a deflection of the pointer to the left; a depression of the right hand key, a deflection to the right. The needle, S $\mathbf{N}$, and pointer, $a b$, are shown in Fig. 3.

Fig. 3.

## THiqurninion

The alphabet used in England contains precisely the same combinations as the Morse alphabet, but differently expressed.

## THE HEBERLEIN BRAKE.

Herr Von Heberlein, Locomotive Superintendent of the Royal Bavarian States Railway, has recently invented a novel railway brake which, it seems, is eliciting considerable attention on the continent. The device, which we find described in the Engineer, is not a continuous brake, though it may be fitted to every vehicle in the train. The inventor prefers to divide the train into sections, including one brake car in each, and the operator in this carcan apply the brake to his own coach, and to one or more others in connection with it.
The brakes are applied to the wheels by the agency of a friction pulley which engages with a friction wheel on one of the axles of the engine or of the brake car above noted. The revolution of this friction wheel winds up a flat link chain like that of a watch, and this, pulling on a set of rods under the carriages, applies the blocks to the wheels. The pulley is of iron, but the friction wheel on the axle is built up of wooden segments, with grain radiating, and jammed be tween two plates set up tight with screws and nuts. The wheels of the
brake car are not intended to stop runbrake car are not intended to stop run-
ning. The friction wheel instantly revolves, and its friction against the iron pulley supplies the force which applies the brake.
The mode of throwing the apparatus into action is exceedingly simple. A line extends over the roofs of the seats from end to end of the train. By pull-
ing this cord, a detent is thrown out of gear, and the friction pulley, which is hung on a weighted tion wheel on the axle, and the brake is applied as soon as the train has run far enough to wind up the slack of the chain. The cord is kept taut, so that in case a car run from the track or become detached, a strain is brought upon the line and the brakes instantly applied. Similarly also the same effect can be produced by any of the employees about the train, as readily as they can now pull the ordinary bsll the train
cord.
The Engineer says that, on trials with the invention on an English railway, no jar was apparent on the application of the brake, which was fitted to the two cars at each end of a train of five. On the first test all the brakes were applied, both to the engine and train, up an incline of 1 in 123, and round a curve, speed about 35 miles per hour ; train stopped in 135 yards, and in 19 seconds. Another case is given on the Royal Hanoverian Railway, with a train weighing 76 tuns, with 17 axles, to eight of which the Heberlein apparatus was applied, when the train, traveling 35 miles per hour was stopped on a down grade of 1 in 64 in 25 seconds.

## SOUTH AFRICAN WONDERS-EXPLOSIVE DIAMONDS AND TURTLES WITH TEETH.

Diamonds liable to explode spontaneously, and turtles provided with canine teeth, are two natural marvels indigenous to the fields of Southern Africa. The former are found at the present time, the latter existed ages ago, and are recog. nized by their fossil remains which have been discovered in the same deposits with the gems. One of these disintegrating diamonds is represented in our first engraving in its na-


Misw
explosive diamond, in its native sandstone.
tural size. It is a rounded octahedron, imbedded in a conglomeration of fine grained sandstone. Some idea may be gained of the richness of the South African beds from the fact, it is stated, that more than three thousand diamonds have been found during the past eight months. The mines are of two distinct kinds; the first, called "dry," are located in the centers of plains, and consist of layers of rock, in which the precious stones are mingled with garnets, pyrites,
etc. ; the others, termed "river mines," are established on the beds or banks of water courses, and the diamonds in these are mixed with agates, emeralds, and chalcedony. In both, however, the gems are rarely found other than in a fragmentary state, and this is ascribed to the strange peculiarity of the finest and largest stones in suddenly disintegrating or exploding. Ordinarily rupture takes place during grating or explodig. the first week after the diamond is brought to light, but the first week after the diamond ire brought ont hasht,
cases are known where it has occurred three months subsecases are known where it has occurred three months subse-
quently. It is said that covering the stone with tallow will prevent the trouble; but of course, if the grease has to remain permanently upon the diamend to preserve it, its value is destroyed.
Although the geological age of the African diamond fields has not been absolutely fixed, it is generally believed that they date from the triassic epoch. In the stiata are found the remains of crocodiles, denosaurians, labyrinthodontes, and other monsters of antiquity, but the most interesting and curious are those referred to in the beginning of this article. The skull, from which our engraving was made, strongly resembles that of the turtle, but it has two long tusks analogous to those of the walrus. Professor Richard Owens, who has profoundly studied this remarkable fossil, believes that the animals, or dicynodontes (the name is derived from the Greek, and means literally two dog's teeth), were, when living, oviparous, cold blooded, and yet with pul-

fossil skull of a turtle with teeth.
monary respiration: and he also recognises peculiarities which ally them closely to the lizard family. Huxley is of opinion that they wers provided with long tails. The peculiar genus to which the reptile, the remains of which our engraving represtents, belongs is termed ptychognatus, and the species, depressus. The bones are not perfectly preserved, and were found in hard sandstone of fine grain and greenish color. In the lower jaw two cavities are noticeable, resem. bling incisive alveolæ which may be really rudimentary teeth. The characteristics of the animal are remarkable from the fact that they seem borrowed from those of creatures most widely separated in Nature. As a whole, the bones indicate a reptile between the lizard and tortoise. That is, the forward portion of the head resembles that of the former; and the edges of the edentulated jaws, covered during life with a bony covering like a beak, relate to the latter. The oblique manner of opening the mouth recalls the same peculiarity in certain fish. Huxley, on the other hand, asserts that the nostrils and various points in the osteology are those of birds. The tusks are more analogous to the teeth of mammifers, while the sutures of the skull resemble those of the latter, and are never met with in the case of reptiles.

## Sunday Science.

There exists in Switzerland a " Society for the Observance of the Repose of Sunday" (literatim), and this body invites the views of the world generally on the subject of resting on the Sabbath, considered from a hygienic point of view. A prize of two hundred dollars is offered to the author of the best essay on the question. The points requiring especial discussion are: (1) The favorable effects of rest on Sunday on people of various ages, and their influence on the family and the nation. (2) Diseases which may be engendered or increased by continuous work in persons who, by the nature of their calling, are deprived of this weekly recreation, as, fcr instance, railroad employees, journalists, telegraph operators, bakers, etc. (3) Practical results drawn from the observation of cited facts. The essays must be written in French or German, and sent in, before September 30th next, to the President of the above named society, at Geneva, Switzerland.

The New Austrian Athenfum.-An institution des tined to survive the Vienna Exposition, and at the same time to serve as a memorial of that event, is the Austrian Athenæum, an establishment founded in the interest and for the instruction of mechanics and working men, and constructed after the plan of the Conservatoire des Arts et Me. tiers, in Paris. Large numbers of afticles left by exhibitors at the Exposition have been transported thither, together with a quantity of models and other instructive apparatus, and a library of 3,412 volumes.

More valuable and practical information is furnished to the readers of the Scientific American, through the correspondence columns of this paper, than can be obtained from any other source.

## THE SIAMESE TWINS.

The autopsy on the bodies of the Siamese twins bas, at last, been consented to by the relatives, and the remains have last, been consented transported to Philadelphia. 1 commission, consisting of Drs. Pancoast, Allen, and Andrews, recently visited the place of residence of the twins, and, after considerable persuasion, succeeded in overcoming the scruples of the two families. The bodies, which had been deposited in cases packed with charcoal, were removed from their temporary sepulcher and carefully examined. Sligbt change had taken place in their appearance; but as the rapid settingin of decomposition was feared, the physicians decided to postpone operations until the remains could be taken to Philadelphia, where every facility for a thorough investigation would be at hand. A number of photographic views were according. ly taken, after which a partial embalment was completed, when the bodies were packed into an airtight tin chest and forwarded to their destination. At the time of writing the dissection has not been completed, and public curiosity, now fully aroused regarding the matter, will look with much interest for the forthcoming report. The main question to be decided will be settled as soon as the knife severs the connecting ligature Opinion now inclines principally to the belief that the strange band contains a large artery and many veins, which made the circulation in both bodies identical. This was the view held by many eminent British surgeons, Sir Benjamin Brodie among the number, Sir Benjamin Brodie among the number,
and appears to be substantiated by the fact and appears to be substantiated by the fact
of a compression of the ligature causing the fainting of the weaker brother. On the other side is no less an authority than Nélaton, the great French surgeon, who always maintained that separation could be safely effected, while the family physicians of the twins consider that the circulation in either body was entirely independent from thar in the other. The post mortem, in deciding this interesting point, will also in deciding this irteresting point, will also
necessarily determine whether Eng died necessarily determine whether Eng died
from the shock due to the realization of his from the shock due to the realization of his
brother's death, or from a cessation of the brother's death, or
flow of his blood.

The illustration which we give herewith conveys an excellent idea of the appearance of these remarkable people. They were of decidedly ugly faces-our picture rather flatters them-and were far from amiable in temperament. Eng was the smaller, and generally stood in the peculiar position represented, bent somewhat backward. The details of their early history are somewhat meager. It is said they belonged to a low order of peasantry, and were born in Siam in 1811. Captain Abel Coffin, of Newburyport, Mass., foung them in the city of Meklong, and bought them from their mother In 1850 Barnum brought them before the world, since which time they have been exhibited throughout this country and Europe. Their subsequent history we have already sketched in a previous notice of their death.

How to Keep a Situation.
An observing correspondent in the Western Rural gives the following hints on the above subject
Be ready to throw in an odd half hour or an hour's time when it will be an accommodation, and don't seem to make a merit of it. Do it heartily. Though not a word be said, your employer will make a note of it. Make yourself indispensaemployer will make a note of it. Make yourself indispensa-
ble to him, and he will lose many of the opposite kind before he will part with you.
Those young men who watch the clock to see the very second their working hour is up-who leave, no matter what state the work may be in, at precisely the instant-who calculate the extra amount they can slight their work, and yet not get reproved-who are lavish of their employer's goods-will always be the first to receive notice, when times are dull, that their services are no longer required.

## The Telephon.

This instrument, popularly known as the "steam jackass," is the invention of a farmer in Illinois. This gentleman was the owner of a mule possessed of unusual ability for producing sweet sounds, it having been ascertained that his voice could be heard over a circle of eight miles diameter The mule was killed, and the inventor severed the head from. the body. The head was then carefully preserved from decay, and the inner organs were covered with a substance that was impervious to steam. We are indebted to the Brooklyn"Eagle for a description of the first trial of the invention
" A short piece of rubber hose was attached to the windpipe and connected with a steam boiler. It was a moment of agony to the inventor, as he placed the head in the hands of an assistant and slowly pulled the valve open, a moment of thrilling interest; as the steam was turned on, it passed into the windpipe, expelling the air and producing a sigh followed by a grcan, a snort, a chuckle, then a violent coughing and sneezing. As a full head of steam was turned on, the most fearful noise, the most frightful guffaw, the most vociferous bray, that ever assailed mortal ears was produced. The lipe were contracted, dieclosing a terrible array
of teeth; the features developed a satanic grin, and the jaws rose and fell as the steam crowded the passages; and the ears participated in the general movement, giving to the head an excited and animated appearance. The man who was holding the head gazed upon it a moment with dilated eyes, colorless cheeks, knocking knees and protruding tongue; then, suddenly losing all interest in the performance, he emigrated. As for the inventor, his success ex


## THE SIAMESE TWINS.

ceeded his most sanguine expectations. For an instant be contemplated the head, his countenance working with every manifestation of intense delight; then he, too, started, probably to learn the greatest distance to which that voice would penetrate.'

PROFESSOR R. A. PROCTOR.
There are few instances on record of a man attaining so distinguished and, withal, so well earned a reputation, in so

hort a period of time, as that of the eminent astronomer who has recently delighted the public of this city with his admirable lectures on the wonders of the heavens. Professor Proctor is now in the thirty-sevonth year of his age; and sor Proctor is now in the thirty-sevonth year of his age; and
although he gained hernor in his coilegiate course, and at.
tracted some attention by literary efforts as early as 1863 , it was not until 1865 that he definitely adopted the profession in which he is now universally acimitted to be one of the ablest masters. To his celebrated controversy with the English Astronomer Royal, regarding the proper method of observing the coming transit of Venus, ending in the virtual defeat of the latter, and the subsequent corroboration of Professor Proctor's views by the first American, Russian, and German astronomers, we have already found occasion to allude; and with his published works, the clearest popular exposi tions of modern knowledge regarding the constitution of the celestial bodies extant, we presume our readers to be already familiar. His books are a remarkable com bination of lucid and vigorous expression with scientific accuracy; and while never superficial, their subjects are treated. even when most abstract and uninviting, in a semi-imaginative manner, which lends to them a charming fresbness and interest.
Professor Proctor's most recent work is a collection of essays on topics more of a general than of a purely scientific interest. Lack of space at present at our disposal prevents our here alluding to the "Border Land of Science" in such detail as we could wish, and hence we reserve its review for a more fitting opportunity. We may remark, however, tbat the author undertakes, in its pages, voyages to the sun and to Saturn, tells about life in Mars, and even ventures into the sbadowy realms of ghosts, only. however, to demolish those vagaries of the brain, by the bright light of scientific investigation and logical deductions of cause and effect.
Professor Proctor is of genial and pleasant appearance, and is a fluent and ready speaker. His lectures are excellent even as literary efforts; and although in some instances technically above the ordinary scientific discourse as usually adapted to the comprehension of a general audience, they nevertheless are so agreeably delivered and so brilliantly illustrated, that the interest of his hearers is kept corstantly alive from beginning to close. An artist contributes a sketch as he appears upon the platform.

## To Destroy Insects.

Hot alum water is a recent suggestion as an insecticide. It will destroy red and black ants, cockroaches, spiders, chint bugs, and all the crawling pests which infest our houses. Take two pounds of alum and dissolve it in three or four quarts of boiling water; let it stand on the fire until the alum disappears; then apply it with a brush, while nearly boiling hot, to every joint and crevice in your closets, bedsteads, pantry shelves, and the like. Brush the crevices in the floor of the skirting or mop boards, if you suspect that they harbor vermin. If, in whitewashing a ceiling, plenty of alum is added to the lime, it will also serve to keep insects at a distance. Cockroaches will flee the paint which has been washed in cool alum water. Sugar barrels and boxes can be freed from ants by drawing a wide chalk mark just round the edge of the top of them. The mark must be unbroken or they will creep over it, but a continuous chalk line half an inch in width will set their depredations at nought. Powdered alum or borax will keep the chintz bug at a respectable distance, and travelers should always carry a package of it in their hand bags, to scatter over and under their pillows, in places where they have reason to suspect the presence of such bedfellows.

The Taylor Steam and Hydraulic Cotton Press. About a year ago, we illustrated an improved form of steam and hydrostatic cotton press, the invention of Mr . John F. Taylor, of the Phœnix Iron Works, Charleston, S. G., and in the accompanying description, page 15, volume XXVIII, the reader will find a full explanation of its working. The power is transmitted to the oil, water, or other liquid in the press from the pistons of two steam cylinders, which act upon the plate alternately, one imparting the initial and the other the finishing pressure. The latter is operated by live steam from the boiler, and the former is actuated by the exhaust. The steam is thus used twice over, on the compound principle, thus effecting no inconsiderable saving of fuel.
One of these machines has recently been erected in the warehouse of Mr. E. C. Pentz, foot of West 11th street, in this city, where it is now in operation re-pressing cotton for shipment. The motion of the apparatus is uniform and entirely free from jar, and its capabilities are stated as extending to the pressing of 100 bales of cottton per hour. The inventor submits testimonials to the effect that 700 bales have been pressed in a working day of ten hours. The power of the machine is $2,006,400 \mathrm{lbs}$. under 80 lbs . of steam. A continuous and steady pressure, we understand the inventor to assert,is maintained so long as steam is kept up in the boiler. The construction is strong and simple, and there appears to be a notable absence of pumps, valves, and other portions liable to be quickly worn out.
THe sand blast is said to work well in cleaning the walle. of iron and stone buildings.

