

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



## THE ALBION BOILER.

This boiler consists of a shell, fifteen feet high and fiftyfour inches in diameter, suspended vertically by four wrought iron brackets, placed equidistant near the top of the shell, and resting on the brick casing, inclosing the shell in a complete oven. The shell is invested on five eighths of its circumference with three lengths of outside circulating tufes of two inches diameter, the outer and inner rows of which run at an angle of about five degrees from the vertical line in one direction, vertical line in one direction, while the tubes of the middle row cross them at the same apgle in the opposite direction; these three systems of circulating tubes are respectively 13 feet 10 inches, 12 feet 10 inches, and 11 feet 10 inches in length, having 23 tubes in eack set. In addition to eack set. In addition to these sixty nine outside tubes, carrying the heate water from the bottom to
the top of the boiler, there are seventy-five inside flues, of two and a half inches diameter, and of an ave rage length of ten feet, running from the top of the boiler into a sheet which forms the top of the smoke box chamber, and carrying the products of combustion from the top of the oven through the boiler, into the chimney, aboat five feet above the fire place:
Directly under the head of the builer and top flue sheet are plifed three in side tubes running across and each connecting with $t$ of the outside circula two of the outide circula ting tubes, which are per forated with small holes on the upper surface, so as to throw water against the underside of the head or top flue sheet, and upon the fiues inside the boiler.

This construction will be readily followed in the an nexed engravings, Fige. 1 and 2 showing the interio of the boiler in perspective and section, and Fig. 3, in plan.

The products of combus tion rise up the outside of the shell, around the circu. lating tubes, then from the top of the oven descend through the flues inside the through the flues inside th
boiler, to the smoke bor
chamber, and thence rise up along one fourth of the outside of the shell to the stack immediately above it, the draft in which is regulated by a self-acting damper.
The water is carried about four and a half feet below the top of the boiler, and the interposition of the smoke box chamber compels the rapid circulation of the heated water through the outside tubes, which inject it against the head of the boiler and the flues inside, which, to some extent, superheat the steam, as the products of combustion are practically exhausted before entering the chimney. The total amount of heating surface is 1,150 square feet.
On May 29, 1873, Mr. H. Robinson, steam engineer, of Bos ton, made a careful trial at the Albion Print Works, Con shohocken, Pa., of twelve hours evaporation with this boiler, which, with feed water at $75^{\circ}$ Fain. and steam at 53 pounds pressure, we are informed, resulted in the actual evaporation of 10.231 pounds of water for each pound of combustible. Compared with other experiments, where the water is taken at $212^{\circ} \mathrm{Fah}$. and evaporated at $212^{\circ}$, the result of the Albion boiler is equal to 11.937 pounds of water from and at $212^{\circ}$ Fah. for each pound of combustible consumed This trial was made with a clean grate, the fire having been extinguished several hours, and a fresh fire started.
On the 17th June, 1878, a second trial was made by Mr. W. Barnet Le Van, of Philadelphia, assisted by Mr. H. S. Robin son ; this was the trial of the Albion boiler in actual practi


THE ALBION BOILER
of combustible consumed, being about six per cent less than n the former occasion, no doubt due to the fact that the inerruption of the dinner hour occasioned a very material loss,

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|as the works were stopped and much heat was lost up the cal work, and was continued for eight hours, including the as the inner hour, when the works were stopped. The fire was aken at a certain thickness, and at the termination of the rial was left in the same condition as at the commencement his second trial shawed as an actual working result the vaporation of 9.585 pounds of water, at $78^{\circ} \mathrm{Fah}$., by one raporation of 9.585 pounds of water, at $78^{\circ}$ Fah., by one
ound of coal consumed, being equal to the evaporation of ork the and this test being intended for practical daily nevertheless a very large evaporation per square foot of heatg' surface and per pound of fuel consumed.
This boiler, we learn, has been in satisfactory operation at This boiler, we learn, has been in satisfactory operation at

the Albion Print Works for upwards of three years. Four | the Albion Print Works for upwards of three years. Four |
| :--- | :--- |
| boilers are in use at that establishment. The circulation is |

laimed to be as nearly perfect as possible while the space occupied is small, and the method of exhausting the heat compact and complete. The boilers, it is also stated have always been entire ly free from scale, and $k \in p t$ in order without expense. For further information as to terms and price, ap ply to J. Eberhardt, agent Albion Print Works, Con shohocken, Montgomery county, Pa .

Development of Hea by Friction of 1 it quids against solids. The energetic absorp tion of a liquid by a po rous body is accompanied by an elevation of tempe rature, probably resulting from the friction of the liquid against the interio of the capillary canals against which it passes. M. Maschke gives, in Le Mondes, numerous mbe sures of this increased temperature, obtained by causing amorphous silica to absorb various liquids Among the cases consid ered were: Amorphous si lica first wet and the dried at a moderate tem perature so as to contain no more than 29.8 per cent of water, treated with water; silica at 18 pe cent water, with water silica dried, with water silica calcined, then ex posed to moist air (22.68 per cent $\mathrm{H}_{2} \mathrm{O}$ ), with water silica calcined, then ex posed to very humid air ( 28.24 per cent $\mathrm{H}_{2} \mathrm{O}$ ), with water; silica calcined and cooled with sulphuric acid, treated sometimes with water, or benzine, almond oil, concentrated sulphuric caid, or alcohol. The experiments lasted ach from 10 to $4 \pi$ minutes, the thermometers, suitably arranged, showing the increase of temperature at their close. The in vestigator operated at a normal temperature of about $60^{\circ}$ Fah. The elevation observed varied in the majority of cases from $1.8^{\circ}$ to $14.4^{\circ} \mathrm{Fah}$. In calcined and dry silica, treated with concentrated sulphuric acid, the thermometer rose from $63^{\circ}$ to $92.6^{\circ}$. In one part of calcined silica mixed with 3.2 parts of alcohol, the increase was from $55 \cdot 4^{\circ}$ to $78.8^{\circ}$. Quartz or powdered glass, treated in the same manner as the silica, gave no appreciable increase of heat.

A Mass Convention of Millers.-The first annual meet ing of the Millers' National Association is to be held at St. Louis, Mo., on June 3rd. All persons interested in the milling business are invited to attend. A large attendance is expected; and by the interchange of opinions, addresses, etc., much valuable practical information will doubtless be elicited.

Preserving Wooden Taps for Casks.-The articles should be plunged in paraffin heated to about $248^{\circ}$ Fah. until no air bubbles rise to the surface of the melted material. They are then allowed to cool, and the parafin is removed from the surface, when nearly congealed, by thorough rubbing. Taps thus treated, it is said, will never split or become impregnated with the liquid, and may be used in casks containing alcoholic liquors.