## Geographical Progreas in 1873.

Judge Daly, in an able address before the American Geographical Society in this city, of which he is the President, recently reviewed the progress of explorations and other efforts toward increasing our geographical knowledge, made during the year just ended. The lecture was an exhaustive review of the whole subject and a summing up of the results obtained. The utility of geographical societies as organized means of promoting geographical discovery, as well as the necessity for their existence, is proved from the fact that there is yet one seventeenth part of the globe of which we know nothing except by conjecture.
The region which surrounds the south pole, the antartic covers an area of $7,000,000$ of square miles. The arctic measures nearly $3,000,000$. The unexplored portion of Africa may be put down at least as $1,000,000$. The unknown part of Australia is certainly more than two thirds of that amount; and in this connection, attention may be drawn to the great islands of the East Indian Archipelago, stretching from the northeast corner of Asia to New Zealand, occupy ing the most favored part of the earth, and which have in xtent the magnitude of a continent. One of this great group, Borneo, is considered the second largest island on the globe. A strip along the coast of about 100 miles deep represents what we know of it; the interior and larger portion remains unknown. So also of Papua or New Guinea which is as large and may even be larger than Borneo. Sumatra is 1,000 miles in length, and Celebes and Luzon are inferior only to Sumatra; and there are in addition numer ous islands of considerable size, some as large as Ceylon and thousands of minute islands, many alounding in spice and mineral ores.
Regarding recent

## reheological discoveries,

the speaker stated that late excavations made in Rome have evealed that the ancient city, before the Republic, in the time of the kings, was large and strongly fortified, and must have contained an immense population. This is contrary to he impressions of modern historical critics. The foundia tions of the ancient city have been laid open, which consis of enormous works, many of which were great tanks and wells. The foundations are constructed of oblong blocks of tufa, put together without mortar, the style of building being the same as found in the ruins of Etrurian cities.
Dr. H. Schlieman terminated his excavations upon the supposed site of Troy last summer. He thinks that he ha discovered Skaean gate, Priam's palace, and the great wal described by Homer. He writes of his discovery of a great wooden box containing jewels, precious stones, ornaments and arms, such as battle axes, shields, and an immense god et of pure gold, with two handles and two mouths, which box, he says, has disappeared. In the island of Delos a whole temple has been laid bare and the ruins of a whole city discovered, and additional excavations, attended with important discoveries, have been made in Pompeii.
A stone has been found on a farm in Parahyba in Brazil containing an inscription, which, upon examination, was found to be in Phœnician characters, which would prove that the Phenicians had visited America at a very early period.
After fully referring to the various surveying expeditions in Central and South America,

## SIAN EXPlorations

were noted, and it was stated that the Russian campaign which culminated in the capture of Khiva has produced valuable geographical results. The most important infor mation of changes is the addition of the right bank of the Oxus to the Russian dominions, embracing the country north of that river, east of the Sea of Aral. Forty thousand slaves have been liberated in the conquered territory, and slavery has been abolished for ever
Mr. Jacob Halevy has explored the southern part of the Arabian Peninsula, through the interior of Yemen, a coun try little known and where traveling is perilous. His jour ney extended from Hodegeda, on the Red Sea, in a norther y direction, through the Wadi Flabouna, $18^{\circ} 55^{\prime}$ north lati tude.
In this part of the country he found many Saboean inscrip tions, and saw the source of the River Kharid, which runs toward the interior of Arabia and disappears, after fertiliz ing the numerous oases of the Djaouf. He believes this to be the river which is alluded to in a passage of Strabo as having been crossed by a Roman army, Aelius Gallus, before entering the country of the Sabcans. Innumerable ruins in a crumbling condition, he says, cover the soil on the banks of the Kharid and its affluent, the Medheb.

## THE ANCIENT JERUSALEM

Concerning the explorations in Jerusalem, the speaker said:
The deiails of this work, which occupied nearly three years, are too numeroas to enter upon; shafts were sunk below the present city in various places to a considerable depth, and discoveries were made of extensive subterranean passages and galleries, winding aqueducts and canals which were cut in the solid rock, chambers, drains, sewers, wells, and tanks. A stream of running water was found, showing that fountains exist far below the surface, and are still run ning, a ciicumstance of interest, as there is now a dearth of water in Jerusalem. Inscriptions in the Phœnician charac ters in red paint were found upon walls, and many objects of interest were gathered, such as lamps, pottery, weights, seals, gems, and sepulchral chests, some of them very beautiful, containing human remains. An attempt was made to determine the exact position of parts of the Temple and the
site of Solomon's palace; but while the investigations have had the effect of disturbing many of the previous theories as to the precise locality of places, they have not been suffi cently certain to remove doubts, or dispense with further nquiry.

## the peninsula of sina

has been surveyed by Professor Palmer and Dr. Drake, and they conclude the locality to be the scene of the events ecorded in the history of the Exodus, and its examination has certainly furnished a remarkable corroboration of the truthfulness and accuracy of the Biblical history. The country is extremely wild and rugged, and has one of the most complicated systems of drainage in the world. Formerly it was well wooded, its mountain sides terraced with gardens; its rushing waters regulated and utilized; and this fertility lasted until comparatively modern times. Jebel Musa is considered to be undoubtedly the Mount whence the Law was delivered.

## palestine.

The country lying east of the Jordan and of the Dead Sea has been undertaken by the American Palestine Exploration Society. It embraces the part of Palestine which is the east known, and is in territorial extent three times as great s the country surveyed by the English. It abounds in rins, inscriptions and objects of great interest, and its exploration will undoubtedly throw a great deal of light, not only upon Biblical history but upon the former history of he whole country lying midway between Ancient Assyria and Egypt.
Lieutenant Steever has spent about five months in explorations east of the Jordan. He has surveyed about 600 square miles,and has prepared a very valuable map. The explorations were in Edom and Moab. Various sites have been satisfactorily identified, and the positions of Mounts Nebo and Pisquit determined. The levels of many important spots ere taticen, a rumber of ruins in Moab examined, and in. eresting imseriptioms copied.

## afrtcan explorations

re represented to be less fruitful in positive results than hose of former fears.
MM. Compeigne and Marche have undertaken to penetrate Equatorial Africa in the vicinity of the Gaboon. Their object was to trace the course of the Ogoone and the lakes to which it is supposed to lead, one of which is reported to be very large. The last accounts of Dr. Gandy, the commander of the West Affican Livingstone Exposition, are that he left San Salvador, the farthest point in the Portuguese dominions, for the country east, which is nearly a blank upon our maps. A German expedition, organized by Dr. Bastian and the Berlin Geographical Society, left last spring for the ex ploration of Loango.
With a glance at the reports of exploring expeditions in Australasia, Judge Daly concluded his survey with a refer ence to the telegraphic event of the year, which he thinks as been the completion of a line of telegraph across the entire length of Australia, from south to north, from Adeaide in the south to Port Darwin in the north, a distance of 2,012 miles.
The completion of the telegraph across Australia gives a line, from Adelaide to Gibraltar, of 12,462 miles, of which 9,146 miles are submarine. The practical result is that Australia now receives news three weeks earlier than the latest brought by the mail steamers.

## Courcspoudence.

## Air Poison and its:Remedy

## To the Editor of the Scientific American

The effects of fresh air upon the human system are well nown to be renewed strength, increased vital force, and ightened complexion; while the fetid atmosphere of close coms produces pallor, weakness, and diminution of the mental capacity. It is remarkable that the same body, air should have such diametrically opposite effects under but lightly altered conditions
After the discovery, in the last century, of the composition of atmospheric air-which is about one fifth oxygen and four fifths nitrogen-it was ignorantly believed to be the absorption of oxygen by breathing, and consequent relative increase of nitrogen, that made the air of crowded rooms noxious; but analysis abolished this idea, and proved that the relative proportions of the two gases are always the same. The oxidation of the carbon supplied by our food causes the gas exhaled from the human frame to be largely omposed of carbonic acid; but the chief impurities of the ir, which cause decay and putrefaction of organic matter are the living vibrios, which multiply so rapidly that, were
it not for the eternal compensation of natural forces, they it not for the eternal compensation of natural forces, they
would soon suffocate all other life off the earth. Their fell enemy is ozone, which is oxygen in a negatively electric tate, and exists in our atmosphere in a propertion varying from one ten-thousandth to one one-hundred-thousandth. Ozone is generated by lightning flashes, which have been ruly said, from time immemorial, to clear the air. The evaporation of saline solutions also disengages ozone, which always found in increased proportion on and near the sea Being more dense, and one and a half times more heavy han oxygen, it descends to the earth, from which the vib rios ascend. It has also a strong phosphoric smell, and has he important property of combining with all bodies, except gold, platinum, and water. This property is its great eapon in the destruction of the vibries.
The open air is the space in which ozone continually rules,
while the vibrios have the supremacy in close and fetid places where ozone is very seldom or never recognized. Every breath we take in such places begins to poison and to weaken our system, while every breath in the open air neu tralizes poisonous agents and renews strength.

## The Aboriginal Americans.

To the Editor of the Scientific American:
There is, I think, abundant evidence that the osseous structure of the mound-building aboriginal peoples differed to some extent, from that of all the present inhabitants of the globe, after making due allowance for individual pecul iarities.
In my researches in this country, which was at one period densely populated by the mound builders, I have never seen anything resembling the short, strong bone running from the sixth cervical vertebra to the scapula, mentioned by Mr R. K. Slosson, on page 244 of your volume XXVIII., and am inclined to look upon such a bone (if found) as a lusus nat urre; but I have found several bones that $I$ am unable to classify or pronounce upon, among which are the submaxil laries, of which I wrote you some time since.
I have a genuine mound builder's akull, which, although somewhat decayed, is a marvel to all who behold it and contrast it with what we know of modern man. There are marks on the skull caused by the copper ornaments with which this once noted character (for such he undoubtedly was) was buried. The man who stood under that skull was probably a stranger to disease, and knew no such thing as fear. A rife ball would hardly fracture or enter his head, if it were to strike it in any way but perpendicularly. There is a peculiar formation where the muscles of the neck wer attached, such as none of us ever saw before. This skull is an object of deep interest, and most especially would I call the attention of all phrenologists to a specimen so rare The copper crown, with which his head was discolored, was so far decomposed that I was unable to save it
Yellowbird, 0.
S. L. N. Foote, M.D

To the Editor of the Scientific American
For the last twelve or fourteen years I have been employed in a shop where there are over three hundred men at work; and, as is the case in all shops of this kind, hardly a day passes but one or more of us cut or bruise our limbs. At first there were but few that found their way to my department to have their wounds bound up; but after a while, it became generally known that a rag glued on a flesh wound was not only a speedy curative, but a formidable protection against further injury. I was soon obliged to keep a supply of rags on hand, to be ready for any emergency. I will here cite one among many of the cases cured with glue.
A man was running a boring machine, with an inch and a quarter auger attached; by some means, the sleeve of his shirt caught in the auger, bringing his wrist in contact with the bit, tearing the flesh among the muscles in a frightful manner. He was conducted to my department (the pattern shop), and I washed the wound in warm water, and glued around if a cloth, which, when dry, shrunk into a rounded shape, holding the wound tight and firm. Once or twice a week, for three or four weeks, I dressed the wound afresh. and it was well. The man never lost an hour's time in consequence. The truth of this statement hundreds can testify to. I use, of course, the best quality of glue.
Racine, Wis.
A. Fielid.

## The Hartiord Steam Boller Inspection and Insurance Company.

This company's report for 1873 has recently been received. It is an unusually interesting and important paper, and the brief summary that we give below does but scant justice to its merits.
Inspections in 1873: Internal, 8,511; external, 23,312total, $31,823$.

Defects discovered: Furnaces out of shape, 599 ; cases of fracture, 1,003 ; burned plates, 682 ; blistered plates, 1,737 ; cases of deposit of sediment, 2,263 ; cases of incrustation and scale, 2,180 ; external corrosion, 818 ; internal corrosion, 333 ; internal grooving, 206 ; defective water gages, 561 ; defective blew-out apparatus, 203 ; defective or overloaded safety calves, 321 ; defective pressure gages, 1,470; boilers without gages, 682 ; cases of deficiency of water, 113 ; cases of loose and broken braces and stays, and insufficient bracing, 465total, 13,866.
Boilers condemned in 1873, 178.
Boiler explosions in the United States in 1873, 88 ; number f persons killed, 139 ; number of persons wounded, 164
r'ases of distortion and fracture of furnace sheets occur from low water, deposits of sediment, and a cold water feed. It is economy to heat the feed water, because it both saves fuel and prevents wear and tear. Sheets are liable to be fractured, if boilers are blown down when heated. Blisters in plates occur from the use of iron which is not homogeneous. Blisters should be cut off; and if the thickness of the plates is much reduced, patches should be put on. The deposit of sediment gives the most trouole to steam users. When the feed water contains carbonate of lime, it will be deposited in a hard mass, if the boiler is blown down when hot; but it can be washed out, if the boiler is first allowed to cool. Grease in the boilers seems to combine with the carbonate of lime, and sink down upon the plates, keeping the water from them and causing overheating and burning. Feed water heaters, with separating plates or chambers, seem to work well when the water holds solid substances in solution. The deposits of sulphate of lime are the mos
troublesome. Potatoes and slippery elm seem to prevent
and remove scale in many cases. Substances containing and remove scale in many cases. Substances containing tannic acid also seem serviceable with some kinds of water. There should be frequent blowing off when these solvents are
used. Crude petroleum seems to prevent scale when the used. Crude petroleum seems to prevent scale when the water is principally impregnated with sulphate of lime, but is not recommended where the carbonate of lime is the prin cipal foreign ingredient.
External corrosion is frequently caused by the exposure of boilers to the weather, and by leakage and dripping. It is a bad practice to put ashes on top of the boiler, wood ashes being the most liable to produce corrosion. Coatings of felt or calcined plaster can be used with benefit. Ashes are fre quently allowed to accumulate in the ash pits of boilers, and, becoming wet, produce corrosion.
Internal corrosion is caused by scale, or by acid in the water. If the latter occasions the trouble, the surest remedy will be to abandoa the water and get a supply from another source. The dyes discharged from factories into streams frequently render the water unfit for use in boilers. This difficulty can sometimes be remedied by neutralizing the acid by the use of soda or soda ash. It should be remarked, however, that a! 1 the solvents and neutralizers mentioned above should be used with great caution, as their indiscriminate application is frequently productive of more harm than good.

Internal grooving or channeling probably arises from une qual expansion and contraction, in connection with the us of impure feed water. Glass gages are sometimes stopped up by a mixture of grease with the impurities of the water The lever safety valve is most commonly used, and, under the care of a competent and reliable man, is all that is needed. It should, if possible, be so arranged that it cannot be tampered with. It should be raised every day, in order to prevent corrosion and sticking to the seat. Pressur gages should be tested every few months. The hight of the water in a boiler should always be ascertained before start ing the fire. It'is not unusual to look after the fire first and the water afterward; and in many cases, boilers have bee nearly ruined from this cause
Many boilers are braced imperfectly, or not at all. Boilers are frequently left without examination for months, and the bracing becomes defective. Steam users take too many chances, under the advice of boiler makers who are ignorant

The abore will be sufficient to show that there is no need of mysterious theories to account for boiler explosicns. Boilers, with the best of care, will wear out, and the proces is mach hastened if they are improperly set and badly managed

The Company employs about 30 inspectors, who inspect the boilers under their care quarterly and semi-annually Defects, when discovered, are pointed out; and unless they are repaired, the Company's liability ceases.

## SCIENTIFIC AND PRACTICAL INFORMATION

adulterations in fellow and red chromes
The yellow and red chromates of lead, employed as pig ments, frequently contain sulphate of lead. This substanc is insoluble in strong nitric acid, and in this way it can be de tected; hut a neater and more convenient method, proposed by Dr, Julius Löwe, consists in the use of hyposulphite of soda. The finely pulverized pigment is placed in a moder ately concentrated, cold solution of pure hyposulphite o soda, when the sulphate of lead readily dissolves, leaving the chromate unacted upon. After filtering, the filtrate may be tested for lead by adding a solution of the neutral chro mate of potash, when the yellow chromate of lead will be precipitated. If it is desired to ascertain the amount of th sulphate of lead present, it may be precipitated by sulphur etted hydrogen gas, or by sulphide of ammonium, as sul phide of lead, which is then purified and converted into sul phate of lead by the use of fuming nitric acid, and weighed This method is preferable to the one depending on the in solubility of sulphate of lead in nitric acid, as proposed by E. Duvillier recently, since there might be other insoluble adulterations present, as, for example, barytes

## He DETECTION OF BLOOD SPOTA.

M. Sonnenschein states that tungstate of soda, strongly cidulated with acetic or phosphoric acid, throws down albu minoid m:tters from very dilute solutions. These precipi tates, insoluble in a large excess of water, dissolve in alkalies especially if hot. If defibrinated blood is treated with this salt, a red brown precipitate is formed, which becomes clotty on boiling. All the coloring matter is precipitated. To de tect blood spots by this means on clothing, the suspected portion is cut off : and after having been treated with distilled water, the filtered solution is precipitated with the above re agent. The precipitate, washed and treated with ammonia takes a reddish grey color. If phosphoric acid be present it must be carefully washed away before treating the precip tate with ammonia.

## tie telegraph in china

The Great Northern Telegraphic Company has recently es tablished a line between Woosing and Shanghai. Twenty words are sent for a dollar. This is the first successful attempt to introduce the telegraph through the main portion of the empire, as previous efforts have been met with vio ent opposition from the people, who cut the wires and de stroyed the poles.

## NITRITE OF AMMONIA

M. Berthelot has recently succeeded in producing this body for the first time in a crystaline state. Nitrite of baryta is placed in sulphate of ammonia. The precipitated sul.
phate of baryta is collected on a filter, leaving the nitrite of mmonia in solution in the liquid. The crystalization of the latter cannot be obtained by heat, as the same causes a rapid decomposition of the substance; hence the liquid is placed under the receiver of an air pump, with very hygro copic materials. In spite of these precautions, however, and although the operation is conducted at the freezing tempera ure, about two thirds of the product become decomposed The balance, however, is pure nitrite of ammonia, crystalized in white needles. The body is remarkable for its explosive properties, detonating violently at $165 \cdot 2^{\circ}$ Fah., or by reason of shock, with a force nearly equal to that of nitro-glycerin

## circular compass needlf.

M. E. Duchemer has addressed a note to the French Academy, in which he claims that a circular compass needle possesses the following advantages over the usual form : 1. A magnetic power, for a given diameter, double that of needle whose length is equal to this diameter.
2. The existence of two neutral points instead of one which has the effect of maintaining the position of the two poles constant; the magnetism seems to be so energetically preserved that even the strongest sparks of a Holtz machine donot cause any displacement of the poles of the magnet.
3. A more satisfactory means of suspending the magne when it is well mounted and balanced by a plate of agate; $i$ seems then to move as if placed in a liquid.
4. An increase in sensibility of the magnet proportional to ts diameter
5. The possibility of neutralizing the magnetism of the vessel by means of a second magnetic circle, changing the position by an amount calculated beforehand, and thus per mitting the compensation of the compass before the sailin f the vessel. This idea was suggested by Captain D Venie.-Comptes Rendus.

EW Experiments in convection
The phenomenon of convection of heat in a liquid, conisting in that the superior portion of the mass is always a more elevated temperature than the lower part, can be clearly illustrated by the following novel experiments :
Two glass tanks are placed before a white surface; one filled with cold and the other with boiling water. A solu tion of starch is freshly prepared in a large test tube, and,by the addition of an aqueous solution of iodine. colored a deep blue. The liquid is then warmed until this color just dis appears, care of course being taken not to add an excess of iodine, which would prevent this action; and the tube is then plunged into the cold water. The blue color, brought back by the cooling, will appear first in the lower portion of the ube, and will gradually extend upward, thus proving that it is the lower portion of a warmed liquid which first become ufticiently cooled to cause a return of the tinge
In the other tank, containing boiling water, a similar test ube, containing a blue liquid obtained by the addition in excess of caustic potash to a solution of sulphate of copper and tartaric acid, to which a little grape sugar is added, is placed. The formation of yellow oxide of copper begins a the surface of the liquid and descends gradually to the ower portions, showing that it is the upper part which first ttains the temperature necessary to cause the re-actio which precipitates the oxide of copper.

## The Fireproof Building Company.

On January 12, a fire test was made of the Fireproof Build ing Company's concrete, at their works, corner of Corlear and Cherry streets in this city. Below we give the details, which will doubtless be interesting to our readers: The company had constructed a small house, and a model of a mansard roof. The latter was open at the top, and was made with wooden rafters, covered on both sides with the oncrete blocks, the inner blocks being $1 \frac{1}{2}$ inches in thickness, and the outer ones, $2 \frac{1}{2}$ inches. The inner blocks were hollow, and the outer solid. A part of the outer covering was slated and a small space was covered with plastic slate roofing which consists of ground slate mixed with a residuum of coal tar until it acquires the consistency of common mortar, and is then applied with a trowel to a double layer of felting, the slate mixture having a thickness of about $\frac{1}{4}$ of an inch This was arranged so that the edges were not exposed, being covered by the common slate. A fire was made both within and around this model, and was allowed to burn for 35 min -

During its continuance, loud explosions occurred caused by the hard finish breaking off from the inside of the blocks, the material not having been thoroughly dried When the fire was extinguished, it was found that the ordi nary slate had crumbled to a serious extent, while the plas tic slate was uninjured. The concrete blocks were apparently unchanged.
The next test was made with the house. This wasa small building about 8 feet square, and the same hight. It was built near the factory chimney, with a flue running into the himney. The walls were $7 \frac{1}{2}$ inches thick, and an inside wall, also $7 \frac{1}{2}$ inches in thickness, was built on one side, a hole be ng made in the outer wall on that side, so that a thermometer could be inserted. The walls were made of solid blocks. The roof of the building was composed of wooden rafters, covered with solid blocks 4 inches thick, and having blocks, 2 inches in thickness, suspended from the bottoms of the rafters. The floor was constructed in a similar manner. A large fire was made in the house with logs soaked in oil, and was allowed to burn for 50 minutes. After the fire had been burning for 20 minutes, the inner wall had ardly become heated through. The space between the two walls was filled with steam after the fire got well under way During this test a large block of concrete with thr e holes in t had a piece of wood put into one, some paper into the
ther, and a handful of shavings into the third. The holes were then closed with cement, and the block was thrown ino the fire, a bucket of oil being also thrown in immediately terwards. After the fire was extinguished, a workman reaching into the building, chipped away pieces of the floor nd ceiling blocks. The beams were thus exposed, and they were found to be damp and scarcely warm to the touch The large block was broken open and its contents were found to be in a similar condition. After this test, the visitors were shown a floor, built of these blocks, and weights were put upon it to prove its strength.
The blocks with which the foregoing experiments were made are composed of cement, consisting chiefly of the hy draulic lime of Teil, which is said to combine great strength with lightness. The blocks used for partitions have been ound capable of resisting a crusbing force of 800 pounds per square inch, and the weight of these blocks, 4 inches in hickness, is 11 pounds per superficial font
We should have stated that the fire was quickly extin guished by water at the conclusion of the tests. and that the blocks showed no signs of cracking, under this severe proof. Those who have carefully perused the foregoing state ments will see that these tests are not conclusive as to the reproof qualities of the material. As a general rule, buildings do not take fire immediately after completion, and tefore the cement is dry. It would be interesting to see an periment with this concrete after it had been thoroughly dried.

## THE RIBBON POST

The Ribbon Telegraph Post Company, of Manchester, England, have recently introduced a light and graceful form of iron pole or pillar, constructed as represented in the annexed engraving. extracted from Iron. The ribbons are made around a mandrel, which is provided on its exterior with spiral intersecting grooves. The latter form a recepacle for the ribbons, which are wound on by machinery, without $t$ wist or strain, and in such a manner that the gradal decrease of the pole is compensated for. The first series s put on from right to left, beginning at the bottom; the next, in the reverse direction ommencing at the top. The ap, and are, at this stare lap, and are, at this stage of he operation, temporarily se cured to those beneath them y bolts fitted in holes previ usly punched in both, so a o coincide exactly at the points of intersection.
The core of the mandrel is hen removed, causing it to collapse, when the pole is with rawn and placed upon a cyl indrical bar, ready for the in ertion of the angle iron These, previously punched re secured by rivets to th ntersections of the ribbons, the temporary fastenings being taken out. The cap, the natur of which depends necessarily pon the uses to which the pol is to be devoted, is then put on; and the base, consisting of various forms, strengthened with extra iion and inserted, for some little distance, with he ribbon and secured to plate which affords a strong upport, is added
The strength of poles thu onstructed is said to be ver great. Two, without angle rons, measuring 10 feet by 8 aches, supported a weight of 0 tuns without sinkage, de ection. or collapse. The tota weight of a telegraph post 31 feet long is about 434 pounds On rocky ground, these post can be fastened directly to the surface of the rock : no light ning conductor or earth wire is
 equired, since the poles are
themselves conductors; no ladders are needed; they offer small resistance to the wind, and are ornamental and durable. It is suggested that they may be advantageously used as substitutes for the heavy iron pillars or clumsy wooden supports frequently employed in the construction of conser atories, porches, etc.
The OHM.-The term " ohm" is derived from the name f the celebrated electrician who first ascertained the laws of lectrical resistance, and is a measure of resistance of which is the unit, in the same way as we use the inch or yard in he measure of length. The "ohm," as a unit of resistance, was adopted by a committee of the British Association,many ears ago,and is now the acknowledged standard of resistance hroughout the world. The ohm represents the resistance f about 210 feet of copper, wire No. 16, or galvanized wire o. 8 , une
of $60^{\circ}$ Fah.

To pass our time in the study of the sciences has, in all ges, been reckoned one of the most dignified and happy of ges, been reckoned one of the m

## IMPROVED COTTON WORM DESTROYER.

The inventor of the device represented in our engraving proposes to exterminate cotton worms by ejecting a poisonous liquid over the plants on which they exist. To this end he has devised a novel apparatus, mounted on wheels, so as to be drawn by horses around the field, which is provided with mechanism by which the fluid is distributed in the form of a fine spray.
There is a large tank or reservoir, A, into which the poison is placed, and from which it is lifted by the double action force pump, B, into the two branches of a pipe, $C$, on top of he tank. The lever of the pumps is actuated, as will readily be understood from the engraving, by a pitman pivoted eccentrically on one of the wheels of the apparatus. From the pipe, $C$, the liquid passes through a uitable valve, by which its flow is readily governed, and into a horizontal tube, D , which runs transversely across the rear of the tank. To this tube are connected several shorter pipes, E , a section of one of which is represented in Fig. 2. In the interior of these attachments, which are of cast metal, are cut grooves, and their lower ends are clos 2 by plugs of india rubber, which are secured by a rod and set screw. By means of the latter the stoppers can be tightened or loosened in the opening at will.
It will be seen that the liquid, being continually carried up by the force pumps, will, in passing through the lower end of the tubes, $E$, escape by way of the grooves, and assume the form of fine spray, which will penetrate and evenly distribute itself over the foliage of the plant. The wheels upon which the apparatus is mounted are smaller than those ordinarily used for wagons, and are attached to the tank by means of vertical bars. The machine is thus enabled to pass over the rows of plants without injuring the same; while, at the same time, the dimensions of the wheels are such as to give the required number of strokes to the pump lever necessary to the production of a constant and full volume of spray from the pipes, without auxiliary gearing. The action of the device is necessarily automatic, and hence but a single hand is needed to regulate the spray openings, admit or cut off the liquid, and guide the horse or horses attached to the machine.
Patented December 16, 1873 . For further particulars address the inventor, Hon. J. W. Johnson, Columbus, Texas.

## IMPROVED BEARING FOR SHAFTING.

In examining the annexed engraving, the reader will notice that the box through which the shaft passes (instead of being made in the ordinary manner, that is, divided longi-

tudinally, and the halves united by bolts) is constructed of two portions of unequal size. The idea of the inventor is to produce a bearing, the ends of which, in taking against the usual collars or rings, secured to the shaft to prevent end motion of the box, shall not cause the unequal wear of the collars and the consequent disagreeable noise.
The lower portion of the box, A, Fig. 2, is cast hollow to fit the shaft, and in a single piece; while at its extremities rings, $B$, are provided to abut against the collar, C , on the shaft. These rings present a smooth surface to the collars, and hence exercise but very little wearing effect upon the same. In putting up a line of shafting, the box, A, has to be slipped over the end, the shaft passing through the rings which, of course, support the box when bearings are being fitted, and also during repairs, etc. The upper part of the
box, D, fits, as shown in Fig. 1, in the opening between the rings, B , and, if both portions are made with flanges, the bearing is readily attached together by bolts in the usual way.
In our engravings, however, these flanges are omitted, and the mode of securing the box in-the hanger is clearly shown in Fig. 1. Lugs are cast upon the box, A, which fit in suitable sockets in the hanger; and an indentation with raised sides is formed upon the cover, D , into which a screw, passing through a projection on the support, is, by a nut, firmly turned. It will be noticed that the apparatus, while thus held tightly in place, can, by loosening the screw, the work $\mid$


## JOHNSON'S COTTON WORM DESTROYER.

of a minute, be quickly opened for any purpose. In practice, the apertures in all boxes of the same size are designed to be of similar dimensions, so that all the covers may be ast alike, and hence all fit any one box. The in ventor states hat the difficulty often met with in losing line by taking off the ordinary boxes and then replacing them accidentally end for end, as may easily be done, is here necessarily avoided, as the lower portion of the bearing is always on the shaft, unless removed over the extremity. The interior of the box is lined with the usual Babbitt or other suitable metal.
Patented December 16, 1873. For further particulars, address Messrs. Pierre J. Hardy \& Co., 156 West 19th street, New York city.

Manganate of Baryta as a Green Pigment
The manganate of baryta, possessing a handsome green color, has attracted the attention of color manufacturers; and it has been proposed to employ it as a pigment. Two methods of preparing it have been published: One consists in igniting together the nitrate of baryta and manganese oxide or dioxide; the other consists in fusing a mixture of of pyrolusite or black oxide of manganese, caustic baryta, and chlorate of potash. By either process a green mass is obtained, but the second method seems to yield a more beautiful and homogeneous product. In experimenting with other and more direct methods for preparing a baryta green of great purity and beauty, Fleischer has made several observations of its properties not generally known, which will, we think, prove of interest to our readers.
If a green solution of manganate of potash be precipitated while boiling, by chloride of barium, a heavy, granular, but not crystaline, precipitate of manganate of barium is obtained. This precipitate has a violet color, approaching blue, can be washed by decantation at first, and afterwards may be collected on a filter. On drying the precipitate, its color grows lighter with the increase of temperature ; and on being heated to a dark red heat, it looks almost perfectly white, with only a shade of grayish blue. If then it be heated still higher with free access of air, or in an oxidizing flame, it gradually turns green; by carrying the process farther, the color becomes a beautiful greenish blue, and inally at a very high heat a dirty grayish brown mass is formed from the reduction of the manganic acid to binoxide of manganese.
On adding chloride of barium to a solution of the permanganate of potash, and boiling, a precipitate is slowly formed, of a peach blossom color, while the liquid retains a deep violet color. By decanting and bringing the mass, diluted with water, on a filter, the precipitate is not decomposed and can be dried at $100^{\circ} \mathrm{C}$. without changing color. When the dry permanganate of barium is gradually heated, its color also grows paler, but does not, like the manganate of baryta, acquire a green color at a still higher temperature; for after the color has once vanished, an increase of temperature soon converts it into the grayish brown mixture of the binoxide of manganese and baryta, or carbonate of baryta. Hence it is impossible to prepare the green manganate of baryta from he permanganate
In regard to the color itself, experiments have shown that he most beautiful green is that formed by igniting the manganate as described above. The green prepared by Rosenstiebl's process,-fusing together caustic baryta, chlorate of potash, and binoxide of manganese-is less beautiful than
the above; while that attained from nitrate of baryta and binoxide of manganese is far inferior to either of the others. Perhaps, however, this color could be improved by preparing it in a reverberatory furnace with a strong oxidizing flame.

The blue green baryta pigment has different shades according to its preparation, some being almost pure blue with only a shade of green, and resembling the light blue quill feathers of many parrots. The greener the color, the more it gains in intensity, but it loses in fineness, although still urpassing the green manganate of baryta.
The production of the blue or bluish green baryta color is due entirely to the alkaline property of the mass. Whether each definite color is due to a definite composition is doubtful, since the temperature, which must not exceed that of a bright red heat, ex. erts a great influence on the color. This much is howevercertain, that both manganic acid as well as the permanganate of baryta, when mixed with about 20 per cent of hydrate of baryta and ignited at a red heat, will always produce this blue green color. It is evident that the blue green color is dependent entirely on its basic character; for on placing this jowder in weak acids, it first turns green aná is then gradually decomposed. The baryta pigment is quite permanent, and may be subjected to the action of strong sulphuric acid for hours, at the ordinary temperature, before the color will be destroyed. Boiling potash solution has no perceptible effect on it. The permanence, especially of the blue shade, is increased by adding a little baryta, which increases its alkalinity. It is also worthy of remark that the pigment prepared from the nitrate of baryta is much less permanent, because the nitrous acid present will after a time exert a reducing action.
The baryta pigments seem especially adapted to fresco painting, because they appear very bright and lively on stone, and especially on lime, where many other pigments lose their beauty or are entirely destroyed.

The Bridge over the Alleghany, at warrenton, Pa. We are indebted to a correspondent, Mr. A. Hertzel, for the following particulars regarding the structure above named, which is one of the handsomest of the many iron bridges crossing the rivers of the United States. The length of span, from cen ${ }^{*}$ er to center of the towers, is 470 feet. The latter extend 44 feet above the abutments, the masonry of which is 24 feet above the water. The floor beams are $33 \frac{1}{2}$ feet long, giving a roadway of 19 feet and a sidewalk of 5 feet on each side. The two main cables are composed of 7 two inch steel wire ropes each, manufactured by J. A. Roebling's Sons, of Trenton, N. J. The cost of the work was $\$ 45,000$.

## COMBINED LOUNGE AND BATH TUB

This is an ingenious combination of two indispensable ar-

ticles of household utility, which will be found a conve nience to persons occupying apartments in which economy of space is of importance. The invention, which was paten ted by Mr. Conrad Wendel, of New York city, consists in arranging, under the seat of a lounge, sofa, or bench, suitable supports, A A, for a bath tub, B, Fig. 2. The seat is hinged to the frame so as to form a cover for the tub, and to be readily thrown forward when it is desired to use the latter, in the position shownin the sectional view. The tub is provided with suitable flanges to rest on the cleats, $A$.
The seat is shown closed in Fig. 1, and serves to conceal the tub, and also as a cover for the same, to prevent the entrance of dust, etc. The tub is also supported by straps, C, which embrace its body at suitable distances apart, and which are secured to the frame.