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MUSCOLAR MOVEMENT WITHOUT LIFE.
" We find no motion in the dead," says the first of Tennyson's "Two Voices," clinching his argument as with an anom. The converse of the proposition, that where there is motion there must be life, is equally an article of popular belief. Especially is conscious life inferred when the motion imitates voluntary movements. A coffin, for instance, is opened for a last look at the features of a dead friend before the remains are removed from the receiving valt to the grave, and the body is found completely turned over: or the hands, no longer crossed upon the breast, expressing "long disquiet merged in rest," are so displaced as to give unmistakable proof of continued motion. The thought that life must have directed such movements adds to the pangs of bereavement the keenest regret and anguish; and too frequently the mourner has borne away a self inflicted
brand of Cain. The idea of returning consciousness and a brand of Cain. The idea of returning consciousness and a burial is too horrible to contemplate; and the faintest sus picion that one has been the cause of such a dreadful fate to another is full of unutterable bitterness.
To those afficted in this way, and those who fear such a fate for themselves, it must be a consolation to know that muscular movements are by no means valid evidence of life. We do find motion in the dead. Indeed, for one class of muecular actions, at least, arrest of motion seems to be rather an accidental than a necessary attendant of death.
The persistence of motion in decapitated snakes, turtles, and other low forms of life is familiar to every one. It is commonly explained by the relatively large nervous ganglia, independent of the brain, of such creatures. But it appears that many if not all muscles may contract without that stimulus of nervous action, with which alone we associate the possibility of conscious life. A striking illustration is given by Dr. Brown-Séquard in the case of two decapitated men. The arms were cut. off ; and for thirteen or fourteen hours, their muscles contracted in response to irritation by galvanism or mechanical stimulants. After that length of time, all signs of life had disappeared. He then injected the blood of a man into one of the arms and the blood of a dog into another. Local life was restored in both; the muscles became irritable, and the strength of contraction, extremely powerful. In the arm in which human blood had been injected, the contraction was stronger than during life; yet the nerves remained quite dead.
On another occasion the same observer kept the eye of an eel, removed from the body, at a temperature of about $36^{\circ}$ to $40^{\circ} \mathrm{Fah}$., for a period of sixteen days. By that time the eye was in almost complete putrefaction, get the iris contracted when exposed to light. Nervous action was impossible, and muscular fibers themselves were considerably al tered; yet they acted.
It is in connection with the rhythmical movements of the heart and other organs, however, that the most atriking proofs of muscular action independent of the nerve centers, are
found. The diaphragm, for example, may be separated com-
pletely from the apinal chord without interruption of its rythmic action. Similarly the heart of a dog has continued to beat for forty-eight hours after its removal from the animal, and there is recorded the case of a man at Rouen whose heart was found to beat for thirty-six hours after the death of the body by decapitation. "I dare say," observes Dr. Brown.Sequard, "that the great canse why we wee those organs stop at death so quickly is that the phenomena of arrest of their activity have taken place at the time of death," the phenomena of arrest, we may add, being quite independent of the cessation of life. Other observers have demonstrated the rhythmic action of numerous other organs in man and the lower animals: motions that persist after, not death merely, but the entire separation of the parts from the rest of the body. Indeed Dr. Brown-Séquard claims to have found tile tissues, but one which shows itself only under certain tile tissues, but one which shows itself only under certain
conditions, different from the ordinary circumstances of condit
life.
Still more remarkable is the fact that motions closely mimicking voluntary movements can go on in the absence of conscious life.
Dr. Séquard mentions a case in which he was called to see a man whe was thoroughly dead of cholera, yet who persisted in certain complicated movements distressingly suggestive of life. The dead man would lift up his two arms at full length above his face, knit the fingers together as in the attitude of prayer, then drop the arms again and separate them. These movements were repeated many times, with decreasing force, untilat last they ceased. To persons not knowing what may take place in the human body after death, these aingular movements, obeerves the Doctor, must certainly have looked as if the will power had been directing them. In fact the family and friends all thought the dead man alive, and many tests had to
had really taken place.
It is worthy of notice in this connection that it is generally with the victims of cholera and other sudden and violent diseases that post mortem movements are most common, and consequently the suspicion of premature burial most likely to arise. That such movements are wholly independent of life was demonstrated beyond a doubt by Dr. Dowler, of New Orleans, who adapted the heroic expedient of cutting off the limbs of patients, dead beyond hope of recovery from cholera and yellow fever. Notwithstanding their ceparations from the nervous center, the amputated limbs continued their seemingly voluntary movements. Whatever may have caused them, it is evident that these imitations of life were
not due to anything that could be associated with concsiousnesm.
DISCOVERY OF THE CAUSE OF THE ZODIACAL LIGHT. Professor A rthur W. Wright, of Yale College, cominunicates to the American Journal of Science and Arts a valuable paper on " The Polarization of the Zodiacal Light," in which the experiments of the investigator are detailed, and results given which will probably set at rest the moot question as to the nature of that celestial phenomenon. The zodiacal light is a faint nebulous radiance, which, at certain seasons of the year, and especially within the tropics, is seen at the west after twilight is ended, or in the east before it bas begun. The luminosity is conical in shape, the breadth of the base varying from $8^{\circ}$ to $30^{\circ}$ in angular magnitude, and the apex being sometimes more than $90^{\circ}$ in rear of or in advance of the sun. To account for this appearance, several theories have been advanced. Cassini believed it a lenticular solar Maeran, a refion from the latter atretched out into a flat tened spheroid. Laplace declared the phenomenon to be a nebulous, rotating ring, situated somewhere between the orbits of Venus and Mercury ; and Chaplain Jones, U.S,N. whose examinations into the subject have been the most ex tensive on record, also believed it a nebulous ring, but con-
tinuous, and not located as stated by Laplace. Professor Wright's deductions, a will be seen, fail to agree exsetly with any of these views.
But few attempts, it appears, have ever been made to determine whether or not any portion of the light is polarized, and up to the present time, knowledge on the subject has been uncertain and contradictory, pointing either to the idea that the rays are not polarized at all, or that the proportion of polarized light is so small as to render it nearly impossible to be detected. Professor Wright, becoming convinced that the difficulty should be ascribed to the imperfections of the instruments employed, constructed a new apparatus, consisting of a quartz plate, cut perpendicularly to the axis and oxhibiting, by polarized light, an unusual intensity of color. It is a macle, the body of the plate consisting of left handed handed through which passes eccentrically a band of righ ent structure. Placed between two Nicols, these strips appeared as bands of color, upon dark or light ground according with a Nicol, formed a polariscope of extraordinary a tube bility, and the first favorable.opportunity to test its powers on the zodiacal light was improved. It was almost immediately found to indicate the existence of light polarized in a plane passing through the sun; and in no instance, when the position as dermin th render the bands, what would be required by polarization in the plane above noted. Not the silightest trace of bands was ever seen when he instrument was directed to other portions of the sky. The observations took place on clear, cold nights when the
moon was absent. The polarization, it was also proved, did moon was absent. The polarization, it was also proved, did
not arise from faint vestiges of twilight, the reflection of the
odiacal light itself in the atmospiere, or from impurities in the latter.
Further experimenting was at orre proceeded with to determine the percentage of light polarized, and it gave, as the mean of numerous determinations, the angle $36 \cdot 6^{\circ}$ corresponding to a proportion of 16 per ceint; 15 per cent, Proessor Wright thinks, may be safely taken as the true value. The fact of polarization implies that the light is reflected, either wholly or in part, and is thus derived originally from the sun. No bright lines were found in the spectrum, nor could any connection be traced between the zodiacal light and the polar aurora. This is important, as excluding from the possible causes of the light the luminosity of gaseous matter, either spontaneous or due to electrical discharge. Further, it cannot be supposed that the light is reflected from Further, it cannot be supposed that the light is reflected from
masses of gas or from globules of precipitated vapor, as the latter, in empty space, must evaporate, and the former expand to too low a density to produce any effect on the rays of light. Hence, Professor Wright concludes that the light is reflected from matter in the solid state, from innumerable small bodies revolving about the sun in orbits, of which more lie in the neighborhood of the ecliptic than near any other plane passing through the sun. These meteorites, which are in all probability similar in character to those which fall upon the earth, must be either metallic bodies or tony masses. If we accept Zöllner's conclusion, that the gases of the atmosphere must extend through the solar system, thougb in an extremely tenuous condition in space, the oxidation of metallic meteoroids would be merely a question of time. They would thus become capable of rendering polarized the light reflected from the plane, and the same effect would be produced by those of stony character. In order to ascertain whether the proportion of polarized light, actually observed, approached in any degree what might be expected from stony or earthy masses of a semi-crystaline character, with a granular structure and surfaces more or less rough, a large number of substances were submitted to examinaion with a polarimeter; and the results showed that, from urfaces of this nature, the light reflected has in general but low depth of polarization, not greatly different in average from that of the zodiacal light.
The nature of the phenomenon, as discovered by Professor Wright, may therefore be summarized as follows: It is poarized in a plane passing through the sun, to the amount of about 15 per cent. The spectrum is the same as that of sunight, except in intensity. Its light is derived from the sun reflected on solid matter, which consists of small bodies revolving about the sun in orbits crowded together toward the ecliptic.

## $\triangle$ PROPOBED TESTING LABORATORY.

Professor R. H. Thurston, of the Stevens Institute, has suggested a really excellent idea, which will be of great benefit to the entire country. He proposes, in a letter to the trustees of the above named college, a copy of which we have recently received, to establish a department "to be devoted especially to experimental invertigations having a direct and practical bearing upon questions arising in the course of regular business." That is, a testing laboratory is to be orgenized, to which manufacturers, for instance, may send material which they propose to purchase, and have its value, properties, etc., carefully determined ; and where officers of railroads may obtain dynamometric determination of the resistance of trains, efficiency of locomotives, and value of fuel and lubricants; and where iron and steel makers may find a secognized authority which will afford them full and accurate knowledge regarding the chemical constitution, physical structure. etc., of their products. These are but a few of the very manifest uses for which such an establishment could be employed by the business community with the greatest benefit, and we doubt not but that the reader will be able from his individual experience to suggest many others.
It is designed to comprise the most powerful testing machines, the most delicate instruments, and the best fcrms of apparatus, to be under the direct control of a very able body of scientists. Professor Tharaton himself, we notice, volun teers to assume the direction, and to carry out the details of the organization. This is decidedly a case of the right man in the right place, and the trustees of the Stevens Institute, in their ready acceptance of Professor Thurston's views and offers, evidently are impressed with the same belief.
These gentlemen, in their reply, promise to accord all necessary space, and to render every assistance in their power As the originator of the scheme says that there will be no difficulty in securing sufficient capital, from business men to be benefited by it, to purchase the necessary outfit, or even to create such an endowment as would insure the independent support of the laboratory, we may regard the enterprize as an accomplished fact, requiring only the time necessary for its practical establishment to place the community in full possession of its advantages.

HON. DAVID A. WELLS AND THE FRENCH INSTITUTE, We notice with much gratification the elevation of Hon. David A. Wells to the vacancy in the list of foreign asso ciates of the French Institute, caused by the death of John Stuart Mill. Membership in the Institute is regarded throughout Europe as one of the highest distinctions to be labored for by literary and scientific men, and only a very limited number of persons, who must have become distinguished in cience, literature, or art, are admitted to its councils. The honor, in the present instance, is enhanced by the fact of Mr . Wells being chosen as the peer of the great thinker lately deceased ; and that it is a well merited one, need not be told deceased; and that it is a well merited one, need not be told
to the many who are familiar with his learned and able wri.
$t^{\text {ingg. The latter have long been held in the greatest eateem }}$ by the first political economists in France and England. Of his reports on local taxation, to the legislature of this State, one hundred thousand have been printed in England and distributed throughout Europe. Soon after the German war, the French legislature caused Mr. Wells' report on tax ation of 1869 and his New York report of 1870 to be trans lated and printed as public documents.