## THE ARTIFICIAL MANUFACTURE OF BUTTER.

The preparation of butter from substances other than cream, and by means other than the time-honored churn, is a subject which seems to be attracting considerable attention. With the view of presenting the fullest possible information on this interesting subject, we have obtained descriptions of various plans, for butter making and refining, patented in the United States, from which we are enabled to compile a comprehensive statement of the progress of invention in this direction. The extent of the topic necessitates its subdivision, and hence, in its consideration, we propose to treat it under the following heads: Manufacture of butter and shortening for culinary use from fats; manufacture of butter from whey; modes of purifying and improving but ter; and, finally, butter-coloring compounds.
the manufacture of butter, etc., from fat
Taking the various processes in their chronological order, the earliest on record is the patent of H. W. Bradley, of Binghamton, N. Y., and is dated January 3, 1871. It con sists in a mixture of refined vegetable or fixed oil, hog's ard or stearin, and tallow, heated and agitated with wate by means of a current of steam. After a suitable length of time, the oil is drawn off and allowed to cool. This produces a purified grease, which may answer for some culinary purposes, but is hardly, we should imagine, palatable for table use. The same inventor, in a specification dated October 3 1871, describes a mode of removing the offensive taste and smell from cotton seed oil, by adding one ounce of chlorate of potash and niter to each gallon. After heating and agita tion, the oil is drawn off and treated with a current of pure oxygen, the effect of which is to deodorize and oxygenate it rendering it, according to the patentee, sweet and palatable for cooking purposes.
The modest claims above noted are somewhat oversha dowed by the numerous advantages which Dr. de la Perouse, of Paris, considers are obtained by his method of preparing fatty matters, patented November 21, 1871. He proposes to render fats, however rancid, neutral and pure-to produce low priced cooking butter, which will always remain swee -to give the prepared material improved digestible qualitie -to preserve meat by enveloping it in unoxidizable fat-t make superior candle tallow, and, lastly, to mix liquid fat with flour of leguminous plants (peas, beans, etc.), or with chopped meat, to form a nutritive food. This last seems to he simply pemmican, an article of diet well known to the in habitants of the northern part of this continent. The ope ration consists in placing a tun at a time of raw fat (beef pork, or mutton) with distilled water, in which is dissolved a quantity of the sesquicarbonates or bicarbonates of oxide of potassium or aluminum. A solution of chloride of sodium r potassium is then added, and the whole boiled, first active ly and then moderately, for several hours, when all the fa becomes separated from its cellular tissue. After a repose of two or three hours, the melted fat is passed into refrige rators, and thence into casks for the market.
Mr. Alfred Paraf's patent, which is next in date, April 8 1873, is that under which the oleomargarin butter is made This process has already been fully described on page 246, Vol. XXIX. of the Scientific American, but a brief review of its salient points will not be here out of place The fresh fat, finely chopped, is mingled with its own weight of water at $120^{\circ} \mathrm{Fah}$., at which temperature it is maintaine for hours. The whole is then allowed to cool, when the mixture of congealed oleomargarin, stearin, and mem.
brane is separated from the water and worked with common brane is separated from the water and worked with common salt between cylinders, after which it is placed in bags and squeezed in a hydraulic press. This operation is performed in rooms at a temperature of $60^{\circ}$ Fah., which is the melting point of oleomargarin, so that, by this means and by the me chanical contrivances, the latter is separated. It is finally re worked with salt, and churned into butter in the ordinary manner, with a proportion of buttermilk.

Mr. Joseph R. Brown, in a patent dated December 23, 1873, proposes to purify tallow, remove its smell, and render it hard and solid at all seasons of the year, by placing the substance in one fourth its weight of water, to which two per cent of strong sulphuric acid is added. This is heated to $200^{\circ}$, an the melted tallow, after an hour or so, is drawn into anothe tank in which there is a solution of alum. The temperature of $200^{\circ}$ is again imparted, when air is forced into the mass for half an hour. Cooling then follows, and the water is drawn off. The tallow is lastly brought to $230^{\circ}$, and more air driven in, when, after settling, it is made up into suitable packages. Bleaching is effected by mixing chloride of sodium vapor with the air that is forced in.
A process which seems different from any yet described, and which is claimed to consist of artificially performing the natural functions of the lacteal system of the cow, when it absorbs its fat in order to transform the same into butter, was patented December 13, 1873 , by M. Hippolyte Mége, of Paris, France. The first operation is to neutralize the ferments; and to this end the fat, as soon as the animal is killed, if possible, is immersed in a solution of sea salt and sulphite of soda. Crushing under millstones follows, and then artificial digestion, at a temperature of $103^{\circ} \mathrm{Fah}$. This is accomplished by a compound of half the stomach of a pig and biphosphate of lime. When the fat is perfectly liquid. showing no lumps, more sea salt is added, and it is drawn off into water, at $86^{\circ}$ Fah., contained in wooden tubs. Here most of the stearin is deposited in the form of teats in the middle of the liquid, which then goes to a hydro-extractor, or centrifugal machine, which effects the complete separation of oleomargarin and stearin. The former, says the inventor, is an excellent butter fo: kitchen use, but he improves it as follows: Cream, bicarbonite of soda, and the
udders of a cow, chopped, are macerated and passed through a fine sieve. This mixture, wth coloring matter, is added to the margarin, which becomes thick, tastes like cream, and, when cold, is passed through large cylinders, which give it a homogeneous mass, and complete the production. When the butter is to be kept for long periods, water is substituted or cream in macerating the udder. The stearin is used for candles or may be saponified.
butter from whey
is made by three processes. The first is that of Homer C. Markham, of West Turin, N. Y., and dated December 11, 1866. After cheese making, the whey is drawn off into a kettle, and to it is added dairy salt and a kind of acid made of old and sour whey. This is heated to about the boiling point, when the cream rises, is skimmed off, and, after cooling, is churned in the ordinary manner. The amount of whey given off by 450 pounds of milk will, it is stated with suitable proportions of the ingredients above mentioned, give three pounds of good butter.
Mr. James Suggett, of Cortlandville, N. Y., in a specification dated December 18, 1866, describes the second process, the first operation of which is to pass the whey into a cooling chamber which is surrounded with cold water. A solution of saltpeter, borax, and saleratus is added, and the whole left in the cooler for twenty-two hours, at the end of which time the cream, having risen to the surface, may be emoved and made into butter.
Mr. Ira Page, of Adams, N. Y., patented June 23 , Mr. Ira Page, of Adams, N. Y., patented June 23 , tand 24 liours; and to the cream, which is then skimmed off, saltpeter is added. The butter obtained by churning is worked with salt and sugar.
There is another plan for butter making which, though not properly coming within the above sub-heading, may nevertheless be found worthy of notice and, doubtless, of trial. It is the invention of Mr. Adolphe Mot, of Washing. ton, D. C., patented July 19, 1870 ; and we add a smal engraving, which shows its construction. There are two

ubes, the inner one, $A$, of which may be revolved by suita ble means within the outer. Within the tub, A, the sides of which are perforated, are placed, first, a quantity of pu micestone, baked clay, or similar porous substance, B, th cream, C, tied up in small bags, and, finally, more pumice The effect of the latter is, after a few hours, to separate the buttermilk from the cream, leaving pure butter in the bags Tub A is then revolved, and the liquid is projected through the perforations into the outer vessel, and, lastly, water i added for washing purposes, which is got rid of in a simila manner

## We now pass to the

refining and purifying of butter
Mr. D. H. McGregory, of Detroit, Mich., patented (Septem ber 10,1867) a process which consists in adding to one pin of milk, fresh from the cow, the yolks of two eggs and pound of poor butter. This is churned, salted, and worked in the usual way, producing, it is stated, two pounds of fresh wholesome butter. Mr. Joseph Sigler, of Anderson, Ind., in a patent dated November 5, 1867, proposes a somewhat simi ar operation, churning together 1 gallon of sweet milk, ounce of loaf sugar, 20 grains of nitrate of potash, 1 ounce of liquid rennet, and 10 grains of annatto, with 8 pounds of butter. The weight of the resulting comporand is not given. Louis S. Robbins, of New York city, suggests, in his patent of July 28, 1868, that butter, after churning, will be less likely to turn rancid if heated to a semi-liquid condition, and then washed, first with warm and afterwards with cold water, so as to remove the buttermilk and other impurities. Butter already rancid, according to the patent of Mr. Calvin Peck, of Marshal, Ill., dated November 20, 1869, may be re stored and purified by adding two ounces of pulverized alum to every five pounds of butter, the latter being melted. The butter, while still liquid, is passed through a fine sieve into clear cold water, from which it is removed and worked with dairy salt, saltpeter, and sugar. Wè add an engraving of the apparatus recently devised by Mr. George Kirchhöffer, of Cbi cago, Ill., and patented June 10, 1873. A quantity of butter in a melted condition, is put in a reservoir, A, its temperature being kept between $100^{\circ}$ and $120^{\circ} \mathrm{Fah} . \quad \mathrm{B}$ is the congealer, which is filled with milk or buttermilk, and through the hollow sides of which a current of cold water is maintained so that the temperature of the milk is retained betwees $55^{\circ}$ and $65^{\circ}$ Fah. Pressure is next applied to the
surface of the melted butter in the reservoir, through the pipe, $C$, and, a valve being opened, forces the butter down through the tube, $D$, and out of the perforated nozzle at its end into the cold milk. The congealed particles, after being skimmed, are thrown into a filter, E, through which the milk escapes and runs down the inclined trough, back into the congealer. The butter is subsequently worked in the ordinary way.


Different from any of the above plans, and apparently much simpler, is the process patented by Mr. Josiah W. Prentiss, of Pultney, N. Y., Octover 4, 1859. It consists simply in removing the hoops from the firkin, A, containing the spciled butter, placing it in a bag, B, and burying the whole in charcoal, C, contained in a barrel or other recepta

cle. The illustration shows the arrangement, and necessitates no further explanation. Two

COMPOUNDS FOR COLORING BUTTER
have been made the subjects of patents. One, devised by Mr. D. W. Dake, of Brooklyn, N. Y., consists in adding annatto to pure oilobtained by melting the butter. The annatto is mixed mechanically with the liquid, and produces a compound of a reddish golden color, 75 pounds of oil to 5 pounds of annatto being the proportions. One or two pounds of the coloring matter suffice for 100 pounds of butter. Messrs. Bogard, Cramer \& Lewis, of Laporte City, Iowa, patented September 16, 1873, another coloring compound composed of annatto, 5 ounces; curcuma, pulverized, 6 , ounces; saffron, 1 oance; lard oil, 1 pint, and butter, 5 pounds. It is said that the amount of coloring thus obtained is sufficient for 5,000 pounds of butter.

## The Suez Canal.

It has been proposed that the European Powers should buy the Suez Canal, and throw it open for the benefit of the whole world of commerce. The present dues levied by the company, it is stated, are absolutely prohibitive against the greater portion of the imports and exports on both sides of he canal; and a recent increase which has been made, of some 43 per cent on the original charges, on the basis of tun nage, operates to shut out small vessels and heavy goods. Each country, it is suggested, should contribute a certain quota of the purchase money, to be estimated by a determina tion of the amount of benefit which each individual commerce would receive by the enfranchisement; and by this means, the entire estinated amount of $\$ 70,000,000$ (at par, and without interest), it is said, could be collected. Vessels in such a case would be required to pay only such dues as would aggregate sufficient for the simple maintenance of he work, and not by heavily taxed as at present for the accretion of large dividends. It is believed that the commerce of the world would thus be immensely benefited.

## Light Draft Iron Steamers

A paper by Mr. Theodore Allen, on " Iron Hulls for West ern Steamers," has lately been published in the "Transactions of the American Society of Civil Engineers." Mr. Allen is about to remove to the west, to test by practice the correctness oì his theories. We give a brief summary of he paper:
In England, steamers are constructed almost exclusively
of ron; and in this country, the proportion of iron to wooden steamers. now in process of construction, is as 21 to 4.

The first iron vessels were built in the same general manner as wooden ones, with iron ribs and sheathing. It soon became evident, however, that the same strength could be secured with much less material, by building vessels in the same manner as beams are made, and hence the introduction of the longitudinal system. This system has now been generally adopted in England for light draît vessels.
In this country, iron vessels have generally been constructed on the transverse system. The vessel proposed by the writer for service in western waters is to be built on the longitudinal system; and the bottom sheathing, to ensue great elasticity for resisting shocks, is not secured to the transverse bulkheads or frames, the connection of the bot tom plates being made exclusively to the longitudinal frames A comparison of this proposed vessel with a wooden steamer of the same general dir: nsions, is as follows

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Water in boiler
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## 1 New Use for Chicken Feathers.

'bicken feathers are among those waste products of the farm of whici no regular means of utilization has hereto fore been suggested. Myriads of them are strewn over the barn yard, packed into the floor of the chicken house, or are converted into positive nuisances by the wind which be strews them over lawns and flower beds, or drives them into oper: doors and windows. The down alone is, we believe occa-ionally used as a stuffing for pillows or cushions, and sometimes employed as an adulteration in goose feathers; but the long plumes of the wiogs, sides. and tail of the bird, unless made into rude bundles to serve as dusters for the houeewife, are generally regarded as totally worthless.
"According to statistics very carefully compiled," says a writer in La Nuture, "we throw away yearly a quantity of chicken feathers, the intrinsic value of which is equal to the money which we pay out for cotton." A startling statenent, but the author considers it true; and he proceeds to xplain how the feathers are prepared to render them valuable: The operation is to cut the plume portions of the eathers from the stem, by means of ordinary hand scissors. The former are placed in quantities in a coarse bag, which, when full, is closed and subjected to a thorough kneading with the hands. At the end of five minutes, the feathers, it is stated, become disaggregated and felted together, forming down, perfectly homogeneous and of great lightness. It is ven lighter than natural eider down, because the latter conains the ribs of the feathers, which give extra weight. The material thus prepared is worth, and readily sells in Paris for, about two doliars a pound. About $1 \cdot 6$ troy ounces of his down can be obtained from the feathers of an ordinary sized pullet; and this on, the above raluation, is worth about 20 eents. It is suggested that, through the winter, children might collect all the feathers about a farm, and cut the ribs out as we have stated. By the spring time a large quantity of down would be prepared, which could be disposed of to pholsterers, or employed for domestic uses. Goose feathers may be treated in a similar manner, and thus two thirds of the product of the bird utilized, instead of only about one fifth, as it is at present the case.
The chicken down is said to form a beautiful cloth when woven. For about a square yard of the material, a pound and a half of down is required. The fabric is said to be almost indestructible, as, in place of fraying or wearing out at folds, it only seems to felt the tighter. It takes dye readily, and is thoroughly waterproof. There appears to be a good opportunity here for someingenious person to invent machines to cut and treat the feathers.

## Bergen Hill Tunnel

Work on the Bergen Hill tumnel, for the Delaware, Lack awanna and Western Railroad, has been lately commenced in earnest. Sevev shafts are to be sunk, and 500 men kept at work day;and night. The tunnel begins on the east side at the foot of Ferry street. Hoboken, and will be considerably above the Erie tunnel. The track will be elevated above the Erie road, at the west end, on a trestle, thus avoiding the danger and delay of crossing. It wili take two and a half or three years to compiste the tunnel.

## IMPORTANCE OF ADVERTISING.

The value of advertising is so well understood by old established business frms that a hint to them is unnecessary; but to persons establishing a new manufacturer to work it: upon auch a class, we would impress the impor ance of advertistug.
In this matter, discretion is to be used at first ; but experience will soon
he class of persons most likely to be interested in the article for sale, will
be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no other source from whith the adve iser can get as speedy returns as through the advertisting colnmis of the We do anericin
atronage, but to direct persons how to increase thetr own busiusert
The Scientific americay has a circulation of more than 42,000 copie er week, which is probably greater than the combined circulation of al the other papers of its kind published in the world.

Inventions Patented in England by Americans. Compiled from the Commissioners of Patents' Journa
From January 14 to January 15, 1874, Inclusive
.
Engine, Pump, etc.-W. D. Hooker, San Francisco, Cal. Grinding Machine.-C. Heaton, New York city.
Grinding Machine.-C. Heaton, , ew York city.
Making Screws. etc.-E. Nugent et al., Brooklyn.

## DECISIONS OF THE COURTS.


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United States Circuit Court---District of Massacht
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#### Abstract








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## NEW BOOKS AND PUBLICATIONS.

Hussey's National Cottage architecture, or Homes for Every One. By E. C. Hussey, Architect. Price $\$$ (i.
Published by (ieorge E. Woodward, and sold by Orange Judd \& C'a., New York.
This work is a collection of sixty-three plates of pleasing und tastefu ${ }_{1}$ architectural designs for suburban homes, ranging from the modest cot-
rage to ornate and handsome villas. The drawinge are accompanted with full detalls, estimates of cost, hints as to construction, specifcations, and enough geneal descriptive matter to enable the searcher for an appropri-
ate plan for a projected dwelling to determine at once whether any in the ate plan for a projected dwelling to determine at once whether any in the
pages before him will or will not meet exactly his requirements. A table of prices of butiding materials is added. The volume is elegantly printed on toned paper, and the plates are executed in the best style of lithography. Altogether, it is a useful and attractive book for residents in the
poring country contemplating building. It seems to possess more originality in
an Elementary Course of Pernanent Fortification. By D. H. Mahan, LL.D. Revised and Edited by Brevet Colonel J. B. Wheeler, Professor of Military and Civil Enginerering, United States Military Academy. Price .ino. New York. Joha
Professor Mahan's text books on civil engineering and ticld and perma-
nent fortifcations are so widely and generally bnown that it is unnecessary
class. The reviser, in the new edition, has suppiled several alterations and
missions in the original text, and made vartous necessal Prominence is given to the bastioned system over others, as it is consid red as having best withstood the test of experience, and Noizet's method is carefully explained. The book is used for Instruction at West Point
A large number of lithographic plates are supplied, together with the reg A large number of lithograph
ular engravings in the text.