## FROM CHAOS TO CORAL.

Many of our readers doubtless have noted, perhaps during the study of experimental chemistry, that silver when melted and afterward allowed to solidify in an earthen crucible will, as it cools, assume a brisk effervescence. The mass bubbles and swells; small particles are thrown out of the pot, bles and awells; small particles are thrown out of the pot,
and, in fact, a miniature volcanic eruption is reproduced :to and, in fact, a miniature volcanic eruption is reproduced: to
complete the resemblance to which, $\boldsymbol{f}$ the silver, when solid, appears covered with little cones pierced at the center, stmulating the form of volcanoes. This phenomenon, however, we can easily account for from the knowledge that gases are absorbed not only by liquids at the ordinary temperature, but by melted bodies. The silver absorbs oxygen, which it abandons on cooling ; the more sudden the latter, the greater the disengagement of the gas; while, on the other hand, if the metal be allowed to get cold slowly, the oxygen escapes insensibly and hardly disturbs the surface. Melted litharge also absorbs oxygen, and similarly abandons it. A like ab. sorption takes place in the combustible gases which are found in the furnaces for melting metals, and recent investigations in France have proved that cast iron after cooling retains a notable quantity of gas, especially of carbonic oxide and hydrogen.
While, however, totally melted bodies absorb gases and reject them at the moment of cooling, the same bodies, when simply softened by the action of heat (though absorbing gases as before), retain the gases after becoming cool, and give them off slowly under the influence of a new elevation of temperature and of an almost perfect vacuum. These facts are not only very curious, but are of considerable importance from a geological point of view.
Volcanoes, it is known, when in eruption emit various gases : first hydrochloric acid, sulphuric acid, and hydrosulphuric acid ; later, the carburetted hydrogens predominate; and finally appears a disengagement of carbonic acid, which lasts for centuries. The volcanoes of Auvergne, in France, have been extinct for thousands of years, and yet springs charged with carbonic acid are abundant in the vicinity. There arò other well known instances, such as the celebrated Dog Grotto, near Naples, so called from the practice of lowering unhappy dogs into its depths to see them overcome by the deleterious gas, and the Guevo Upas or poisonous valley of Java, where the atmosphere is so deadly that the soil is said to be covered with the bones of animals and of men who have died from its effects: in both of which the discharge of gas has existed from time immemorial. Humboldt counted 407 volcanoes on the earth, of which 225 only were active. This latter number has since been increased to 270, of which 190 are on the islands or shores of the Pacific. The majority of volcanoes are situated near the great fracture which extende along the coast of the American continents, and is prolonged to Kamschatka, to Japan, and as far as Java and Sumatra; others are located in New Zealand,New Britain, the New Hebrides, New Caledonia, and, in the antarctic regions, Mounts Erebus and Terror. The quantity of carbonic acid disengaged by these vast furnaces is enormous. Boussingault estimates it at 95 per cent of their entire gaseous emission, and this has been verified by Bunsen in investigations upon the emission of Mount Hecla. Here then is an immenee and appa rently inexhaustible series of reservoirs, which forms the source of a large amount of the carbonic acid in the world It remains to examine how this supply was generated, and the theory which has been proposed is readily followed.
When the earth cooled down from its molten state, the various substances, which were maintained separate by the excessive temperature, became united according to their re spective affinities : hydrogen and oxygen formed water; oxygen and carbon, carbonic acid ; chlorine and sodium, sea salt and so on. The incandescent rocks, however, while still liquid, found themselves in contact with a dense atmosphere containing various gases, which they absorbed in exactly the same manner as we have stated the gilver and litharge to act as regards oxygen, and iron, in reference to carbonic oxide and hydrogen. Further, it was possible that these rocks should become charged in a greater degree with carbonic acid than with other gases existing in the atmosphere, through the action of a relative affinity, just as the melted silver absorbs oxygen instead of nitrogen, though both are present in the same atmosphere. As commotions on the surface of the globe were frequent in its transition state, the rocks were perpetually changing places. Vast masses would be engulfed, to be replaced by others rising from the depths, and so an incredible quantity of carbonic acid became oc cluded in their substance. As these rocks solidified, the carbonic acid slowly escaped; and if, as is proved, with reasonable probability, there still exists in the interior of our globe an incandescent mass which is constantly cooling, here then is the source of the disengagement of the gas which, escaping through the volcanic apertures, mingles with our atmosphere.
It is curious, in thas tracing the part which the extinct volcanoes play in the economy of our globe, to note how perfectly the migration, which the carbonic acid that they evolve may assume, illustrates the truth of the indestructibility of matter. First found in the primitive atmosphere of our
earth, it became absorbed by the incandescent rocks, and re
mains buried in their depths for thousands of years. Little by little, however, as its captors become colder, it makes its way from its subterranean prison, and escapes into our atmosphere. Its liberty is, however, of short duration, for the rain again seizes it and carries it perhaps to the rivers, and the latter to the sea. From the water it is wrested by lime to foim a carbonate, which minute animalcule-the coral insects, working tirelessly century after century-build
first into a reef and then Into an island, forming perhaps the nucleus of a new continent, to be completed in the ages far in the future.

## ABT AMONG THE ASHANTEES.

The thousand ounces of gold gathered in such haste by King Koffee, as the first instalment of the indemnity de manded by his English conquerors, furnish many curious and striking illustrations of the artistic development of the native goldsmiths. Their skill in working gold-which ap. pears to be the most common metal of the country-seems, indeed, to be fully equal to that of the best European artist while their fertility in invention is simply wonderful.
Among the larger articles brought away by the English is a human head of massive gold, nearly five pounds in weight: a ghastly object, apparently representing the head of a victim gagged for sacrifice. Of a more pleasing character, and more to be preferred as works of art, are two heavy golden griffins, said to have been broken from the King's chair of state. There are besides, many badges of office of different styles, some of them massive fibule on Kougee gold, like those worn by the heralds sent by Kin Koffee to treat with the English commander, others of vari ous patterns according to the office of the wearer. That of
the King's chamberlain, for example, is distinguished by the King's chamberlain, for example, is distinguished by
padlock and keys; the butler's, by cups and bowls, all of solid metal, and, for the most part, castings of exquisite design.
In addition to these great badges, each of which contains many ounces of pure gold, there are fetish caps ornament ed with gold in repoussee work, the golden tops of nmbrellas and sticks of office, grotesque lions for the heads of scep. ters, golden jaw bones, thigh bones, and skulls, a large sacrificial knife with a golden handle, and many indescriba ble objects which doubtless served their purpose in the fantasSmaller in size fetish worship.
Smaller in size but not inferior in workmanship is an in finite number and variety of objects of native design, besides numerous imitations of the gold work of other nations and ages: bracelets, some so heavy as to be a burchains, pendants, brooches, and rings of curious yet beautifal shape.
The imitated articles give a striking indication of the skill with which the native workmen copy everything that comes to them from the outer world. Thus there are golden padocks, buckles, bells, and even watch keys, whose use must have been unknown. Not the least curious are several
copies of reliquaries, left, perhaps, by Roman Catholic missionaries in that benighted land, and reproduced in gold by the native workmen, with a faithfulness and delicacy which a Chinese might envy. Among the brooches, pendants, badges, rings, and so on, there are forms which are almost facsimiles of early Indian ornaments; othera approach Egyptian styles: atill others, Scandinavian and Anglo Saxon types. The whole world, in fact, has been laid under tribte and the relics hoarded in this out-of-the-way region.
Some of the articles are quite new, and still have clinging to them the ine red loam in which they were cast. Others are old and worn, and bear traces of frequent patchings and solderings. One of the most remarkable of the ancient pieces is a finely chased seal ring, the signet being made of an ancient Coptic coin. Two other rings were evidently copied from early English betrothal rings. Some of the necklaces and chains are formed of beautiful shells reproduced in gold, while others represent seeds and fruit. In every case, the design is individual and the beauty of the every case, the design is individual and the beauty of the
workmanship refreshing to see, in contrast with the machinemade jewelry worn by modern civilized belles.
The most noteworthy object in silver brought from Aehantee is an enormous belt or baldrick, to be hung over the
neck by a massive chain, crossing the breast diagonally. neck by a massive chain, crossing the breast diagonally.
From the belt depend seven or eight silver sheaths for knives, the use of which it is not difficult to imagine.

## burial in the sea.

The disposition of our dead is a problem so important that any contribution towards its solution should be welcomed. Ordinary inhumation is manifestly objectionable on sanitary grounds. The pollution of the air we breath and the water we drink is enough to condemn the practice in densely populated countries. The Italian suggestion of casting the bodies into one common charnel house, hasten-
ing decomposition by caustic alkalies, gling of the good and the bad, the rich and the poor, offends our moral and social tastes; and then too we fear some one in this utilitarian age would propose, and some agricultural legislaturs carry out, the idea of using the compost as a feris the use of hydrated oxide of iron to assiet the destruction of the body; but even this is not entirely free from the hygienist's objections. In spite of the utmost precautions (which in practice would seldom be carried out), the air and
water would be more or less contaminated. The pagan plan of cremation has something in its favor, but much against it. The establishment of furnaces for the conversion of our de parted friends into gases and ashes is too infernal to be
popular; and we are not so sure that the atmosphere would be any the better for breathing or smelling, should the prac ice become general.
To those who object to earth burial for the sake of the living, and to the roasting process on other grounds, we now propose a third method, which certainly has the merit of escaping the disadvantages of the other two. We mean burial in the deep sea, which, for the want of a better word, we will call thallataphy. Let a steamer for the purpose-a loating hearse-transport the dead at least a hundred miles from land and commit them to the depths. The coffin, whether of metal or wood, should be perforated with small holes and weighted. Is any one shocked? We doubt if he can tell why. Banish the idea of sharks; they belong to the coast. The deep sea fauna is made up of low and harmless forms of life-sponges, rhizopods, diminutive molluscs, and the like. The dead would never pollute anything of which the living partake. Do you prefer to commit the relics of your departed friends to their "kindred elements?" It is far more appropriate to lay them in the bosom of the ocean than to inter them in the land-dust with dust; for the average man consists of 88 lbs . of water to 66 of solid matter. Nor need any one be trocibled about the resurrection; for we are assured that " the sea shall give up its dead." We say then, especially to the great maritime cities like New York and Boston, London and Liverpool, away with patent furnaces and crowded cemeteries, and find rest in the unlimited burial place which Nature has provided.
J. 0.

## REGULATING THE SPEED OF AN ENGINE.

We have received a neat little pamphlet*from the J. C. Hoadley Company, of Lawrence, Mass., giving the results of experiments in regulating the speed of an engine, first by means of a variable cut-off, second, by throttling the steam controlling mechanism being actuated in each case by the govornor. It is scarcely necessary to say that the results are large ly in favor of the variable cut-off: It is easy to understand why this should be so.
When a cut-off is employed, steam of nearly the boiler pressure is admitted to the cylinder; and the admission valve being closed before the piston has completed its stroke, only a portion of a cylinder full of steam is used. On the other hand, when the steam is throttled, its pressure is reduced be fore admission, and a cylinder full of steam is required. In the pamphlet referred to, quite a number of comparisons are given and statements are made in regard to the amount of coal and water required for horse power per hour in each case. There is no account of the manner in which the experiments were conducted, nor is it stated whether they were made by mem. bers of the company or by disinterested experts, both of which facts will tend to lessen their value, in the opinion of many. There is little doubt, however, of the truth of the principal statement,that under ordinary circumstances an engine with a variable cut-off will be more economical than one in which he valve is arranged to cutoff at a fixed point, all regulation being effected by throttling the steam.

## THE MAGNETIC EQUIVALENT OF HEAT.

There has recently been devised, by M. Cazin, in France, a hermomagnetic differential apparatus, by means of which, it is stated, the absolute:quantity of heat engendered by mag netism may be measured; in other words, the magnetic
equivalent of heat may by its aid be determined. The investigator, after observing the thermic effects of magnetism on the core of a rectilinear electromagnet, around which the wire is rolled in alternately opposite directions, so as to produce several poles, enunciates the following law: "When the alternate spirals, constructed by the wire, have the same dimensions, and when they divide the magnet into several equal portions (concamérations), the quantities of heat created in the iron core at the opening of the voltaic circuit are in versely proportional to the squares of the number of divisions, the other circumstances not changing." For example, four similar bobbins are disposed around a cylindrical iron tube at equal distances apart, the tube extending a short length beyond the outer coils. In establishing the communications, there is obtained, with the same total length of wire and the same total number of points, one, two, or four $t, \frac{1}{18}$.
In order to measure this heat, M. Cazin has constructed a kind of differential air thermometer, in which air reservoirs are used. Two or three thousand interruptions of the electric current produce, with an ordinary battery, a calorific
effect very plainly measurable. By dividing the pressure observed by the number of interruptions,and making a small correction analogous to that employed in calorimetry in taking account of the cooling action of adjacent bodies, the thermic effect of the magnetism is obtained.

Recent Boiler Explosion.-A correspondent in Lexington, Ky., sends us an account of a boiler explosion in that place. Considerable damage was done to the building in which the boiler was situated, and two horses were killed. The boiler was quite old, and the steam gage was very defective, according to our correspondent's statement; so it seems quite probable that the explosion occurred from excessive pressure. A steam gage that shows 45 pounds pressure, when the actual pressure is 100 pounds per square inch, with a so-called safety valve to correspond, and a care less and ignorant man in charge of the boiler, offer very favorable conditions for an explosion.
Comparative Economy of Regulation, by Variable Cut. Off and by Throttle Valve, as Exemplified by Indicator Dla
J. C. Hoadley Company, Lawrence, Mass.

DEVICE FOR PREVENTING HORSES FROM CRIBBING.
Cribbing by horses is a peculiar habit, or perhaps disease, which seemingly impels the animal to gnaw its manger, seize hold of objects with its teeth, and, by the action of the larynx, to suck in air until a very uncomfortable as well as unsightly condition is the, result. In the invention represented in our engraving, Mr. A. Stilwell, of Dwaar's Kill N. Y., supplies a mechanical arrangement which, he considers, will prevent the difficulty.

The device is suitably secured to the headstall by a metallic strap, A, on which are formed arms, B and C, at right angles. With the latter connects a bent lever, $D$, the inner end of which, terminating just forward of the larynx of the animal, is provided with a number of aharp spurs. Attached

to this lever are curved bars, E, the inner extremities of which extend to the same point, and have semicircular flanges which, rising above the spurs, prevent the latter from pricking the horse so long as the animal remains quiet. The moment, however, the cribbing action distends the larynx, the latter, expanding, presses upon a cross, $F$, which, being pivoted to the curved bar, $E$, and also to the arm, $C$, pulls on the short arm of the lever, $D$, thus lifting the points, which punish the horse until he desists. The machine is made of iron or other suitable material, and weighs some six ounces.

## Hints for the Care of Horses.

At a recent meeting of the Farmers' Club of the American Institute in this city, Mr. G. W. Jobnston read a paper on "The Horse," in which we find a number of valuable hints regarding the management and care of that most useful of our dumb servants. With reference to balking, the speaker said that horses frequently resist because they fail to understand what is required of them; or it may occur from overloading sore shoulders, or being worked until exhausted. The latter is especially the case in young animals. The vice can only be corrected by kindness and gentle treatment, and it is recommended, when the horse attempts it, to jump out of the wagon, and pat and reassure him by a kind word, carefully examine the harness, and then get in again as if expecting him to go. This will generally prove of fectual.

Mr. Johnston says that the French are the best authorities on the dieting of horses, and that they hold that, under all circumstances in the giving of food, age and condition should be taken in
to consideration. better than hay for old horses, as it is more easi ly masticated an'd y masticated and swallowed. When
a horse is working hard, his main food should be oats. If he work but little, hay alone will answer. For a saddle or a light carriage horse, half a pect of good oats and of good oats and harteen pounds of hay are sufficient. The hay should be wet with salt wa-ter-a teaspoonful of salt to a bucket of water. . Oats possess more nu-
tritious matter for making flesh thanany other kind of food; buta small quantity of mown grass should always be given in the spring to horses not kept in the pasture. A horse should have river water rather than well or spring water, as the latter is cold and hard, while the former is sweet and comparatively warm. One bucket morning and night, or, what is better, a half bucket at four different times a day, is the properquantity. If a horse refuses food after drinking, he should be allowed to rest, as the refusal is always evidence of exhaustion.
The stable should always be well drained and sufficiently lighted, because the vapors from a damp, putrid floor, and the sudden change from darkness to light, will almost certainly cause blindness. Let proper openings be made, just under the ceiling, to permit the hot foul air to escape, and free ventilation be allowed, at the bottom of the walls, to admit fresh air, for impure and confined air causes broken wind. The fresh air should enter through a number of


## OVERHEAD TRAVELING CRANE

driving pulley through gearing to the bevel wheels, and thence to the worm which actuales the chain drum. The crane is intended to lift and transport weights up to $2 t$ tuns.
Linseed orl.-Linseed oil is obtained from flaxseed, by grinding the same under heavy stones, set on edge and made to revolve on beds of stone. Attached to the edge stone are scrapera which throw the seed into the circular track of the roller. The ground seed is placed in strong, woven woolen bags, which bags are covered with mats made of horse hair and sole leather, of a proper and sufficient, width to protect the bags in the operation of pressing. These mats with their contents are subjected to an immense hydraulic pressure, and the expressed oll flows off into large iron tanks, where it is allowed to settle. What remains in the bage after the pressure is known as oil caks. About $8,000,000$ gallons of linseed oil are used annually in the United States.

## IMPROVED MIXING SPOON.

If temperance agitations were not so fashionable just at present, we should innocently write that this invention is peculiarly adapted for mixing drinks; but as in some portions of the country, the latter operation, fortunately for the inhabitants, bids fair to become one of the lost arts, we restrict ourselves to the observation that the device is most suitable for combining medicines, compounds less agreeable to take, perhaps, in the beginning, but sometimes-not al-ways-more beneficial in the end.
It is an ordinary good sized spoon, the bowl of which is made with a number of perforations and provided with a projection, A, which catches upon the edge of the vessel in which the mixing is to be done, thus holding the implement

securely in place. The sugar or other material is placed in the bowl, and the medicines or other liquids to be added are dropped or poured in, in succession, percolating down through he perforations. Mr. William S. Clark, of Ish penning, Mar quette county, Mich., patented the device through the Scientific American Patent Agency.

## How Thermometers are Made

L. C. Weldin describes, in the Polytechnic Bulletin, the method of making thermometers at the Tower Manufacturing Company's establishment, Chester, Pa. :
The glass tubes, as received, are about a yard long. A boy nicks them with a hard steel knife, and breaks them into the lengths required. The bores, which are flat, are compared, by means of a lens, with those of ten standard sizes, and the tubes assorted accordingly. They are then passed to the blowpipe table. Each giass blower has a foot bellows, and uses an oil lamp. Melting the glass at one end of a tube, he blows it into a bulb by pressing the sides of a of a tube, he blows it into a bulb by pressing the sides of a
hollow india rubber ball attached at the other, proportionng the size of his bulb to the bore of the tube, and ascer taining the size by using a pair of callipers. While the bulb is yet hot, the tube is inverted in mercury, which, as the bulb cools, rises and partially fills it. The tube is then withdrawn and a short india rubber tube attached at its open end. Into this mercury is poured; that in the hulb is boiled to expel the air, which rises up through the mercury in theindia rubber tube, and an atmosphere of the vapor of mercury now fills the glass tube and bulb. As this condenses, the mercury in the india rubber tube takes its place, when this tube, with any mer cury remaining in it, is removed. The bulb is now warmed, and the open ond of theglass tube hermeti cally sealed.
The bulb and a portion of the tube are immersed in mel ting ice, and the hight of the mercury marked; they are then trans ferred to a bath at $62^{\circ}$ Fah. and the hight marked; next
Fah., and the hight again marked. The lengths of the three spaces of thirty degrees each are now carefully measured. If they are exactly equal, the bore of the tube is assumed to be uniform, and the degrees laid off on the brass scale of the thermometer are all made of the same length. If the spaces of thirty degrees each are not found to be exactly equal, then, by means of a highly ingenious dividing engine, the degrees on the scale are made to increase in length as the caliber of the tube diminishes. When the plate has been divided, and the figures and letters punched, it is passed, laterally, between rollers, to remove the burr left by the tools. Were it rolled lengthwise, the accuracy of the dividing would be impaired. The plate is then silvered and lacquered, the glass tube attached, and the whole slidden into the well known japanned tin case. The establishment turns out two hundred dozen thermometers a week.

THE wine crop in the United States is $20,000,000$ gallons.

road and railway bridge over the mississippl, at keokuk, iowa.

## 324

## THE KEOKOK AND HAMILTON BRIDGE.

 We publish herewith a full page engraving of the road and railway bridge over the Mississippi at Keokuk, Iowa, designed by Mr. J. H. Linville, C. E., and erected by the of the highest engineering skill and most solid construction, and of great magnitude, as the following dimensions will show:Commencing at the west or Keokuk end of the bridge, the spans are located as follows: Pivot span, total length of one truss, center to center of end posts, 376 feet 5 inches; open-
ing under each arm of 160 feet measured on the square; 2 spans, 253 feet 6 inches; 8 spans varying in length from 148 feet $4{ }^{3} \frac{3}{6}$ inches to 161 feet 7 inches; total length, backwall to backwall on bridge seats, 2,192 feet. It is a through bridge built on a skew of $17^{\circ} 15^{\prime}$, with a distance between the two trusses of 21 feet 6 inches. It carries a single line of railway track and two tramways for local traffic, the track being placed in the center between the tramways. On
each side of the bridge, outside of the trusses, are footwalks each side of the bridge, outside of the trusses, are footwalks
5 feet wide protected by light and substantial iron lattice 5 feet wider
railings.
We are indebted to Engineering for the engraving, which is made from photographs taken on the spot.