Treatise on Astronomy, Spherical and Physical with Astrononical Problems and Tables. By William
A. Norton, M. A. New York: John Wiley \& Son, 15 Astor Place.
The fourth edition of this standard work appears in an entirely remod eled form, with many of its most important chapters wholly rewriten, science of astronomy from both a theoretical and practical point of view. The results of recent investigations concerniog the physical constitution researches on the sun and the comets. A new and more accurate mode of determining the sun's parallax and mean distance from the earth is pre sented for the first time in an American treatise, and a description is also added of the astronomical observations for finding the latitude and longltude of a place as cited by the Uuited States Coast Survey. A number of valuable
volume.
Art Culture, a Handbook of Art Technicalities and Criticisms, selected from the works of John Ruskin. Ar-
ranged and supplemented by Rev. W. H. Platt. New ranged and supplemented by Rev. W. H.
York: John Wiley \& Son, 15 Astor Place.
As indicated by its title, this work is a compilation from the original and exhaustive writings on art criticism which have been given to the world by perhaps the greatest living art critic. It is int anded for educational pur-
poses, and alms to give the student a thorough apprectation, based upon poses, and aims to give the stadent a thorough apprectation, based upon
the correct principles of a true and retlied taste, of the handiwork of the painter, the architect, and the sculptor. 'There is enough of the technica in the volume to render it a valu able gulde to the artist, and many chapters notably those on color, light, perspective. sketching from Nature, \&c.. are eminently practical and clear in direction and precept. A profusion of
admirable illustrations.mainly extracted from the complete works of Ruskin amirable illustrations.mainly extracted from the complete works of Ruskin in the text. A glossary of artistic terms and an alphabetical index of artists, sculptors, and architects referred to, are added. Press work and binding are alike excellent

## zacent axacrican ancl forcign eqatents.

Improved Mole Trap.
Robert I. Huggins, Bethel, o.-To locate the trap, the earth is pressed gently down, so as to fll the burrow, and the trap is set directly above, with sill picces parallel with the burrow, and with a cross piece on such depress-
ion. The mole, finding ts hole obstructed, will commence reparing dam ion. The mole, tinding its hole obstructed, will commence repairing dam-
ages, and in forcing its body through the old track the cross piece will be raised, which ratses a rod, and this, acting on a lever, releases a cross head which drops with its teeth on each side of the cross piece. The teeth penerate the ground and spear the mole.

Improved Windlass and Crank for Brakes. henry M. Howard, Brooklyn, assignor to John Stephenson, New York wounc. is made polygonal, with the upper end reduced in size with a loose collar placed thereon, whith is kept in position by a screw nut. The crank as $t$ wo parrs of jaws. The former is made to fit two opposite sides of the raising the outer end of the crank, the jaws will be detached from the indlass and the crank may be turned round to allow the jaws to engage With any other two of the sides of the windlass. By this means the driver required sto take a hold of the windlass that will allow him to exert the
best advantage. When the brake is not in use, as, or instance, when thecaris reversed, the crank may be thrown over so as to hang out of the way.

Improved Sash Fastener.
John G. Spathelf, Sandusky, 0 .-This invention consists of a casing with bolt and lever arrangement, which catches into recesses of the window frame, and is within or action of the spring will force the lever into the next recess, fastening thereby the window at that point.
Improved Road Scraper.
Thomas M. Tate, Longiew, Tcxas.- This invention relates to means Thumas M. Tate, Longview, Texas.- This invention relates to ineans
whereby road scrapers may be loaded with more fachlity,drawn with less xpenditure of muscular power. and made to perform an increased a mount of work in a given time. The invention consists in combtning with a road craper two front wheels, movable, to let them below or carry them above
he bottom of scraper: in end-angled levers, having journals and fulcrum pivots combincd with wheels and bearings in the sides of the scraper; in evers connected by a bar and combined with shoulders on scrapers, and a spring latch working therethrough : and in combining with the latch, held orward by a spring:, a cross bar and arm of the latch lever:

## Improved Lantern.

 .Joseph K!ntz, West Meriden, Conn., assignor to hilnself and P. J. Clarkof same place.-The object of the construction is to facilitate insertion and removal of globes and clamping or securing them between the base and top of the lantern. The vertical guards are hooked into the top through holes in the sides so that the top can swing sidewise. They are also hooked
into the bottom in slots, so that they can move up and down in them to some extent. The guardsare so adjusted as to length that, when down to the lower ends of the slots, the globe will rest on its seat and the top will rest on the globe, and when they are raised up in the slots as high as they will go, the top will swing off or on the globe. They are to be pressed down by inclines, formed by notching a ring which is fitted around the bottom of
the lantern, and adapted to be reciprocated to fasten or unfasten the globe the lantern, and adapted to be reciprocated to fasten or unfasten the globe
hy actIng upon the guard wires. The horizontal guards are connected to bent pieces, and the latter are arranged so that they will slip down on the vertical guards and hold fast at the bulge so as to hold the horizontal guards in place, and, at the same time. atiffen the bottom, globe, and top againet lateral motion.

## Improved Car Coupling.

Frank A. Markley, Waynesborough, Va.- his invention relates to car coupling generally, but more particularly to that clasy of them in which is employed a link wrth spring grapple at each end. The invention consists same transverse median plane, in order to shorten the coupling link, and allow the cars to come as closely together as possible. It also consists in arranging a projection at one side of the rear concavity of link slot, so faras to arrest any lateral pressure of pin against the spring latch, and thereby prevent any chance of accidental uncoupling. It also consists in using sig.t side latches, and chus throw the maln wetght and strength of

Improvement in Boots and Shoes.
James McMillin, Ripley, O.-This invention contemplates the use of a wedge as a remedy for the tendency which so generally exists to wear the
heel of a shoe or boot on one side. If the tendency is to wear out the subjacent edge of heel on the inner side, the thicker part of wedge is caused to abut against the corresponding side of the apper, thus throwing the struin toward the center, and not only preventing the edge wear on heel, but tending gradually to correct a slovenly habit of twisting the ankle
when the wetght is pressing thereon in standing or walking. If the wear should be usually on the other side of the heel, the wedge plece is reversed
shen in position, and is in like manner productive of the same result.

Improved Apparatus for Unloading Corn from Wagons.
Thomas Barro n , Black Oak, Mo. The parts of the bottom of the Thomas Barron, Black Oak, Mo. -The parts of the bottom of the wagon
box are attached to cross bars, so that the sald bottom may operate as a single ptece. One edge of the bottom is connected with the lower edge of
one of the side boards of the box by hinges. To the bottom, near its other one of the side boards of the box by hinges. To the bottom, near its other
edge, are pivoted buttons, which may be turned into catches, attached to the side of the box to support the bottom in place. Upon the outer ends of the
bustons are formed toes, to enter the forks of levers, which are plvoted to the side board of the box, and are connected so that they mary all move to ether. One of the levers projects upward. so that it may be operated be cel ve hooks attached to cro ss bars, to the centers of which are attached the ends of the ropes by which they are suspended. The ropes pass over gulde
pulleys pivoted to the beam attached to the frame of a corn house. The pulleys pivoted to the beam attached to the frame of a corn house. The
ropes are connected with a drum pi vo ted to supports attached to a sill of he frame. A drum is pro vided with a ratchet wheel and pawl to hold the wagon box suspended in any position to which it may be ralsed, and is
operated to wind up the ropes by horses or other well known means. The upper ends of arms are plvoted to parts of the frame in such positicns that
a board may be swung beneath the locked edge of the bottom to form an a board may be swung beneath the locked edge of the bottom to form an
inclined plane to gulde the corn into the crib or bin as the locked edge of Inclined plane to gulde the corn into the crib or bin as the locked edge o
the bottom is detached and lowered.

Improved Fly Trap.
nd Henry L. Crist, Phelps cit
N. Barker McCreary a nd Henry L. Crist, Phelps city, Mo.-This invention an improvement in the class of insect traps formed of an inner and outer wire gauze cage. The outer cage rests on the cross bars of a batt pan which
is of sufficlent depth ${ }_{\text {s }}$ width to extend around the base of the cage, and admits easily the files the bait at the bottom thereof, from which they pass through cones into the upper chamber, where they are killed by ho
water, heat, or other suitable means. A small dooris innged at one side near the top part of the cage, and serves for the purpose of removing the
flies without detaching the inner cage. iles without detaching the inner cage.
lmproved Sanh Pulley.
$t$ is inserted in a hole bored in the end of the stile, and incloses an parts. wheel of such relative diameter as to allow the sash cord to project fre from each side of the stile
Improved Potato Digaer.
Richard B. Evans, Connellsville. Pa.-A scraper removes the portion of
he earth which covers the potatocs, leaving a corrugated roller suspended the earth which covers the potatocs, leaving a corrugated roller suspended
from the beam to act with good ettect upon the smooth surface thus ormed. A double or V shaped plow. following immediately after. Is thu eiabled to elevate the eartb in which the potatoes ile embedded without
injury to them, and with comparatively small expenditure of force. The roller also acts as a colter wheel, in respect both to the scraper and the
plow, go verning the depth to which they penetrate the soll. Improved Combination Lock.
plate, having a projecting pin at one end, which engages the locking bolt, so as to withdraw the same in part by means of the inner pin of a rotating
dial plate acting upon a projecting band spring, attached to the rotating plate. The withdrawal of the lock bolt is completed by the action of a
second pin of the dial plate on the bolt, which is recessed and provided with inclined front and rear projections for the same. The plns of the
dial plate may be changed to any comblnation of letters by betng placed nto any two holes of the concentric serles of perforations provided

## Improved Winged Plow.

Isaac A. Benedict, West Springfileld, Pa.- This Inventlon has for its object to improve the winged plow for which letters patent were granted to the
same inventor December 13, 18テu. To opposite sides of the standard are pir-
oted arms, to which braces, fastencd to the rear side of the standard, cured by bolts, whtch pass through short slots in of the standard, ar rear ends of the latter may be raised and lowered, as required. Wings are also secured to the arms, and may be expanded and contracted. The
$i_{\text {nward }}$ pressure upon the wings is sustained by a cross bar, the ends of which pass through longitudinal slots in the arms, and are bent into hook
form. The brace bar is further secured in place by keys which rest in form. The brace bar is further secured in place by keys which rest in
notches formed iu the arms to prevent the ends of the brace from slippling when arljusted. Wedge wheels are interposed between the arms and the
standard, so that, by turning them, the pitch and spread of the wings may end
be adjusted to sult wide or narrow rows, and turned down flat for shallow
ulture, or set up for hilling corn or potatoes.
lmproved Die for Forming Hammer Eyes. Henry Harrison Warren, Bridgewater, Canada.-The object of this invention is to furnish an imprused means for forming the eyes of nall and
other hammers, of the slape and style of the "adze-eye;" snd it consists in constructing the dies with recesses or forming surfaces which will give the eye of the hammer blank the prellmenary form necessary to the proper
action of a punch or plunger employed to finish the eye.

Improved A pparatus for Painting Broom Handles. Yor painting or ornamenting broom handles by means of bands or stripes, and consists in a series of strings or cords so arranged upon a frame that
paint may be applied to them, and thus transferred to the broom handles paint may be applied to them, and thus transferred
when the same are subsequently rolled over them.

## Improved Feed Wheel for saw Mill

John Kerr, Milltown, Canada.- The object of this Invention is to produce a feed mechanism for saw mills, which will be absolutely regular, and cut or stroke of the saw will be equal to erery other cut or stroke. The
invention consists in the application of a friction shoe to the $V$ shaped rm of the feed wheel, and in its connection with the operating mechanism in
manner that, will, when the shoe is drawninone direction, cause the wheel to be turned, whille the wheel will not be turned when the shoe is moved he other direction.

## Improved Clamp

Jacob r. Schnetder, Bresery, N. Y.- This a strong and adjustable where the parts are made detachable for the purpose of transportatiog and readjustment. It consists of two plates with bent edges, which are silght incll ned toward each other, and applled to the pleces to be connected, plate with downward bent edges, with similarly inclined sides, is driven
over the side plates, holding them rigidly together, and forming a strong the parts.

Emproved Floor Clamp.
Robert C. Davidson, Evanston, Wyoming Ter.-There is a plate for pro cecting the edge of the fooring, and a pawl for holding the clamp after the bar according to the thickness of the joist to which the clamp is to be
fastened. $A$ key is fixed in said screw to cause thenutand barto shift to. gether. Sald key shifts a long the screw with the nut and bar in a groove in
the screw. A set of pointed stud scre ws is provided in the bars, near th onnecting ssrew, for screwing into the joist to hold the clam $p$ when it get a new hold. tn case the flooring is not cla mped up sufficlently by the first operation. The bars are placed in the joist close to the edge, and fastene
by the screws. The upper end of the clamp is then pressed forward, so
olpress the flooring together by the plate.
Improved Machine for Sprinkling Cotton Plants. ight and width, is arranged to run along above o ne row, and provided wit There is a it quid holding tank on the front part of the frame, which has frinking tube, of sultable size for sprir kling the liquid upon three row ond the wheels, for reaching over the outside rows, and carrylng revolv Ing sleves for sprinkling on powdered substances. By sultable arrangeerspread with poisonous powitr, the former cansing:t he latter to adher to the plant.

## Improved Bung Bush Inserter.

Lomax Littlejohn, New York city.-The object of this invention is to im prove the oung bush inserter for which letters patent No. 198,568 were
granted to the same inventor May 6,1873 , to makeit imposilble to burst the bush, however much power may be a pplied. By sultable construction, when a sleeve has been inserted in the bush, and a shank turned, an elliptical jourinto the bung hole in the stave. In case the stave is hard, and considerable power is required to force the bush into place, the powerful expansion of thesleeve will sometimes burst or split the bush. To remedy this, a tongue
is attached to the elliptical Journal, which enters a slot in the sleeve, which trikes agald the side of shoulder of sald slot, and thus turns the bush he sald tongue and slot being soarranged that the sleeve will be expanded Improved Apparatus for Manufacturing Illumiuating Gas.
John G. Müller and Willam Müller, Dayton, 0 .-The gas retort of cas John G. Müler and Whlliam Müller, Dayton, O.-The gas retort, of cas brick, in the usual manner. Coal oull is fed to the retort from a tank a the formation of the gas progresses. The retort connects, by a contcal
neck and pipe, with a hydraulic valve. The gas, which is formed after the retort is at red heat, passes up thro ugh the bottom of the valve. The mouth placed in water, thro has a conical cap, which is open at the bottom an
plat rapors. The top part of the valve is made airtight by being placed with its gaserendin tar or other fluid, on the outer casing of the valve, as usual in
and re falled with coke,
Improved Music Lieat Turner
willam H. King, Petersburg, Ind., assignor to himself
of same place.-The object of this invention is to provide an improved music lear turner for sheet and book music, by which the lea ves a re readily urne as required during the playing of the instrument, and firmly re
ained in position on the rack or stand, whether they are placed singly o in book form thereo $n$. The Invention consists of a frame which is attached
by its base plece to the rack of a music stand or plano. Upright connect ing bars are pivoted to the base plece and top plece, by means of which the $f$ the rack. The top piece is slotted for the arms, which are pivoted to co mmon center pin, and applied by flat ond wings to the sheets to be turned by a slding plate, which catches by staples and slots into the forked ends
if the arms. The silding plate isdrawn eys connected to a knob on the base plece.

Improved Wheel for Vehicles.
Frederick H. Brinkkotter, Quincy, Ill.-Flanges rise out of the suriace o he hub cyllnder at a considerably greater distance from each other than
he breadth of the spokes, and incline toward each other for the greate The breadth of the spokes, and incline toward each other for the greate
portion of the distance to the periphery. Near the outer edges they make a short turn directly to ward the spokes, and for the rest of the distance hoy are parallel to each other, and have a flange on the inside, and form a
ovetail shaped annular chamber, in which are collars of wood, divided in wo parts, for putting them in. They are coated with white lead, to pre-
ent them from shrinking, and the spokes are driven in so as to wedge tightly all the way to the bottom. The inside of the hub and also the ex erior of the box are provided with short spiral ribs, near each end, to loc that the ribs bear against each other; and near the outer end of the box tia nannular ring, a galnst which is a leather washer, to pack the joint tigh $y$ a llange of a nut. The wheel is placed down, with the inside of the hub
p, the box centered at that end, and the space finally filled with melted ulphur.