## Cotrtapandence.

## Acoustics of Public Buildings.

To the Editor of the Scientific American:
There are few things more provoking than the inability to hear a public speaker distinctly, when that inability arises from the fact that the building has been constructed with little or no regard to good acoustic effect. We are inclined under such circumstances to blame the architect; but unfortunately the architect is often compelled to consult the wishes of those who come not to hear, but to see. In no public buildings are the simplest laws of acoustics more neglected than in our churches. This arises in a great neglected than in our churches. This arises in a great
measure from the fact that, at the present day, an effort is measure from the fact that, at the present day, an effort is
made in church building to imitate in architectural effect made in church building to imitate in architectural effect
the large churches of the middle ages. The fact that these grand old structures were not erected to be filled with a single voice, but to raise a monumental pile for great ceremonials, seems to be entirely forgotten; and many of the churches of today are built with a high apsis, in which is placed the speaker's desk instead of the high altar of earlier days. The nave is lofty and, by its groined arches and days. The nave is windows, gives ample opportunity for the sound hooded windows, gives ample opportunity for the sound
of the speaker's voice to be echoed and re-echoed from its of the speaker's voice to be echoed and re-echoed from its
numerous surfaces until it falls upon the ears of the audience numerous surfaces until it falls upon the ears of the audience errors in church architecture have been committed, the question arises: Is there any remedy by which the acoustic properties can be improved? Plain and parabolic sounding boards have been introduced, but with very indifferent results. Drapery has been festooned about the sides and bases of the arches with no better (and with very unsightly) effect; and until quite recently, no really successful method has been devised by which the difficulty could be overcome. The Rev. Joseph P. Taylor, formerly rector of St. Paul's Church, Brunswick, Me., ascertaining that his audiences
were greatly troubled to hear him distinctly, on acwere greatly troubled to hear him distinctly, on ac-
count of excessive reverberation, gave the subject careful count of excessive reverberation, gave the subject careful
investigation and study, and conceived the idea of overcoming the difficulty by the introduction of screens of very fine wire beneath the ceiling, at a proper angle and at such a distance from the pulpit as would best intercept the sonorous wave, and thus prevent its striking the reflecting surface with sufticient force to cause echo. The same device was with sufticient force to cause echo. The same device was
subsequently employed by Mr. Taylor in the Brown Memosubsequently employed by Mr. Taylor in the Brown Memo-
rial Church, Baltimore, where a very bad echo or reverberation existed; and the testimony of prominent men connected with the church is that the cure is complete. The Asylum
Hill Congregational Church, of Hartford, Conn., is a fine Hill Congregational Church, of Hartford, Conn., is a fine
gothic structure, built of Portland stone after the style of architecture of the middle ages. It has an apsis of 17 feet depth and 52 feet hight. The point of the arch of the nave or clerestory is 54 feet above the floor of the audience room, and is ornamented with hooded windows. The organ gallery, at the end of the church opposite the apsis, extends over the vestibule to the front of the central tower, and is some 25
feet deep. When this church was completed, its architectural effect was beautiful, but it was found impossible to understand the speaker in some parts of the audience room. A parabolic sounding board was introduced, back of the speaker's desk which was situated in the apsis. The effect of this contrivance was to benefit the hearing directly in front of it, but was of little or no service to those sitting in the side seats. Subsequently an organ was purchased and put in the apsis, nearly filling it, and the speaker's desk was placed on a platform extended some 8 feet in front. The front of the organ gallery at the opposite end of the church; was provided with a skeleton gothic window, that is, one with the frame and tracery, without any glass. (The organ gallery is unoccupied.) This was done to break the column of sound which was found to vibrate in this gallery independently of the great column of sound in the audience room. These changes improved the hearing qualities of the church, but in certain localities the old dificulty remained, and some of what would ordinarily be the best sittings in the house were very undesirable, from the great dificulty of distinctly hearing the words of the speaker. Various devices for overcoming this difficulty have been suggested,and investigation
of them has been made. The one which was regarded with of them has been made. The one which was regarded with
most favor by the society's committee was the introduction
of wires to be used at points of greatest reverberation. MrTaylor was invited to examine the audience room of the plish the end desired. The diagnosis of the case was interesting. A speaker was placed in the desk and the two or three persons composing the audience distributed themselves within the limits of greatest reverberation. The effects of he speaker's voice at different angles and at different eleva tion was carefully noted, and the source of the reverberatory
waves traced out. This having been done, the mode of applying the remedy was decided upon. There is no undeviaing rule that can be laid down, but every case must be exmined and the remedy introduced in accordance with the peculiar circumstances involved. In some cases, the wires are strung across the groined arches high up in the nave. In others, they are placed across the arches leading to the tranepts. In the Asylum Hill Congregational Church, it was ound necessary to separate or divide the groined arches and ooded windows of the clerestory from the audience room below. The wires are of very small gage,and do not disfigure
the church in the least. A stranger would not notice them unless his attention were particularly directed to them. The result of the experiment is most satisfactory, and the hearing is equally good in all parts of the house, provided that the preacher speak with sufficient strength and distinctness for an audience room so large. Mr. Taylor's patent is entirely different from the plans of some who have made use of wires to overcome acoustic defects. These have usually consisted of wires of large gage, distributed from four to eight feet apart, being very unsightly and producing but indifferent
results. His plan is what he terms a "break sound." The results. His plan is what he terms a "break sound." The
wires are so placed as to receive the sound wave before it wires are so placed as to receive the sound wave before it
reaches the reflecting surfaces which cause the reverberation. The sound impinges against the wires; its force is broken, and it has no power to produce an echo or reverberation from the surfaces beyond, nor is the sound reflected back by the wires to the audience. It is simply broken, and its force is taken up by the wires which, by inaudible vibrations, convey it away. If a sounding board or sonorous reflector were placed in the same position,an unpleasant reflection of sound would be the result; and if drapery were used, the sound would be dead and muffled. Having made trials of all these devices, we can say that the wires alone accomplish the end sought, and they are adapted to all kinds of public buildings where difficulty in hearing is experienced. I have given you a full and lengthy account of our experiments because I am aware that there are many public buildings and churches in the country which are beautiful in their architecture, but have acoustic defects that sadly eclipse other attractive features, and I amalso a ware that the Scientific American is a paper which people look for such information.
Hartford, Conn.
J. M. Allen.

The Relative Attraction of the Earth and the Sun. To the Elditor of the Scientific American:
It appears that I have not been explicit enough in my communication on the above subject, published on page 245 of your current volume, and have used too few words in disposing of Captain Ericsson's iron ball floating in a bath of mercury : consequently he labors under the impression that I do not understand his apparatus. I understand it only too well, so well indeed as to know that even the attraction of the rising or setting moon can never affect such an arrangement, which, according to Captain Ericsson's ideas, it ought to do, if only its sensitiveness were slightly increased. In order to show this, we will take Captain Ericsson's data, given on page 164: Mass of sun $=314,760$, the earth being 1. As the mass of the moon is 0.0125 or the 80 th part of that of the earth, the sun's mass surpasses that of the moon: $314,760 \times 80=25,180,800$ times; and the force of gravitation being inversely as the square of the distance, and directly as the mass, the sun's attraction is relatively equal to $25,180,800: 400^{2}$, nearly 157 times that of the moon. The attractive force on Captain Ericsson's iron ball is, according to his calculation, for the sun equal to 748.6 grains, and thus for the moon $748 \cdot 6: 157=4.9$ grains. If, therefore, the arrangement were only a little improved, so that the ball were movable by a little less than 5 grains, in place of 8 , the moon would affect it. But that this can never be the case, with any contrivance of this kind, bowever delicately it may be constructed, even if it could be moved by a single grain, is due to the fact that the circumstances are totally different in the cases, first where the ball and the bath in which it floats are both affected by changes in the direction of gravita tion, and second, if the ball alone is acted upon by some me chanical contrivance. The cause of the ball being always balanced under various conditions of gravitation, as I stated on page 245, is that the attractions of the sun and moon act simply in such a way as to shift the center of terrestrial attraction towards them, according to the law of composite forces. This shifting of the center of attraction induces changes in the ocean level, and thus is the cause of the tidal waves. Therefore the rising or setting sun or moon, in shifting the earth's center of attraction eastward or west-
ward, will not only act on the floating iron ball, but change equally the level of the mercury, and so keep the ball at rest; while, according to Captain Ericsson's ideas, it should slide over the unaffected mercurial surface, as down an inclined plane, towards the side on which the sun or moon is ituated.
Surely the lunar attraction is not nentralized by centrifugal force, because the earth does not revolve around the moon, and any lunar attraction therefore must manifest itself to its full amount.
That the solar attraction is, for the greater part, neutral.
is evident from the fact that, notwithstanding that the attraction of the immense solar mass : surpasses that of the moon on our earth's surface 157 times, the solar tidal wave is smaller than the lunar tidal wave; but the existence of the solar tide wave is a better argument in proof of the effects of solar attraction than can be drawn fromany such experiment as the one in question.
The amount of this solar attraction, manifested in the solar tidal wave, enters, as is well known, into the calculation of the times and relative hights of the spring and neap tides; it has been laid down on geometrical principles that the change in the moon's gravity, due to the sun's action, is
expressed by the formula $\frac{M}{D^{3}} \times y\left(1-3 \cos ^{2} . \Phi\right)$ in which $M$ is
the sun's mass, $D$ its distance expressed in the earth's radii, y the distance of the particle from the center of the earth, and $\varphi$ its elongation from the sun as seen from the earth's center. The same formula is applicable to the moon; and as $\bar{Y}\left(1-3\right.$ cos. ${ }^{2} \varphi$ ) may be taken equal for both, we
find, if we call the moon's mass and distance $m$ and $d$, find, if we call the moon's mass and distance $m$ and $d$, that the
$\frac{M}{D^{3}}:$
, showing that the power to raise the tides is in direct proportion to the mass, and inversely as the cabes of the distances. If now we give the quantities the proper val. ues, taking, for simplicity's sake, the moon's distance as $\frac{314,760}{400^{3}}: \frac{0.0125}{1^{3}}=$
the moon's attraction surpasses that of the sun.
This calculation gives results perfectly in accordance with the observation that the mean hight of the solar tidal wave is to the lunar as $3: 7$, while the whole theory of the tides (aqueous and atmosphoric) proves that the solar attraction on our rotating and revolving globe is only neutralized by the centrifugal force when we consider the earth as a whole but that this is by no means the case for the different particles in its mass, especially not for those near or upon its
P. H. Vander Weyde.

## New York city.

## Solar Attraction and Contrifagal Force.

To the Editor of the Scientific American
With surprise I read the communication of Captain Ericsson (page 291, current volume), in which he concludes that Dr. Vander Weyde does not understand the principle of his apparatus for showing the neutralization of solar attraction and centrifugal force. Though Captain Ericsson, in his communication of March 14, proved to be master of the subject, he evidently overlooked one point, or else he would not have mentioned the experiment with the iron globe.
Though solar attraction does balance the orbital centrifugal force while the sun is rising, it will not do so three hours afterwards, when a pendulum will be slightly deflected to wards the sun, while the floating globe will not move. True, the globe is attracted towards the sun somewhat more than it is repulsed by centrifugal force, and consequently would move towards the sun, if the mercury were not under the influence by virtue of which its surface leaves the true horizontal direction, rising slightly at the side nearest to the sun. If the mercury only were attracted, not the iron, the globe would seek the lowest level and retreat from the sun. These two tendencies upon the globe will perfectly balance each other, and in no position of the sun can any result be ob tained by the experiment. To prove my assertion of the in clination of the level of liquids when the sun occupies an angular position, I refer to the solar tidal wave. The water in a straight line with the sun being higher than that at right angles, there must be an inclined level at intermediate points of the ocean.
As the experiment does not show a difference between solar attraction and centrifugal force when it actually exists, it cannot demonstrate a neutralization of those forces.
In addition to what was said on the question, it may be in eresting to state that the moon, though much smaller than the sun, by her nearness causes about three times greater variátions of gravity during her apparent diurnal motion, than the sun, as may be found by repeating Captain Ericson's calculation, with reference to the moon.
Philadelphia, Pa.
hugo Bilgram.

## Drying Peat.

To the Editor of the Scientific American
A kiln of condensed peat has recently been dried by evaporation in forty-eight hours, upon the principle and system for which a patent was obtained through your agency. The heat requisite was carefully noted from a thermometer in constant use during the process, and found to average only $85^{\circ}$. Two other appliancss, embraced in my aystem, could not be used at this time, but, when used, will shorten the time to thirty-six or forty hours only. The im portant question of artificially drying peat is therefore solved, at the same time preserving economy of labor and fuel, and the system is ceptible, as to quantity, of almost indeinite extension
Rome, N. Y.
W. E. Wright.

Turpentine.-Venice turpentine is obtained from the arch, and is said to be contained in peculiar sacs in the upper part of the stem, and to be obtained by puncturing them. It is a ropy liquid, colorless or brownish green, having a some what unpleasant odor and bitter tante.
Oil of turpentine is the most plentiful and useful of oils. It obtained in this country from a species of pine very plentiul in the Carolinas, Georgia and Alabama. The tree is known as the longleaved pine (pinus Australis), and is
where the original forent has not been removed.

USEFUL INFORMATION ON STEAM POWER.
Careful experiments by Favre, Silbermann, and others have shown that a pound of good coal will liberate during com plete combustion 14,000 or 15,000 units of heat, each unit being equivalent to 772 foot pounds. The

## mechanical equivalent of the heat

developed by the combustion of a pound of coal is, therefore, say $14,500 \times 772=$ over $11,000,000$ foot pounds. A horse power is always assumed to be equal to 33,000 foot pounds per minute, or $1,980,000$ foot pounds per hour. So the combustion of each pound of coal per hour liberates heat enough to develop $11,000,000 \div 1,980,000=$ say 5 horse power ; and in a perfect steam engine the consumption of coal would be about at the rate of one fifth of a pound per hour for each horse power developed.
The greatest economy obtained in ordinary continuous working may be taken at from 3 to 4 lbs. of coal perindicated horse power with non condensing engines, and from 2 to 24 lbs. with condensing engines. A consumption as lit. tle as $1 \frac{1}{6}$ or $1 \frac{1}{2}$ lbs. per indicated horse power has been reported in the case of compound condensing engines,and such results are quite possible. But a consumption of 2 lbs . is as little as can yet be counted on with certainty. The manufacturer, in choosing an engine, would do well to look with some little doubt on promises of a better result than this, and he may feel satisfied if the engine he buys shows itself capable of working with that degree of economy. A consumption of 4 lbs. of coal per indicated horse power per hour means
a loss of nineteen twentieths; and 2 lbs. per indicated horsea loss of nipeteen twentieths; and 2 lbs . per indicated horse-
power, a loss of nine tenths of the power theoretically due to power, a loss of nine tenths of the power theoretically due to
the coal. There is, therefore, ample room for improvement, even upon the best of modern steam engines.
The conditions necessary to

## economy in the fteam engine

are: 1 st . The complete combustion of the fuel in the furnace 2d. The transfer of all the heat generated to the water in the boiler. 2d. The passage of the steam through the engine without loss of heat, except such as is converted into motive power, and the conservation of the heat remaining in the steam on its leaving the cylinder. 4th. The absence of friction in the working of the engine. Let us see how these conditions are fulfilled in a good modern steam engine. As to the
combustion of the fuel,
with the best coal and most careful stoking, a quantity of the coal falls through the fire bars, either as unburnt coal or ashes. Another portion goes up the chimney unconsumed in the form of smoke and soot; and a further quantity, half
consumed in the form of carbonic oxide. The loss from the causes may amount to from 2 to 20 per cent. It all arises from wrongly constructed furnaces and bad stoking, and it may nearly all be avoided.
As to the heat generated, most coal contains a greater or less quantity of moisture, and the evaporation of this moisture causes the first loss of heat. Radiation from the furadmission into the furnace of a large quantity of useless air and inert gases, and the escape of these, with the actual pro. ducts of combustion, up the chimney, at a very much bigher temperature than that at which they entered the furnace. Air is composed of about one third oxygen and two.thirds nitrogen. The oxygen only is required to effect the combustion of the fuel, and the useless nitrogen merely abstracts heat from the combustibles, and lowers the temperature of the furnace. About 12 lbs . of air contain sufficient oxygen to effect the combustion of 1 lb . of coal, but owing to the difficulty of bringing the carbon into contact with theoxygen, the quantity actually required to pass through the furnace is from 18 lbs. to 24 lbs . of air per pound of coal burnt. The surplus air passes out unburnt, but its presence in the furnace lowers the temperature subsisting there, and abstracts a portion
of the heat generated. And whereas the whole of the air enof the heat generated. And whereas the whole of the air enters the furnace at about $60^{\circ} \mathrm{Fah}$., the unconsumed air and the products of combustion leave the flues at from $400^{\circ}$ Fah. to $800^{\circ}$ Fah. The total loss from these "causes is from 20 to 50 per cent. In other works, whereas each pound of good coal burnt is theoretically capable of evaporating about 15 lbs. of water, in good practice it evaporates but 9 or 10 lbs ., and in ordinary practice but 6 or 8 lbs . of water.
There are difficulties in the way of abstracting all the heat from the furnace gases: first, because with natural or chimney draft, the gases require to pass into the chimney at no less than $500^{\circ}$ Fah., in order to maintain the draft; and secondly, because the transmission of heat from the gases to the water, when the difference of their temperatures is small, is so slow that an enormous extension of the surface in con-
tact with them becomes necessary in order to effect it. But by having energetic combustion and a high temperature in the furnace, the quantity of air actually required may be much reduced; by suitable arrangements for admitting air and feeding coal into the furnace, the proportions of each may be suitably adjusted to each other; and by a liberal allowance of properly disposed heating surface, the temperature of the reduced quantity of furnace gases may be reduced to that
simply necessary to produce a draft, in a furnace with nasimply necessary to produce a draft, in a furnace with na.
tural draft, or to about $400^{\circ}$ Fah. or less, in a furnace where the draft is obtained from a steam jet or fan. Under these conditions an evaporation of from 10 to 12 or more lbs. of water, per pound of good coal burnt, may be expected. As to the heat in the steam-umongst the minor canses of loss are radiation from the boiler, steam pipes, and engine most of which can be prevented by carefully lagging with a
good non-conductor of heat), blowing off, and leakage. A good non-conductor of heat), blowing off, and leakage. A
greater loss arises from initial condensation in unjacketed
cylinders, nearly prevented by using a properly constracted ateam jacket. But the great loss arises from the escape of the steam into the atmosphere, with only a portion of its heat utilized. This, of itself, leads to another great loss, o from 40 to 60 per cent.
The use of high pressure steam, high rates of expansion, and of an efficient feed water heater, is conducive to economy, but no practicable means have yet been devised whereby the whole heat may be saved; and the removal of this source of
loss in the working of the steam engine offers one of the most loss in the working of the steam engine
promising subject for inventive genius.
In a good modern steam engine, the coal used is thus approximately disposed of:
Lost through bad stoking and incomplete combustion. Carried off in the chimney gases.
Utilized in motive power (indicated)

## engine friction.

A further loss of useful effect ensues from a portion of the motive power actually developed being absorbed in driving the engine itself, and the useful power of the engine is reduced from this cause by from 5 to 25 per cent. The use of equilibrium valves, ample bearing surfaces, careful lubrication, and cleanliness go far to lessen the friction, as well as to increase the working life of a steam engine; but in selecting an engine, it is as well to bear in mind this source of loss, as injudicious improvements, introduced for the attainment of increased economy, may defeat this subject through the xcessive power required to drive them.
For engines with cylinders less than 6 or 8 inches in diameter, the simple high pressure non-condensing arrangement should be adherad to, as it makes for small powers the most economical as well as the cheapest engine. The boilers for the smaller powers can be heated by gas instead of by coal, and the cleanliness and convenience of the arrangeWhen also the trouble of attending often to the water level is objected to, a boiler of large capacity should be provided. Non condensing engines with cylinders above 8 inches in diameter should always be provided with expansion valves, steam-jacketed cylinders, and feed water heaters; and the exhaust steam of non-condensing engines should always be used to urge the draft. Condensers cannot well be used for portable engines or engines requiring removal; but fixed engines, having cylinders larger than about 10 or 12 inches, should be fitted with either surface or jet condensers. The jet condenser is less costly and nearly as efficient as the surface condenser, under ordinary circumstances ;but when the water from which steam is made contains much impurity, surface condensation is to be preferred. For seagoing purposes, engines are now very generally made on the compound system, and some very good results have been obtained from such engines. Their use for land purposes also is becoming very general, and for large powers the compound engine is to be recommended. But it should be borne in mind that, whereas a compound engine must be both designed and constructed with the greatest skill and care, in order that it may work with greater economy that a good ordinary engine, a bad compound engine may easily be much more wasteful than even a bad ordinary engine.
The unmistakable tendency of modern steam engineering is towards much

## HIGHER PRESSURES OF STEAM

than those hitherto used. A pressure of over 100 lbs . per inch means thesupercession of what may be termed large capacity boilers. High pressures are as safe as low pressures, provided the boilers are suitably designed to withstand them. But the construction of high pressure boilers should be confided to none but competent engineers; and those who intend putting up new boilers should recollect that the boiler maker who uses the best quality of plates and workmanship is not likely to send in the lowest tender. His boiler may, nevertheless, be the cheapest. For land purposes and moderate pressures, the Cornish boiler will continue to be used. For higher pressures, a modification of the French or elephant boiler is better, and the multitubular boiler is also to be preferred. The enormously thick plates found necessary in some modern marine boilers lead to most serious inconvenience, and it becomes essential to stipulate that steam shall not be got up in less than several hours. Many attempts have been
made to use tubulous boilers for very high pressures, but as made to use tubulous boilers for very high pressures, but as
yet without any marked success. A good boiler of the kind, owever, is a great desideratum.
The actual, or useful, or
dYNAMOMETRICAL HORSE POWER
is the net power of the engine, after allowing for friction, otc., and this alone is the power with which users of steam ongines are concerned. In small engines the useful power can be ascertained accurately'by the application of a friction brake or dynamometer. The dynamometer, however, canot be conveniently applied to large engines, but the indicated power, less an allowance for friction, gives the actual power
near enough for most practical purposes. In comparing the prices of different engine makers, it is ery necessary to look at the actual power an engine exerts, not to the nominal power, or to the size alone of the cylinder. horse power ; and of two engines of the same size and general construction, one may not only develop much more power than the other, but may do so with a less consumption of fuel per actual horse power.