## Improved Earth Closet.

John L. Young, New York city.-A hinge is attached to the cover and to he casing, by means of which the service pan and shutters are operated
and which consists of a bar which is attached to the edge of the cover having a branch thereon. Connected with this is mechanism so arranged that, when the cover is raised, the service pan is carrle d forward beneath
he seat, taking with it a layer of earth equal in thitckness to the width of he seat, taking with it a layer of earth equal in thickness to the width of
he discharge mouth. The excrement falls upon this layer of earth. When the cover of the seat is closed, the pan is drawn back, and the contents of
hie panare deposited in the tub beneath. The thickness of the layer of arth on the pan may be of any width. The shutters are two pleces of they will fall and close to gether by their own gravity. They are opened when the cover is rasised, by meane of the turned up edges of the service pans, which strike cranks, which ralse the ball as the pan is carried for hutters are nelther opened nor closed untll the cover is thrown almot back agalnst the front of the hopper

Improved Plane Guide.
Walter S. Shipe, , which the plane to steadied in tes to an improvement n plane gulde s, by which the plane is steadied, in squarl ng or bevellng, to
ny desired angle without the useof a try square or bevel; and consists of yoke, which is tirmly applied to the plane, and provided, at one end, with
pivoted gulde strip, which is adjusted, by clamplng screws, under any re pired angle to the plane.

## Hernan M. Aschenbrenned Sugar Manufacture

Herman M. Aschenbrenner, Havana, Cuba, assignor to himself and The
ophilus Masac, same place.-The juice passes from the grinding mill into conveying tank with $t$ wo sets of filters, which operate alternately. The ank whtch hese kettles, in succe ssive order, thecane juice is prect pitated, by means Thus purified, the tion pump, is forced into the sulphur box. This box, of wood, has inside a paddle wheel, worked by the steam engine of the mill, and is fed with sul-
phurous fumes from the adjoining sulphur furnace. The juice leaves the box in a perfectly bleached condition, passing upon a metallic hox of shee jut ce to not over $90^{\circ}$ centigrade,by a condensation of $32^{\circ}$ to $33^{\circ}$ Baumé. There It goes into a commanicating canal, upon the inclined plane, also heated by steam and provided wit th an outlet, and finally is acted upon by a bla st rom a steam fan placed at the lowerendof this inclined plane. The julce
becomes now so thick that thas to be scraped with the slowly revolving cra per, which is constructed like an endless apron, provided with sultable scra ping blades, and actuated by power transmitted from the engine. There
is a no ther smaller and more inclined plane, similar to the former one, and also fa nned by another fan,from which plane the sugar. already crystallized ascraped off, by hand or o the rwise, Int o the final recetver. A complete XXIX., of the ScIENTIFIC American

Improved Package for Caustic Alkalies.
Heary, B. Hall, New Yo a spon or stamped metal cup, with a hermet cal cover of resin and wax or the like material, formed by pouring a gum ny substance, in a melted state, over the alkail, with which the cup it
alled and it consists of a metal disk or cover of tin or other sultable sub flled; and it consists of a metal disk or cover of tin or other sultable sub
stance put in before the gummy sealing material is put on, and made spring into asmall groove in the inside of the cup near the top. The objec is mainly to utilize gummy sealing matters or compounds for closing meta packages containing broken caustic soda. The sealing substance cannot well be used without sald metal cover, in consequence of its setting down
in the spaces between the pleces, and cementing them together, causing In tbe spaces between the pleces, and cementing them togeth
considerable waste, besi des interfering with the use of the soda.

## Improved Pen Wiper

Hugh S. Ball, Spartanburg, S. C.-Ths invention consists of two sponge ald in sultable metal cups affixed to the ends of bent lever arms. The when the pen is lightly pressed upon the lower sponge, sufficient foroe is
exerted to bring the upper sponge down upon it, so that both sides of the pen are thereby cleanly wiped.

Improved Farm Gate
David A. Nelddg, Parts, O.-This invention is an
osing and self-latching, and answering the purposes of a pate for self or the passage of perso ns on 巳oot and horseback as well as those of a large and lifts clear above the snow. nd irts clear above the snow. When the gate is closed, a supporting rail
extends through itt full length, and rests with a semicircular notch on the pulley of the main post. When pushed open to the side, the gate slides on he supporting and inclined ralls, and, betng self-closing and self latening into its former position. When it is desired to keep the gate open for
ordinary purposes $\begin{aligned} & \text { during the day, it is pushed back till it rests on a loug }\end{aligned}$ porting rail, and locks it into the top of the main post, bringing the gate $t$ a level. In this position the gate cannot be swung around, and in order
to do so, so as to make room for a load of hay or other bulky sutstance, it s necessary to push the gate into a second or shorter noteh, which causes the forward end of the supporting rail to drop into a semicircular recess,
from which position it can easily be lifted and, the gate betug properly

Improved Can for Transporting Oil, e
James E. Pimpley, Newark, N. J.-The ends of the cover extend down and verlap the sides of the body, a nd are fastened by screws put in so that the ents are belng drawn from time to time for use. A tapered nozzle is constructed without a bead at the top, so as to secure a tapered cap, which is
provided with an a nnular groove, to till with plaster of Paris or other ement in a plastic state when the cap is put on for sealing it up tight The cement is broken loose by a few taps with a small hammer or othe
instrument when it is to be taken off. There is a funnel around the vent ole, to hold the cement for sealing the vent for transportation.

## Improved Wire Stretcher

Isaac H. Congdon and Jacobe E. House, Omaha, Neb.-This invention con
Ista in the mechantical application of an Iron frame and rollers for the pur. pose of adjusting or giving a uniform and constant tightness to the iro Wire used in the construction of wire fences. The rollers are of hollow alindrical shape, secured in sultable frames on etther side of a post, an
are provided with flanges in which are holes for the insertion of lock pins, Which prevent the rollers from turning back after the wire has been tight ened. The wire is attached by its end to o ne roller, and is adjusted thereon
by a crank haudle, which is carried by the attendant from post to post, so hat very extensive fences can be easily set as desired.
Improved Fountain Pen.
Henry N. Hamilton, White Plains, N. Y.-The ade hollow, and is tapered at its lower end. In the inner surface of the
apper end of the handle isa hollow screw plug, with a closed lower end
and with a hole through its xtends dovin to the ta pering part of sald handle screw plug is a rod which the lower part of the cavity, soas a to prevent the out flow of the ink, unless
the rod and valveare sili ghtly rase se. A nut, which is screwed into the hol. he rod and valveare silighty ralsed. A nut, which is screwed into the hol
low screw plug, is perforated from its lower end, from the upper end ow screw plug, is perforated from its lower end, from the upper end
of whith a perforation leads out throught the side of said plug. By turning out. The nut is then unscrewed suftciently to bring its side perforation
in bove the plug, so that the air may passin to cause an outfiow of the ink.

> Improved Sugar Cane Cultivator.

Henry Von Phul, Jr., and James Mallon, Holly Wood, near Baton Rouge, La.-The mold board is hitnged to a standard and the land side. The land
side produces, with the mold board, the shape of a slanting V. The position f the mold board and lader projecting lug of the mold board. For expanding the fluke to to largest andle, into a hole of a projecting bar of the ping the widt $h$ of the fluke may be contracted as de sired.
Improved Velocipede.
George Avery, Ottawa, inl.-The rear axle is provided with a crank fo a ch pedal bar, which are so arranged that the bars are made to act alter
atelyonthe axles, the welght of the driver being first thrownupon o ne ba ately on the axles, the welght of the driver being first thrownupon one bar
nd then upon the other. The power is applied when the cranks arc in a orizontal position, when the welght will have the greatest effect. The rms of the steering lever are attached to the for axle belng bent to allow the bars to play. The bars are jointed to the for
ard end of the frame, and foot pleces are on each of the bars, one each ward end of the frame, and foot pleces are on each of the bars, one each
ide of each joint. The driver stands upon these bars, with his feet on the oot pleces, and propels the machine by
bar and then upon the other alternately.
Improved Ore Washer or Buddle and Ore Separator.
John Collem, Idaho Sprigs, Col Terr. The first invention buddle. The finely crushed ore, consisting, for instance, of quartz, copper prites, Iron pyrites, and galeua, is conveyed by water through a suitable sout into the distributing box, from which it passes through smalin hole
and spreads itself uniformly upon the surface of the table, the heavier min rals settling mostly near the center, and the lighter near the periphery
but still in a mixed condition, as the separation caused by the running wate only is very imperfect. As the table revolves the minerals are subjected to the co mblned action of the clear water from the distributing box, and the
irring of the brooms, which causes the quartz and other light earthy mat tirring of the brooms, which causes the quartz and other light earthy mateptacle; while, o wing to the jarring action of the pounders and the greate ensity of the other minerals, the latter still remain on the buddle. The opper pyrites, and then the iron pyrites, being subjected to the action of
he other brooms and larger quantities of clean water, are cach passed to the circumference, and deposited in separate receptacles. The galena still remaining on the table may be remo ved by other brooms or scrapers, or be washedo of by strong jets of water. The same Inventor has also patented
an improved ore separator which consists of two or more grading sieves in he upper portion of a tank of water having approprite discharge passages by sultable mechanism, and also have a washing attachment so arranged that currents of water are caused to flow upward agalust the descending currents of ore. The "slime" water ts thus separated from the coarser particles, and caused to flow, with the fine particles of ore, into another
ank, In which is a siphon pipe adapted to collect that which is suffctently ank, in which is a siphon plpe adapted to collect that which is sufficiently
eavy to settle to the bottom of the water in said tank and convey it to a oper receptacle.

## Improved Station Indicator.

John W. Ne wiln and Jacob S. Simmerman, Millville, N.J.-This invention is an improved station indicator for rallroad cars, so constructed that the
indcators thro ugho ut the traln mayall be adjusted at the same time. The ront of a rectangular box has a transparent portion in its middle part, t now the names of the stations to be seen. The names of the stations ar
printed upon strips of wood. The upper parts of the strips have hook ahaped slots. Vertical pleces are attached to the top of the box, and to for lower inclined edges are attached metalic straps, $n$ such a way a re attached to the bottom of the box, and their forward endsextend close up to the door. The lower edges of the strips incline downward. A shaft,
which works in bearings attached to the box, carries three arms. The first rm projects downward tato such a position as to strike the clapper of owest namestrip, and pushesit longitudinally until it drops upon the in clined edge of the lower vertical pleces, duwn which it slides to the rear part
of the box. The third arm passes out through a slot in the end of the box, d has a pulley piloted to ts end. to receive a cord which is kept in place pon the pulley by a spring which allows the cord to be slipped off and on
nventently. The cord extends thro ugh all the cars of the train. When he cord ts pulled the effect ts to ralse all the arms, which strike the brlls, nd push the lowest strips from theirplacesand expose the next strips. W!es Lhe end of the route is reached, the strips will all be upon the lower ver ic.
ipl eces, and arranged in proper order for the return trip, so that all thal will be necessary to rearrange the indicators will be to raise the strips, an!
bang them upon the etraps of the upper pleces.

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tng, Pulleys Hangers. D. Frisbie \& Co., N. Haver, Ct


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umac in any good work on botany.-G.C. B. can repair ubber boots by the process described on p. 155, vol. 26 . Con c.stings on p. 203, rol. 29.4. C. B. and others can ob-


 C. H. F. says: 1 . In a self.feeding stove, the some 12 feet perpendicular into the garret, , where it runs
0 feet horizontally and enters the chlmney. $A$ substance 20 feet horizontally and enters the chimney. A substance
is constantly arip ping from this 20 feet of pipe in the
 the pipe from the chimney. I send you a few crystals
whlch formed on the perpendicular part of the pipe in he garret where this substance runs down on it. What causes this substance, and what are the crystals com
posea of? A. Probaby sone corrosive substance is $118 t i l l$ d from the coal, and condenses in the pipe. The
specimens sent seem to be sesquioxide of fron. 2 . How Can the tore of a church stee bell that ts cracked be re
stored? Could it be done in the steeple? The bell 18 so ard that steel tools will not cu'. 1t. A. We scarcely how 18 s t made, that will take the temper out of stecl or soften tit so that tit can be drilled without heating?
Wc do not know of any. 4. Which wwill siand the m
J. F. W. . asks:
d screw be driven more easily than with a short one? A. On account of the greater
ceverage that cai be obtained by inclining the long screw driver. 2. Can the same screw be driven more
casily withe presure easiy wtha pressure on the screw more than en ough
o keep the screw driver in place? A. We think not. F. D. asks: 1. IIow can I get a good spring
cemper on steel wire?
 case harden it
think it will.
F.F. R. asks: 1. Will a common horseshoc compass needle, as to polarity? A. Yes. 2. Would a compass neeclle lose its power if it were confined so that
it could not turn on its pin, a welght belng put on the cap of the needle sot hat tit cannot move? If I turn the
compass oo that the north end of the needie would polnt
 tractive force. 3. Is there any motor run by a magnet?
A. Yes. C. A. W. says: 1 . It seems. to me that, in he present state of steam engineering, there ought to
be rules for the construction of silde valves that would be generally recognized by bullders as giving the best
result for average speeds. The diversity of pracitce sems to be asgreat as the number of bullders, and the Therries equal the mechanics in number. I know bulld
rrs who give so large a compression in some cases as to ers who give so large a compression in some cases as to
force the valve fromits seat whill e as early a the cut. offtand have practically no compres
sion I should suppose that the most economical potnt of cut.off, release, and compression would have been de.
ermined approximately, by actual experiment by thit termine approximately, by a tual experiment by th18
tme. 1 there no work treatng on these questinns? huchios assumes these potints to be determinea, an hen gives rules for constructing valves accorddngly
A. We think the subject is treated in several manuale of the staam engine and locomotives. 2. Are sirups pre pared from starch, cotton, wood dber, etc.., by the use of
sulphuric actd or other re-agents deleterious? And is there any simple test for detecting deleterious quallties? A. We think not, in general. Probably the simplest test
would be with litmus paper. R. H. says : In a shop heated with exhaust steam, conveyed through pipes made of galvanized iron
the heat does not seem to radiate, no matter how muct steam is turned on. Why 18 this? A. Probably the
trouble is caused by insumflecent radiating surface or too w
W. asks: In estimating the heating surface the tubes be measured which project above the surface
of the water throush ing surface as great in a boller where the tubes only ex
tend tand to the surface of the water as in a bodles of same
dimensions wher the tubes extend to the top of boller A. The heating surface 18
tend the whole distance.
T. J. McM. asks: : How can I divide a given
raight line into two parts, so that the square on one of Craight line into two parts, so that the square on one o
he parts mas be double of the square on the other? You can solve the quesition, to any degree of approx
mation desired, by the following formulas: Let $1=$ length the line. Lesser part $=1 \times \mathcal{V}^{2-1}$. Greater part $=21-1 \times$ T. C. W. asks: 1. Can you give me a recipe
for making blackberry wine? A. Cook the berries slightly; let them stand unt11 the next day. Then strail them, add 1 quart of water and 3 pounds of brown sugar
to each gallon of the julce. Place the mixture in a cask.

 ring all the bells in one church? $A$. Yes. 4. Can $I$ get the different drawlings and specifications of all the patent tee elevators? How cen I Ind out how many have been
patented? A. Yes. You can only thd out the number
by s search. 5. Can I have my hydrant so arranged à
of orce the water out of my cistern into water plpe through the house, without lettlog any water out of the
hydran hydrant thto the clstern? A. You can probably do $1 t$
by putting up a water engine, to be driven by the water from the hydrant. 6. Can you give me a good recipe for
halr oll that will not injure the halr? A. Probably cas talr ont that will not injure the halr? A. Probably cas.
tor oll is as good as anything. We cannot answer your
other question, as
J.T. H. asks: Should the propeller be of a to avold drag? A. There ts a great difference of optnIon among engtneers on thls potnt. Makers of propel.
lers with varying pttch asert that their screws, when in motion, do not shake the ressels so much as equally et
J. W. D. E. asks: 1 . How many different
kInds of Are engines are there in use? SInes, steam engines, chemtcal engincs. 2. How much fall 1 is usua on canals? A. They are generally le ecel. 3
What is the common width? A. The widthe vary great
I th ly in different localities. 4. Is it essentlal that canals
should be walled up? If so, would brick be cheaper to be walled up, but we do not think that brick to the most sultable material. 5. When will the committee de cide bet ween the competitors for the reward offired by
the State of New York? A. The time during which
V. L. T. asks: 1 . How can I compute the volving in a clrcle the radius of whith is 1 foot, a
incolution per second? Is there any inedrule for determining the centrifugal
centrituya force of a bsif)
(Weight in pounds)