COAL
weight per horse power is not in itself sufficient to show the economy with which an engine works. When an engine consumes so little as 2 lbs. of coal per horse power, we know that the coal used must be of good quality, and that the engine is an economical one. But the consumption of three or four times that weight of coal per horse power does not necessarily prove the engine to be a bad one, because the coal used may be but one third or one fourth as good. Generally, no doubt, the best coal is also the cheapest; but when an in ferior quality as used, and it is desired to test the efficiency of a steam engine, an analysis by a competent chemist will show the relative heating value of the fuel, compared with that of standard quality. The best steam coal is capable of generating sufficient heat to evaporate about fifteen pounds of water, from and at $212^{\circ}$ Fah., per pound, properly burnt. The same coal after a long sea voyage or long exposure to weather often loses much of its calorific power, owing to its partial decomposition, pulverization, absorption of moisture, and other causes. Other kinds of coal contain a large per-
centage of incombustible matter, and knowing its chemical centage of incombustible matter, and knowing its chemical heoretical efficiency. Anthracite coals give the best result in generating steam, but bituminous coals may be burnt with a high degree of efficiency under suitable arrangements.
After the engineer has done all he can to attain economy, much of the result remains in the hands of the steam user. A reduction of $\frac{1}{l} \mathrm{lb}$., of coal per indicated horse power, under 2 lbs. can only at present be effected by the greatest ekill on the part of the engineer, while a careless or unekillful stoker may easily counteract all the engineer's ingenuity. The use of a high class steam engine involves the necessity of employing an intelligent, careful attendant: not that the work is more difficult, at any rate, with good coal, nor is it so laboripower.
Clean fire bars, an evenly spread grate, preliminary coking on the dead plate, and the exercise of some little inteiligence in the admission of air and regulation of the draft, are the main points to be attended to by the stoker, and these cannot be said to involve an unreasonable amount either of labor or vigilance. A self feeding grate is conducive to economy, especially when the coal is small or of inferior quality. Its use lessens the stoker's labor considerably, and it is not easy to find a reason for its comparatively limited adoption.-Henry Northcott.

## Aversion to Manual Labor.

The practice of educating boys for the professions, which are already overstocked, or for the mercantile business, in which statistics show that ninety-five in a hundred fail of success, is fearfully on the increase in this country. Americans are annually becoming more and more averse to manual labor; and to get a living by one's wits, even at the cost of independence and self-respect, and a fearful wear and tear of conscience, is the ambition of a large proportion of our young men. The result is that the mechanical professions are becoming a monopoly of foreigners, and the ownership of the finest farms, even in New England, is passing from Americans to Irishmen and Germans. Fifty years ago a father was not ashamed to put his children to the plow or to a mechanical trade; but now they are "too feeble" for bodily labor; one has a pain in his side, another a slight cough, another "a very delicate constitution," another is nervous; and so poor Bobby or Billy or Tommy is sent off to the city to measure tape, weigh coffee, or draw molasses.
It seems never to occur to their foolish parents that moderate manual labor in the pure and bracing air of the country is just what these puny, wasp-waisted lads need, and that to send them to the crowded and unhealthy city is to send them to their graves. Let them follow the plow, swing the sledge, or shove the foreplane, and their pinched chests will be expanded, their sunken cheeks plumped out, and their lungs, now "cabined, cribbed, and confined," will have room to play. Their nerves will be invigorated with their muscles; and when they shall have cast off their jackets, instead of being thin, pale, vapid coxcombs, they shall have spread out to the size and configuration of men. A lawyer's office, a counting room, or a grocery is about the last place to which a sickly youth should be sent. The ruin of health is as sure there as in the mines of England. Even of those men in the city who have constitutions of iron, only five per cent succeed, and they only by "living like hermita, and working like horses"; the rest, after years of toil and anxiety, become bankrupt or retire: and having meanwhile acquired a thorough disgust and unfitness for manual labor, bitterly bemoan the day when they forsook the peaceful pursuits of the country for the excitement, care, and sharp competition of city life.-M., in What Next?

## Artificial Alizarin in Printing

Hitherto artificial alizarin has been chiefly used as a steam color, but it can also be emploged likegarancin and fleurs de garance. To prepare the dye beck, chalk to the extent of 1 per cent of the alizarin paste to be employed is stirred into the beck, which is heated to $190^{\circ}$ Fah. The goods, previously printed with the mordants, aged, dunged, and washed, are unwound into the beck, and heated quickly to a boil. The dyeing is complete in ten minutes. The alizarin in the spent bath, in combination with the excess of chalk, is precipitated with hydrochloric acid, and recovered from the precipitated thus formed. The dyed pieces are washed in warm and cold water, and then three times, using each time $\frac{1}{2} \mathrm{lb}$. soap per piece: the two first soap baths at $145^{\circ}$ and the third at $190^{\circ}$ Fah. They are then placed in a weak solution of chloride of lime for half an hour at $88^{\circ}$ Fah., washed again, dried, and finished.

IMPROVED PICKET FENCE.
In many sections of the country, and especially upon the prairies of the West, it is difficult to obtain long fencing timber, and heuce the expense of building and maintaining proper fences constitutes no small item in the farmer's expenses.

The invention which is represented in our engraving is a novel construction of fence, which may be made of proper rails, short split timber, small poles, limbs of trees, and similar rough wood, very readily by ordinary farming operations. It is composed of two sizes of posts, the shorter ones, A, Fig. 1, resting upon the ground, and the longer ones, $B$, their upper ends with a straight line their upper ends with a straight line of wire. The latter is extended between fixed poste, C , which are dri. ven in or firmly anchored to the ground, as shown in the engraving, and located some fifty yards apart. The posts, long and short, are arranged in panels and connected together by fence wire, woven in between them. They brace in alternate directions, thus giving the fence a zig.zag base (Fig. 2) and straight top, the former giving it sufficient stability to resist wind as well as forcing by stock and currents of water.
The inventor proposes to make the longer pickets six feet apart at the top and sevan feet apart at the bottom, which will give the fence a proper base when set up, but when stretched flat upon the ground will render it circular in form. The panels may then be rolled into bundles and transported like bales of cotton or similar packed material. One hundred feet of fence, it is stated, will weigh about five hundred pounds. The material suitable for the purpose, we are assured, need not cost over one fourth that of the common rail fence, and the wire is worth about fifty cents
for the purposes below set forth. The bar, A, is provided at ne end with a vertical groove, E, Fig. 1, in which slides a ongue formed on the arm, D. The top of the latter is turned $F$ (all figures), which turns down upon the top of the is another screw bolt which passes through a slot in the end of the bar, A, and enters the jaw, C, holding the tongue of the latter in the groove, and sliding up and down in its slot. It will be seen that, by loosening the screw, $G$, the jaw, $C$,
may be set at any desired elevation, and then, by clamping


In Fig. 1 a tap is being fluted, in Fig. 2, a screw nicked, and in Fig. 3 , Any one who has ever atten the tap Auto taps o planeris woll a hat the tool jumps along from thread hat the tool jumps along from thread o thread, and the result at bes anything but satisfactory. By this anything but satisfactory. By this
device the tap can be turned and then fluted on the same lathe, thus neces sitating no interruption of either planer or slabbing machine.

The entire tool consists of seven pieces in all: one bar, three jaws, two bands, and a wrench, and is capable of holding round, flat aquare, half round, and three cor nered articles, from $3-16$ to $1 \frac{1}{2}$ inches in diameter, and of any length. The material is malleable iron, with hardened steel screws.
The tool seems to be a valuable device, and one, from its many and nice adjustments, not only useful to mechanics but to inventors who ar working upon the construction of now models. It is quite small in size, and hence occupies but little space,' while its cost is but $\$ 5$. W have examined some specimens of its work, which appear excellently well done. Premiums were awarded to the tool at the American Institut Fair of 1873, the Buffalo Fair, and

## McGINTY'S PICKET FENCE

said screw, be nicely adjusted by a screw, $F$, which also serves to secure it at a given point. The screws are turned by the wrench shown, which fits all the heads. The clamping band, B, also has a screw, H, passing down through its top and pressing upon the jaw, $C$, so as to draw up the lower inside end of the band toward the under side of the jaw, and hold firmly articles inserted between them while being acted upon by the revolving cutter, as shown in Fig. 1. The extent of the operation is regulated by the movement of the tool carriage, and the sliding arrangement of the jaw, $C$, Any one who has ever attemp futed on the same lathe, thus either ened steel screws iron, with mander not only usef a throughout the country.
Pas particulars address the inventor, Mr. William P. Hopking, Lawrence, Mass.'

## Iceland's Millenial.

Perhaps no country more uninteresting than Iceland ex ists in the world. Situated in a high northern latitude, a about 160 miles from the Greenland coast, it is little more which natural convulsions have
per rod.
Patented through the Scientific American Patent Agency October 14, 1873. For further particulars relative to pur chase of rights, etc., address the inventor, Mr. R. H. McGinty, Moulton, Lavaia county, Texas.