and the variations to which the magnetic needle is lia. bie, treating the subject in such a way as to enable a
person to accuire the skill and knowledge requsite an expert surveyor? A. Glllespo's \& "Treatitse on Land
W. J. B. asks: What is the most reliable अork on superheated steam, and where may it be ob
ained?
What is the greatest number of degrees ot heat that can be obtat ned from superheated steam?
We do not know of any work that wll pose. Steam can be superheated to any degree that the pose. Stean can ound. It wauted poroababy be bee wellin or you
apparatus will stand
to consult an experienced englineer about the matter, a .
$\xrightarrow[\text { T. L. C. asks: } 1 \text {. What is the greatest per }]{\text { pendicularhight to which the waves on the ocean rise }}$ measuring trom bottom of the trough? A. From 30 to
40 feet, , te think. from top to top or center to center? A. About the
samke as the hight. 3 . How far below bottom of trough is the water apitated by the stronest wind and largest
waves? A. Probably about 2,000 feet
$\underset{\text { vessel, } t \text {, } \mathrm{two}}{\text { M. seet iong ind ind four inches square, made of }}$ heet steel, one sixteenth of an Inch thick. Can $I$ pour tin molten cast Iron to make a solld plece, and secure a per
fect weld with the steel without deteriorating the qual tey of the steel? Whith is the best method to perforim
the operation? A. We do not think you can do it.
W. L. asks. Is any injury to be apprehendWhence the wool has been extracted, from greasy rag
with oll with on of vetriol? A. We searcely think that
jury will reault from the use of this material.
(I. W. V. G. asks: 1. Will a thermometer Indicate the same temperature hangling in the wind
that it would if sheltered from the wind, everything his being equal? .. Probably the tancation would b Dwer in the wind. 2. . Is the temperature when air
putin motion by a fan or bellows changed? isthe cause? A. We think not, materially
(i. A. E. asks: 1. In the electrical plate ma glass, is it absolutely necessary to the proper worklng
of the machne that the lower disk should be 7 and the upper its Or is it only necessary that the lower one should elative thickness is not a matter of great tmportance
 L. W. M. says : We conduct escape steam Hrough our builiding with tin pipe, for heating pur hat we could coat the inside of the pipe without taking escape steam if we could apply some good radiator.
E. P. C. asks: In Bourne's mode of setting
the eccentrics, what is meant by "the center of the ec. centrces"? A. It has the same relative position as the g going around a bend in the road, do the inslde or the outside wheels silp on the track? A. The outer whe
will slip the most, if both have the same dlameter A. B. D. asks: 1. What will remove black
worms from the face? has been highly recommended by some of our corres tog insects, or merely a secretion? A. We think the are secretlons of matter. 3. Are hot air furnaces bad for the health? If so, what is a better and not too ex
pensire way of heating a house. A. This is a matter bout which there 18 a great diversity of optinion. For
our own part, we think that hot air furnaces, in wht water is constantly evaporated, may be used in well ven dary
A. C. E. says: 1. I have a small library of logue. What 18 a good method for so dotng? A. It is a
zood plan to arrange the catalogue alphabetically good plan to arrange the catalogue alphabetically, ac-
cording to the names of the authors of the worke. Example: "Lloyd, Humphrey. Elementary treatise on the
wave theory of light. 2 d edition, 1 volume, 8vo. Lon wave theory of light. 2 dd edtlion, 1 volume, 8vo. Lon-
don, 1873. 2. E." The ingure 2 refers to the book case. and he leter Et to the shefle on which the boot may be the grind stone st turning towsrds you, should you hold he latter way
E. E. B. asks: What course of study is sary, and where can they be procured? A. Send to some
 eeothe advertuse
TITIC AmRRIOAN.
harlum? asks: How can I stop the leak in an T. E T. E. asks: How can I ascertain the amount any given element in any given mineral, tor instanc
he lead in galena, or the zinc en blence? A. It can be $\underset{\substack{\text { ascerta } \\ \text { sss. }}}{\substack{\text { and }}}$
R. C. Ci. asks:
wire?
I have tried
dipplng them in
melted tin, but annot prevent their sticking together, and they are have to arrange the pieces so that they can be dipped separately.
tin bath.
C. D. says: We have a private telegraph.
station would not work; upon sceking for the cause he copper Insulated wire (running from the street wire
nto $m$ cellar) was found corroded at the two ends of Into my cellar) was found corroded at the two ends of
the cellar window where it touched the brick wall. Will you inform me of the cause of this corrosion at
hese two potnts? A. Gases that corroded the wire dight have been given of from some place in the vicin. J. M. D. asks: What will be the advantage hereby mzking direct communtication from one end to the other? The object of this is to provide for the
drainage of the cyllinder. A. As we understand the question, the e
on the p piston.
H. F. M. asks: 1. How many fect to the mile eet toamile, measured on the incline. 2. How can I scertain the amount of water that a roadside gutter
will carry? A. . nowwin the construction, you can de.
 the amount of water discharged in a given time. 3 .
Iow much fall should be glven to a n open spout, made ow much fall should be given to a n open spout, made
of two planks nalled together, in a distance of 50 ofect so as to carry 30 gallons of water per minute? A. You
can use tre formula ativen on p. 48, rol. 29, multupling he coeftcients there given by 0.551 . In this way you can find the inclination necessary for a wooden pipe
Then make your trough so that the wet surface is the same as the surface of the pipe. 4. Is there any way to
repair the screw on a common auger when it is slightly amaged or worn? A. It can often be done with a file. 5. Is there a way to clean kerosc ne barrels, so as to make
them fit for packing meat in? A. We think they can be hem ft for packing meat in? A. We think they can be
cleaned by steaming. 6. What is the best way to wash lannel? A. This is a disputed point. Perhaps the la
dies, who know all about such matters, will send us G. R. E. says :1. In your article on the initial
elocity of projectiles on p. 400, vol. 29 , you say that the circuit of the battery of the Bouton, instrument can be
closed or brokenat will by means of a dirjunctor. What is that dis junctor composed of, and what is its position? 2. In the description of the Schultz chronoscope,you men
ton the interrupter, and say it closes and opens the cir-竍t about 500 times per second; can you explating and the attraction is destroyed by Intcrrupting the con
nection of the conducting wire with the battery. 3 What wlll cut off or stop the current of a common horse hoe magnet? A. We do not know or anything that
you can use to cut off the attractive force of a perma C. R .
R. asks: In the compound engine, in tween the first and second cylinder? A. From 2.5 to 5 .
2. What ganis is claimed for this sort of engine? A. coling and reheating of the cylindcr during alternate strokes. 3. Is there not a back pressure on the piston
of the smallcylinder on the return stroke? A. Yes. 4. Is there any way or avolding this back pressure, and, if
it could be obviated, would not the gain be large over A. Reducing this back pressure reduces the working
G. E. W. asks: Is not the curvature of the inches? Reckoning diameter eight thousand, and cirumference twenty-five thousand, miles, the fall from pole to equator is four thousand miles, of course. Then,
as the square of 6,250 miles is to the square of 1 mile, so , oco miles are but a small fraction more than $61 / 2$ inches A. The polar diameter of the earth is $41,707,536$ feet, or
i899.155 miles; the mean diameter at the equator is 41 i899.155 miles; the mean diameter at the equator is 41 ,
E47,662 feet, or 79295694 miles. It is sufficiently accurate, in calculating the curvature of the earth, to regard it as yards $=7912.5$ miles. The curvature for any distance, dimensions being taken in feet, is found by dividing the square of the distance by $41,778,000-$ or the curvature in feet, for any distance expressed in miles, is equal to
two thirds of the square of this distance. For a dis. (5280) 5,280 feet, or one mille, $-\frac{5280)^{2}}{41,788,000}$
Has a telescope a lifting power, so to speak, as wel as a power for enlarging; and, if so, are the two powers equal? A. In general, a correction for refraction
(which makes the object appear higher than it rcally is raries with diffierent states of the atmosphere, but it average value maybeassumed as one sixth of the curva-
ture, so that the corrected curvature is five sixths of that given by calculation. Hence it appsars that th fraction is, on an average,,$\frac{(5250)^{2}}{41,778,000} \times{ }_{6}^{5}=(1)^{2} \times{ }_{9}^{5}=0.556$ feet. 3. From what bases have the earth's circumfer timated? By the measurement measured, been es mated? A. By the measurement of the lengths of
degree of latitude and longitude at different parts of
R. J. B. R. asks: At what age does a person
usually ptop growing? A. Some one has recently pub ished the following data in regard to the growth of
men and women: Average weight of boys at birth, $6 / 2 \mathrm{~s}$ weight of males at $20,143 \mathrm{lbs} . ;$ a average weight of fe average, at 35 , weighing $152 \mathrm{lbs} .$, women, at 50 , welghing
28 lbs . Weight of an average 28 ibs. Weight of an average man or woman wh
growth is attained is about 20 times that at birth.
J. G. asks: Why will a hollow cast iron
cylinder sweat on the inside when a flame of illuminat inggas is turned into it for hcating purposes? Is it be-
cause the moisture is contalned in the pores of the iron and liberated by heat, or is the gas condensed into wa ter upon comingin contact with the cold surface of the
iron? A. The team formed by the combustion of the
gas condenses on striking the cold cylinder.

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צxientific Amcricau.
J. H. asks: What is the best method of
painting upon glass, so that the coloring will resist the weather? A. First draw the subject on paper, and fast-
en it face downward, by pasting it at the ende, to the glass. Turn the glass over, and paint wha a camel's hair pencll, the pigments betng mixed with varnish. Let the
outlines dry before flling in and shading. The painting may
J. B. N. asks: How can I transfer pictures
from paper to glass? A. Coat the glass with a varnish

 the forefinger, rubbing it till a mere flim is left on the the foretinger, , then varnob hagaln
H. H. asks: How are organ pipes construct
d, and are they tuned in the slop or after the organ they made rithat again ? $\Lambda$. organ pipes are mawe of
wood or metal. The wooden plpes are enerally nearly square in cross section, varylng in size of section a.-.
cording to the length, Metal pipes are of kItas of pewter, the best belng the sort known as spot-
ted metal. Pites ted metal. Pipes can be tuned before belng put in the organ or afterwards. Sh
lengthening 1 l lowers it.
R. H. S. says: By what means can a barometer that has lost a poitlon of the mercury from the cits-
tern be made to register correctly? A. It would prob ably be diflcult to adjust it without usi
ometer, unless the cistern 18 ad justable.
H.S.
Hiving?
A. Chemstats make analyses, prepare reports o processes. etc. Some of them are professors $i n$ educa
tional instututions. 2. Does he ever get ruch tional institutions. 2. Does he ever get rich? A. Good
chemstst often realize large profts from their profes sion. 3. What are the best books for a boy to otudy
who wants to learn chemistry, supposing he knows no thng about it? A. "Townes' Klementary Chemistry.",
price 82:Ti, will be a good book for you to have, and you price $\& 2.7$ TTs, will be a good book for you to have, and you
will tind in it information in regard to your other ques. tions.
J.S. asks: 1. When in a rotary engine there
are two or more pistons to but one abutment and steam port, after the second plston has passed the abutement and is recelving steam, does the steam bet ween the frist and second piston cause back pressure by expanding and
pressing the two pistons apart? A. In generalit does. 2. Are the comppund brass fishng reels cast or stamped out of sheet
are stamped.
Insulating it? A. A. A disk having a large hoore in the for cen ter, and carrytng two spools on which the sill 18 wound,
Imade to revolve as the wire s drawn through the hole the ends of the silk belingfirst ted to the wire. By yary fug the relative speeds of the difk and wire, the silk mà be wound on as closely as may be desired.
J. P. L. asks: How can I prepare bronze I want t to dry quickly. A. The best way is to coat the
wood with der over it through musilin. But the bronze powder may I make small por tions of yellow and green bronze, and golden ink? A made with a decoction of saffron. Green ink can youknow of a simple prescription to take tan oft the Which is the better to tudy ctyll with cold cream. cally, or to study it by being the aselistant of an eng ave written on the "True and Bequtul," A Pusti, Taine, Goethe, Matthew Aruold, and the majority of the poets. 5. What 18 the salary of a Unted States coast
surveyor? $A$. From one hundred to one hundred and thenty-five doinars a month, we believe. 6. What are
the predictions of the coming spring? Will it be early? A. Probably it will be late, but this is a mereguess. 7 .
Whose work on civil engiueering do you regard as the
H. J. B. asks: Is there any kind of oil that Will form an explosive gas by forcing air through it? A.
Probably naphtha or some other of the hydrocarbons Will aswer your purpose.
W. asks: Why is it that, in hewing green next to the ax, where there cound beno grit? A. The
spark is probably due to the friction between the ax and woo
R. G. asks: Why is it that a large boiler cannot carry as much steam per square tnch as a amanl
one? . The errength of a cylinder, ther things beling E. J. F. asks: 1. Will the magnet be less powerfull in attraction under water than otherwise ? A.
We think not. 2 . What is the best method of causing a magnet to retain its full power of attraction? A. Keep
weights suspended from the armature. .3. Which is best, magnette or iron merely magaetized, or
ference in the power?
A. The latter is best
T. S. V. says: I am using a $10 \times 20$ engine, 3 inch exhaust pipe $:$ and $I$ would llke to exhaust into the botom of a tank con alaning six feet water. How much
back pressure willit make on the engine? A. About two back pressure will tit make on the engine?
and three quarter pounds per square inch.
J. A. B. asks: Would a steam boiler explode
with the samenoise and throw pieces of the boller as far if it exploded under hydraullc pressure at 150 pounds of stam? A. The explosion would generally be the nost violent in the case of steam.
N. L. T. T. asks: 1 . Why can a kettle of boil-
ng water be held on the hand without inconvenience as long as it boils, but as soon as it stops the heat becomes
iatolerable? A. If such is the fact, 1 is probably be-. cause water in Doblling requires soo much heat that it is
abstracted from surrounding objecta.
n. Can heat be trunsmitted through a vacum? A. We thnk s. bo. 3 .
Thy are rite balls made conlcal at one end, and fat and sometimee concave at the other? Would they not be more effective if made tapering to both ends, as in that
case no vacuum 18 formed after the ball, the air fowing In bohtnd it Instantaneously? $\Lambda$. They are made con-
cave at one end, in order that they may spread, and till the grooves of the rifie barre
 bullt of freestone. 2. Hasit ever been rebuilt? A. We
think not. Why Itit called the White House? A. Be.
couselt
W. B. . N. Says: A A friend claims that, in set
ung logs for sawing, the eccentric blocks, making two motions for one tnch, will not throw the log as hard ag
setting the log by one motion with the double rack and Inion. There is no back lash in elther case, and the og is to be moved the same distance in the same time.
Iclaim that, if there is any difference, It would bein fa ror of my plan with the double rack and pinion. He ts sure that he is right, and will not let any one dectle,
fask for your oplnion. A. It is difficult to determine which 18 correct without
devices.-J. E. E., of Pa.
W. M. J. asks: What is the best kind of hounds? How many plow beams are a day's work for for
one man, cut from plank of the proper thickness for one man, cut from pank of the proper helckness for
common two horse plows? Is cutting the lumber or logs into plank the proper way to get out plow beams,
or would it be better to saw the timber or logs to the shape of beam, and then slit up to the thickness of
beams? A. The logs are first sawn tinto plank to the proper thickness for the beams, and then to a pattern
marked with the required shapes. A strongly built jig or band aswing machnne is used for saww the curve
or the curved way of the beam. The frrt cost of a band sawing machine would probably be more than for a jig
aw, but it would aaw more raplily. So much depends upon conditions that it it simposible to give an approx
imate estimate of a fair day's work.- - . E. E. of Pa. W. J. asys: 1 . I have a theory that a bal loon could be gulded at wiil by attachngry to tra conica the open and large end to be fastened to one side of the
balloon, the other end converging to a point. The the ory 18 based on the principle that the ballon with the
above antachment offers less sall lilike surface to the
widn currents of air. What is your opinion? A. We do no think that this arrangement will enable you to do wha
you propose. 2 . Would not perpetual motion be poss you propose. 2. Would not perpetual motion be possi-
bie fif it were not for the law of gravitation? proposition: If perpetual motion ts ever invented, will. it work by magnetism or attraction of magnetlc force . No. 4. Has there been anything invented to con
ense all the steam from a steam engine and return it Co the borier. If so, what is the perceutage of waste
A. Yes. There is no waste, If the apparatus is ty Doest he patentee of an Invention possess any certifi
cate to show that his invention is patented? A. No Is there any instrument that will detect the presenc
W. S. C. asks: 1. If the same pressure is engine and boiler, why are they made of different
strengths? For example, the boller tis 4 inch thick, the ivesteam plpe is $\frac{\%}{2}$, and the steam chest and cylinder oometimes one tich and more. A. The strength of a cyl inder, other thtngs betng equal, Increases as its diameter
is decreased, consequently small cylinders do not re quire to be made as thick as large ones. 2. How is it
thata steam boller can pump waterinto otself? It seem to me that there would be a back pressure on the pump piston head. A. The steam piston 18 larger than the wa
ier piston, so that the pressure per square ter piston, so that the pressure per square inch on the
water piston tis greater than the boller pressure. 3. it takes 10 ordinary horses to run a machine at the re.
quired space, what A. An average horse performs about half an engine
orse power, when working in a tiu or mill so that an ngine of five horse power would generally do the work of 10 horses. 4. Why can a horse pull more when he i
hitched directly to the load than he can 100 yarus from it by a rope, deducting the weight of rope? A. We are C. H. W. asks: How is curd soap made?

A. B. says: 1 . In February last, while plow-
ing p piece of land, I found, at a depth varynng from 3 to 6 Inches, a large number of honeycombed insect nests.
These nests were of various sizee, but, for the most
 and have gute a numbio generally from six to twenty-four, which contatin the
cocoan of the insect. These nests are made of clay cocoon of the tnsect. These ests are made of clay
somewhat llke the dirt dobbers. Can you inform me ts habits are, etc.? A. The Insect which you describe appears to be a kind of wasp, of which there are two
descriptions, the social and the solitary. The olltary deseriptions, the social and the solitary. The eolitary
wasp somettimes bullds stst nest in the ground, while the hanging from trees and fences. Consult an encyclope. dia, artitele "wasp.". 2. What is the best method of mixing
white lead or $\begin{aligned} & \text { Inc }\end{aligned}$ for palinting wood? A. White lead and zinc are mixed with botled lingeed oll to a proper con,
gistence for paint. 3 . In vol. 28 , No. 26, you puolished a new specific for rheumatism. It will be valuable t many If you republish it. A. Propylamin is the specific referred to. Wertheim prepares it by the decomposi
tion of narcotine and codeine by alkalles. Dose, 5 drop
C. S. A. asks: If a magnet were made in
he shape of a ring, of the ordinary thickness, would not each molecule have polarity in the same direction ic power is most intense at the two extremttres or poles,
 way, the position of the poles depenalag apon the maiuer in which t was
G. M. G. asks: Why is it that metronomes, A. Make one for yourself by tiking a cheap clock movement, and substituting for the pendulum a wire
witha a sidning welbht. Mark the wire with a fle at the
atferent afferent
R. J. asks: 1 . How can I make phosphate
of calctum? A. By phosphate of calctum, we esuppose you mean calclum phosphate or phosphate of lime.. The
formerterm and analogous ones we consider both con fusing and uncalled for in chemical nomenclature, al
though some chemists affect them. Phosphate of lime occurs naturally in the mineral apatite, and consists to constderable extent in bones. In chemistry there ar
various phosphates of 11 me, depending upon the amount ot base present. To form a bastc phosphate, add a solu-
tion of basic phosphate of soda to a solution of chloride of calcium. 2. Can you tell me how to dissolve old rub

 times with the a broad and long, but never, properly
with any sound of o, as in " cont.,
R. F. Jr. asks: 1 . Will you please give a
practical method for testing the explosive nature of the everal brands of burulng oil? A. Oll that will not take
fre when a lighted match Is held to to may be considered olerably safe. 2. In a recent number you gave a rectpe for a pant dryer, which named gum lac as one of the in
greaients. Is thereany other name for that article more tamillar to the tiade? A. We think the name gum la Is applied to all tae varleties in the market, namely
stiek lac, the crude product, seed lac, in a granulated orm, and shellac, which has undergone a puritication,
J. V. D. says: After getting up steam on onay morniug, i went to start my engine when, after he boller, which jarred the whole mill. In about two seconds there was anothe rand louder one, and then the
boilers went on all right. On the next Mond $\begin{aligned} & \text { On morn- }\end{aligned}$ oollers went on all right. On the next Monday moril
ing they acted simplarily. In the frst case, the steam fell nrom thy acte to bos., and in the second from 40 to 20 . What
for Was the cause? A. It may be that the pipes connecting
the bollers with the steam drum tha been choked with
ice or something else, which would account for the ac ice or something else, which would account for the ac
cldent.
E. S. H. asks: How can I make a safety
fuse, to burn at least 5 minutes?
S. asks: 1. How may I prove meerschaum an expert. 2. How may it be made white, after it has
become colored? A . We think it can be done by heat. ing.
H. S. asks: If If ill a cask with steam from
water at a heat so that the pressure will raise a a a fety water at a heat so that the pressure will raise a safety
valve welghted to one pound to the square inch, and then allow the steam to condense, what proportion of the cask would fill witi. water by suction caused by the
condensation of the steam, if the cask is connected by a water ta a well feet, the pipe betng full of water? A. If the steam is
condensell, there will be practically a perfect vacuum, and the cask will become filled with water from the
W. F. M. B. and N. C. R. ask: Is the law ersons in chargeof steam botiters and entines to bo examined by commissioners appotnted for that purpose,
still in force? A. The United States law applice only nost of the States, Htisvey of the working of the present United States law whether government regulations affecting al
of steam bollers would be desirable.
T. H. E. asks: In soldering two pieces o hey have been thoroughly cleaned, tinned, and fastened ogether with binding wire, and warmed so that a thi
heet of solder applied to the joint will melt, is ther ant ought, to make a gocd job" Resin is dsagreeable to ron, which is difficult to remove. A. To 2 ounces of uriatic acid, add smanl piece of zinc unt11 bubble
cease to rise. Then put in half a teaspoonful of sa
H. E. F. asks: Is vulcanized rubber the G. M. A. asks: Is there a garden gate which1 scribed on p. 406, vol. 25. 2. Is there any method to ce ent mica to copper, tin, glass, or another plece of mica
The cement desctibed in our answer to $R$. $L$, on $p$. W. L. asks. II there any chemical that can
Ie applied on glass, tin or parer, which will be visible only through colored or staned glass? A. We
aware of the existence of any such substance.
M. H. A. asks. If I Itake equal parts of block ould this be used for a polish for cleaning knives,forks c.? I Propose to use muriaticacid and then apply the
in and quicksilver; would it adhere so that they could be used? Would there be any danger in using such articles? A. Your process might answer for tinnng, and
you can easily try the experiment, but amalgamated ar
cles would be objectionable for cullinary purposes.
M. B. asks: How can I make molds to cast n casting small artieles? A. You can make molds for Iver stmlar to those which are used for fine cast iron
astings. For a amooth faclug, fine soapstone or plum bago may be used
A.A. S. asks: Has hydrogen ever been de-
A. S. says: An engineer of some experience esponding convexity of the cylinder heads, taking team in the center of the pistons by an arrankenent
of ports cored out of the leads, claimlug that he gaing a greater ettective pressure on the plston by that shape.
He state that, on $\begin{aligned} & 4 \text { thch chlinder, he galna } \& \text { square }\end{aligned}$ the shape of pls. re will be the same as in the common engine. A. We hink you are right.
W. S. IV. asks: How are Japanese scintilletes made? A. Japanese sclntillettes consist of pen-
ils of rolled paper, one extremty ent of about half the length of the pencll, is filled with acomposition which burnswith a red flame. It 15 isni-
led by holding the fine extremity in the hand, while the other end contanining the mixture is held for a moment In a flame. The composition may be made to sult the
fancy, the chief ingredients belng probably sulphur

Minerals, etc.-Specimens have been re ceived írom the following correspondents, and examined with the results stated:
S.E. W.-Your Doller sediment consists of some salline
 only to $\begin{aligned} & \text { orm scale, but to corrode the ron. The remedy }\end{aligned}$ is to distil, and to use the
G. W.P. Jr.-The stones you send are garnets. When eckoned among of a pure color, they are sometimes found in Ceylon and Brazil1. We do not consider your specimens of any particular value. The garnet

is moss prepared for finsthng wax fioxers? Can it be
bleached and inade to resemble white wax, to be put in White bouquets? How can small monopetalous corollas
be made of wax so that Eile appearance of natural Hlowers? With what should he colors be mixed, so that they can be put on the wax
the

## COMMUNICATIONS RECEIVED

The Editor of the Scievtific American acknowledges, with much pleasure, the re ceipt of original papers and contributions pon the following subjects
On the Spider's Web. By J. H. B.
On the Hot Springs of Nevada. By G.A.F. On the Centralization of Matter. By A. D On Ventilation. By A. R.M.
On the Relative Attraction of the Earth and Sun. By A. R. Jr. and by E. W.
Also enquiries from the following
A. W.-G.A.-S. R.-G. B.-A. P.-J. W. T.-R.J. W
-W.I.-E. C. B.-E. A.-A. Mh.-D. A. S.

Who makes match splitting machines? Who make Who makes match splitting machines? Who makes
balanced slide valves for use on locomotives? Who sells a hash machine? Who makes woolen machinery,
such as pickers. breaker cards, and tinisher cards? Who manufactures balloons? Who makes a machine which machines for making friction matches sold? Who
makes movable calks for horseshoes? Who make broom handle machinery? Who makes ditching ma to blocks be obtained? Makers of the above articles will probably promote their Interests
Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had
also those havilig goods for sale, or who want to find partners, should send with their communuccations an ersonal" which is spectally devoted to such enquiries.

## [OFFICIAL.]

## Index of Inventions

Letters Patent of the United States January 20, 1874,
and eacii bearing tiat date.


Engine, rotary, J. G. Witt......................
Engine valve, direct acting, H. A. Jamieson Equalizer, draft, J. M. Orput........
Evaporating briue, etc., A. Ungerer ence, portable, A Wright ence, portable, A. ilter, water, $\Lambda$. Heinz.................... rearm, hrazine. Peace \& williams..
 Fooil from ceiery, Ziegler \& Seal... Fork, horse hay, W. W. Moore............
Fountain, aerated liquid.J. C. Kennedy Furnacc, boiler, D. T. Casement.... Gage, depth, T. P. Hiorns ......
Gaining mschine. G. W. Bupbe Gas making apparatus, J. D. Patton. Gate, farm, M. Humes.
ienerator, steam, J. I.
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Hars ester, J. II. Gordon
Harvester cutting apparatus, P. Kitte. ats and caps, sweat band for, G. Lane Hoe, wheeled, s. S. Roys
Hose tubing, elastic, J. C. Boyd ( nhaler and dental prop,J. H. Vickers. Les hole, Guard.,. Lew Salz
Lamp. F. Mi. Gideon
eather co:nters, cutting, A. Keith (r)
 Loom take up, W. Murkland
Loom weft stop, IF. Comey. dabricator., J. . . . .ees (r).
ulvicatur, J. B. Wickerham. attocks, J. C. Klein................. Medicated plaster, i. E. Audouit... eter, water, J. Waterhouse.........
hilk receiving vessel, J. (t. Rogers Mold. supposititry, J. H. Plaisted
Motion, converting w. vut and bolt fastening, I. C. Tiftany or $\stackrel{2}{ }$, treating, J. II. Bo
 Paper machine, B. F. Field...........
Papre, inini hing printeá, J. Morris..
Picks, manufacture ot, J. C Klén Pin, di per..J. Poznauek


Plow, one whe ed riding, R. . C. A. Arex.
Pocket sifety attachment, W. H. Cairns
Press, conying, W. II. Fairba
Prin ter's aule, C. N. Morris
Pulley, band, E. Sanford....
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ineamer for metal, J. W. Bareantee.......

Roout, fire and waterproof, T. N
ant
tw, diamond, J. D. Husbands,
Saw fursiwing stone, J. D. IIusbands, J.
saw jointer, H. Parron....
saw mandrel, J. w. Bugbe
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cale, , platiorm, II. B. Osgood.
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rewny machine, W. G. Beckwith.
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tewing
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Stove, base burning, W. Halles..
146,627


## APPLICATIONS FOR EXTENSIONS.

Applications have been duly flled, and are now pending
for the extension of the following Letters Patent. Hearngs upon the respective applica
the days heretnafter mentioned
27,973.-Printing Press.-F. o. Degener. Aprill 8.
28,014-Mentalic Cask.-W. B. Scalfe. April 8 .
28,043.-Temple.-J. H. Woodward. April 8.
EXTENSIONS GRANTED.
26,891.-Spectacie Case Catch.-G. N.
26,902.-Planing Machine.-S. S. Gray.
6,900.-SEwing Machine.-A. F. Johnso 26,919--Repeating Fire Arm.-W. H. Morriset al. 26,952.-Lewing Machine

DISCLAIMERS
6,919.-REPEating Mis Aki.-W.H. Morris et al.

## DESIGNS PATENTED.

 T,112 to 7,115.-Carpets.-A. Heald, Philadelphis, Pa. f,117.-Bird Cage.-J. Maxheimer, New York city. 7,118 to 7,124.-Oil Cloths.-C.T.\& V.E. Meyer, Bergen 7,128. to 7,132 .-OIL Clorrs.-J. Hutchison, Newa


## CANADIAN PATENTS.

## List of Patents Granted in Canada

 Jandary 3, 1873.3,058.-T. G. Messenger, Loughborough, Eng. Improve ment on the coupling of pipes and in the iftings there
for, called "Messenger's Improved Pipe Joints." Jan. 3, 1874.
$3,058 .-\mathrm{J}$.
3,059.-J. D. Marshbank, Harrisburgh, Pa., U. S., and J.
R. Annett, Montreal, P. Q. Improvemen ts on a cupo la furnace for melting iron,
Foundry Cupola." Jan. 3, 1874 .
3.060--J. Mc. Armour, Syracuse, Onondaga county, N.Y.
U. S. Iniprovements in knittlng "Armour's Improved Knitting Machine." Jan. 3. 1874 P. Q. Improvements on the Ithaca Wheel Rake, calle
"Goddard's Rake Lever Attachment." Jan. 3 , 1874. 3,062.-J. V. Browne, New York city, U. S., and R. P
Fidlar, Sterling. Hastings county, Ontario. Improve Feeding Mucilage Bottle for the Economical Use of Mucllage.' Jan. 3, 1874.
tario. Machine for cutting sickles, called "Collin son's Reaper Sickle Cutter." Jan. 3, 1874 .
364.-S. Collinson, St. Catharine's, Lincoln county, on tario. Improvements on tongs used in machinery
called "Collinson's Patent Tongs." Jan. 3,1874 . 3065.-E. Sahm, Greenville, Mercer county, Pa., U. A conbined square and gage for carpenter's use,
called "Sahm's Combined Square and Gage." Jan ${ }^{3,066}$. -Wm . Todd. Portland, Cumberland county, Me. U.S. Improvements oncar couplings and the method
of a ttaching them to the cars, called "Todd's Ca Coupling.' Jan. 3, 1874
Improvements on spoon baite for fishing, called "Skin ner's Fluted Trolling Spoon." Jan. 3, 1874. U. S. Improvement on saw mills, called "Gowen, Improvement in Sow Mill." Jan. 3, 1874 la maniere de be servir d'une corde pour echapper a un
incendial a maniere de se servir d'une corde pour echapper a un
incendie, called "Sauveteur d' Incendie." A new mode
of using a rope in case of fre. Jan.

3,070-J. A. Green, Hamilton, Ontario. Improvement
In rallway switches, called ". Green’s Self Adjustable
Rallway Switch " 3,071.-Wm. Hamilton, Neversink, Sullivan county, N. U. S. Improvements on machines for making
shoes, called "Hamilton's Ox Shoe Machine." Jan ${ }^{1874 .}$
3.0r2.-D. J. Casement, Painesville, Lake county, Ohio
Seal Lock." Jan. 3, 1874 .
gor3.-J. Wilson, Klugston, Ontario. Improvements
(073.-J. Whison, Kingston, ontario. Improvements on
paddle wheels, called "Wilson's Paddle Wheel.
Jan. 3, 1874.
Jani. 3, 1874.
, 18 . Amos, Potsdam Junction, St. Lawrence count
Improvements on horse hay rakes, call
"'Amos' Improved Horse Hay Rake." Jan. 3, 1874.
3075.-C. McPhail, B1g Harbor, Inverness county, No
075.-C. McPhall, Big Harbor, Inverness county, Nova
Scotia. Improvements on armor for silps of wa
called "McPhall's Armor for War Ships."' Jan. 3, 1874
ments on machinery for weaving tape, called "Chap-
man's Tape Weaving Loom." Jan. 3, 1874 .
,07i.-Wm. McAllister, St. Lawrence, Mass., U. S. Im
provements for protecting butldings from tre, call
"The McAllister Fire Protector,"
The McAlister Fire Protector." Jan. 3, 1874.
3Ts. - I. Woolriuge, Dean's Corner, Lake county, IIl.
U. s . Improvements on land rollers, called "Wool
U. S. Improvements on land rollers, called "Wool
ridge's Iuproved Land Roller." Jan. 3, 18i4.
H79.-W.C.Davol, Jr., Fall River, Bristol county,Mass,
U. S. Improvements in hose leak stoppers, csill
"Davol's Fire Hose Leak Stopper." Jan. 3,1874 .
3080.-I. Helton, Carter's Depot, Carter county, Tcun.
v . S. Improvements in a medical compound, called
Fever Specific," the title or name whereof is "Fev
Specific Compound." Jan. 3, 1874.
Improvements in the formation and construction
gate posts, called "Hudgin's Gate Post." Jan. 3, 1874
882.-M. Boch, Brooklyn, Kings county, N. Y., U. S.
mprovements on fasteners for shoes, etc., call
"Boch's Improved Shoe Fastener." Jan.
"Boch's Improved Shoe Fastener." Jan. 3. 1844.
,083.-J. Rogers, Brooklyn, Kings county, N. Y., U.
Improvements on apparatus for manufacturing lam
black, called "Rogers' Improved Lamp Black Fur
nace,", Jan

## HOW TO OBTAIN

 in CANADA.

## TENTS are now granted to inventor

in Canada, without distinction as to the nation patents in Canada are nearly the same as in th United States. The applicant is required to fu nish a model, with specification and drawings in dupli
it is also necessary for him to sign and mak tfldavit to the origluality of the invention
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a conventent scale. The dimensions of the mode hould not exceed twelve inches.
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pletion of the papers, to obtain the decision of the Cana lan Patent Offlce. Remit the fees by in the box with model. Give us yourname in full, middle name include Inventions that have already been patented in the
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oftcial rules and formallties must also be observed. The efforts of the inventor to do all this businesshimself are generally without success. After great perpleaity and renced in patent business, and have all the work done ver again. The best plan is to sollcit proper advice at men, the inventor may safely consulted are honorable they will advise whether the improvement is probably

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model, make as good a pen and luk sketch of the improvement as possible and send by mail. An answer as to the prospect of 2 , patent will be recelved, usually, br
return of mail. It is sometimes best to have a searcb made at the I'atent Ottice ; such a measure often saves

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