## MPPROVED WORK HOLDER FOR LATHES

There are few mechanics accustomed to using the lathe who will not recognize at a glance the utility and convenience of the ingerious attachment to that tool, represented in the annexed engravings. Its object is to hold small article in the lathe while being acted upon by a revolving cutter turning upon centers; and it is secared to the carriage in the same manner as the ordinary cutting instruments. The inventor does not aim to supersede theexpensive shaping machines common in use in large shops, but offers an apparatus, the cost of which will be within the means of every mechanic, and which may form a handy substitute for the more cumbersome contrivances devised to perform in a lathe the work of milling machine and planer on a reduced scale. The device is adapted to fluting taps, slabbing studs, nicking screws, and other similar work, in great va. riety; and by the aid of gear.cutting attachments, gears, circular cutters, and the like may be formed.
The three combinations of the invention are shown in our engraving. In Fig. 1 the workis so held as to extend across the bed of the lathe at right angles to the arbor. In Fig. 2 the cutter acts perpendicularly downwards, as in the case of nicking the screw head shown, while in Fig. 3 the axis of the article under operation is parallel to that of the lathe. A, in all the figures, is the bar, which is clamped in the ordinary manner in the tool post. B is the clamping band which secures the tool. These parts remain the same in all the adjustments of the instrument, the only portion changed being the jaw, $C$, and its arm, $D$, in manner and


IMPROVED WORE HOLDER FOR LATHES.
upon the bar, A. The lower part of the band, B, is enlarged so as to permit the insertion of larger articles than would the portion sliding upon the jaw, C , and is strengthened by the rib, I.
By examining thethree engravings, the reader will under stand that the difference in the form of the instrument lies simply in the construction of the jaw, C, and arm, D, neces sitating three separate pieces, either of which may be used in connection wifh the bar and clamp, according to the kind
of work to be operated upon. upheaved into mountain ran ever, 1 in indita, fined are and are fined race, and strongly devo Libra Libraries exist in considerabl numbers, and are connected with every church.
Just ten centuries have now elapsed since the island was settled by Europeans; and Iceland proposes, during the com ing summer, to celebrate he millenial birthday by a grand meeting on the plain of Thing valla, near Reykjavik, the capi tal city. The object is not only to commemorate the lapse of a thousand years of national ex istence, but also the granting of a new constitution by Den mark, in which the indepen dence of the island is guaran teed; and it is intended to de vote such proceeds as the af fair may yield to the enrich ment of the national library Messrs. Longfellow and George W. Curtis have recently sug. gested that a gift of books from the American people would be a very appropriate contribution; and it is announced that all who may desire to send volumes can have them transported by the Geo graphical Society, CooperUnion Building, in this city, or the Pennsylvania Historical Socie ty, Philadelphia, Pa.

A Composition for Cov ering House Roofs.-Take one measure of tine sand, two of sifted wood ashes, and three of lime, ground up with oil. Mix thorougbly and lay on, with a painter's brush, first a thin coat, and then a thick one. This composition is not only cheap, butit resists fire well

## CURIOUS PLANTS.

There is little to our minds interesting in a garden filled with roses, lilies, fuchsias, heliotropes, and passies, or any other simple selection of the flowers that every one knows True, their fragrance is always delicious, and their beautiful colors never pall upon the eye; but while we should perhaps stop for seconds to admire the gorgeous hues of a cluster of tulips or to enjoy the perfume of a bed of violets, we would certainly give minutes, and many of them, to watching the shrinking of the leaves of the sensitive plant or to examining the strange forms of the aloe or cactus.
In the one case we admire a flower which we know is beautiful, doubtless far more so than the odd plant which attracts our closer attention; but with the one we have attracts our closer attention; but with the one we have
always been familiar, and the gratification it affords us always been familiar, and the gratification it affords us sents the charm of that greatest of wonders, a new va gary of Nature, and arouses a deeper and more intellec tual interest, which holds us enchained until we have gratified the curiosity which leads us to new stores of knowledge. For this reason, we think that no garden should be without some odd or queer plant, in the growth and development of which new marvels will be daily un folded. Of course there are hundreds of species wel known to the profeseional floriculturist but of which th known to the professional foricultarist, but of which th amateur gardener is comparatively ignorant; and from these, selections may be made which will render one's
flower beds a museum of strange and beautiful forms, which will make them a constant source of pleasure and interest.

As specimens of these odd freaks of Nature, the an nexed engravings represent plants which, we think, will prove something novel even to the skilled gardeners in this country. We extract the illustrations from that ex cellent periodical, the English Garden. In Fig. 1 is shown a noble sub-tropical plant, called the Wigandia caracasana. Its broad leaves are of a fresh green color and very luxuriant, rendering it a beautiful ornament for lawns. It rarely flowers, but produces a large scorpioid enflorescence at the top of a thick fleshy stem. The plant grows quickly in warm soils, and attains a hight of from six to seven feet in a single season. It is easily propagated in the spring by means of cuttings; and if the thick roots are cut off in the autumn, a large proportion of them will form young plants when set out in light sandy earth.
In our second figure is represented one of the hardiest of the ferns, the Dicksonia antarctica. The trunk varies considerably in thickness, and in its native country, Aus-


Fig. 2.-Dicksonia Antarctica.
tralia, attains a hight of thirty feet or more, bearing at its summit a magnificent crown of dark green lanceshaped fronds, from six to twenty feet long, beautifully arched and becoming pendulous with age. The crown itself is frequently ten or twelve feet across, and is evergreen.
In Fig. 3 is another queer but very differently appear ing plant, coming from high latitudes in Mexico, and called the mammillaria sulcolanata. It grows from five to six inches high. At the base of the mammal is a dense forest of white wool which disappears as the plant gets old. Its flowers are yellow, and one inch and a half in width. They have short bell-shaped blossoms, which rarely protrude beyond the spines, and are produced in whorles.
A very curious plant, known as the ataccia cristata, shown in Fig. 4, is a native of the islands of the Malayan archipelago. The underground portion consists of a short and conical root stock, marked with the scars of former leaves, and here and there throwing up some small tubers, by the removal of which it is easily multiplied. The actual roots consist of a few coarse fibers. From the crown of the root stock rise three or four hand. arme and dark green leaves, and in the midst is a stout
one inch and a half in diameter. The ground color of the plant is dark green, and its whole surface is thickly and regularly beset with whitestar-like scales, which giveit a very beautiful appearance, especially under a microscope. Its culture is in no way different from that under which other echi. nocacts thrive, but it must, says Mr. Croucher, not be subjeced to a temperature below $40^{\circ}$, otherwise it will be sure to suffer more or less from cold, and will not flower satisfactoily.
In a future issue we shall present engravings of several other curious plants and flowers, which will doubtless prove as interesting as those above described.
scape, like that of a hyacinth, twelve to eighteen inches in hight, bearing on the summit a unilateral umbel of from twelve to twenty brownish purple flowers. With these are many more that are abortive, attenuated to a length of at least twelve inches, and hanging down like thin straight hair, a lock upon each side, while back of all stand up two enormous vertical bracts, and two smaller ones, flattened out and of a cadaverous greenish purple hue. The whole thing is so weird and gipsy-like that one almost starts at the supernatural mockery. It is easily propagated from its tubers. The echinocactus myriostigma (Fig. 5) may be described a a civilized cactus, inasmuch as it has laid aside its spines

Fig. 1.-Wigandia Caracasana.
and other asperities, and put on an elegant attire, bespangled with silver. This little gem (from Mexico) has generally five deep angles, though sometimes they number seven or eight at the apex, on the margins of the angles, are borne a quan tity of silky, yellow, star-like, sessile flowers, which open du


Fig. 3.-Mammillaria Sulcolanata.
ring sunshine, and close about four o'clock in the afternoon. They keep expanding for four or five days in succession, ac cording to the intensity of the sunlight, and they last longest when least exposed : the blossoms begin to open in June and continue expanding, at intervals, until October, during which period a good plant will bear from ten to twenty blossoms,


Fig. 4.-Ataccia Cristata
 nies of death fills the parrot with the most fiendish de light, to which he gives utterance in a succession of bloodchilling "ha has," in all manner of diabolical tones and keys. Should the hunter miss his aim, however, the parrot ruffes his feathers, croaks and scolds, pulls his master's hair, and long refuses to be pacified. Duck hunting in Forche and Meto Bayous is, however, the parrot's chief delight. Seated in the bow of his master's boat, sungly ensconced in


Fig. 5.-Echinocactus Myriostigma.
a patch of tall bullrushes, the parrot bursts forth into such a "quack, quacking," and general duck gabble that there seems to be in the vicinity a whole flock of these birds, all enjoying themselves immensely. Thus are many passing flocks of ducks lured within range of the gun of the hunter. Geese are in the same way called up by the parrot; also many other wild fowl and even deer,as the bird imitates the plaintive bleating of a fawn or doe to a nicety. No money would buy the bird, and Nat. Lask, seen strolling through the woods, gun in hand and with his almost inseparable companion seated on his left shoulder, seems a second Robinson Crusoe. Although so perfect in his imitations of all manner of birds and animals, the parrot is not a great talker; indeed, his vocabulary is limited to a few words and one or two short phrases. He will sometimes sing out: "Nat, you lubber," and when Dan Lanagan (a brother boatman of Nat's, living at the head of Bayou Forche, and almost his only visitor), in his dug.out, is ssen paddling in toward the mouth of Big Mammelle Creek, the parrotwhose name, we forgot to say, is Bobby-will shout, "Lanago, ahoy! Lanagan, a a.hoy!" The moment Bobby sees his master take down his gun,he is in a great
utter. He cocks his head on one side, his red
eyes sparkling with delight, and, in a low, inquiring tone, says: "Turkey? turkey?" "No, Bobby," Nat will perhaps say, " not turkey today." Bobby cocks his head the other way and softly says: "Quack, quack, quack?" "Yes, Bob by," says Nat, "quack, quack!" Bobby then bursts into a loud "ha, lia,ha!" and cries, "Nat, you lubber, quack,quack, quack!" Then he ha has till the whole cabin rings again.

## THE FLOW OF SOLIDS AND ITS EFFECT UPON THE STRENGTH OF MATERIALS

by profegsor r. H. teurgton.

One of the most important properties of metals is that which has been carefully and akillfully investigated by M. Tresca, the distinguished "Sous-Drecteuri du Conservatoire des Arts et Métiers," and by him called the flow of solids. The important modification produced in the strength of materials by this action is not generally recognized, and has not been cons:dered by standard authorities on this subject.
Professor Henry proved long ago that liquids, which were previously regarded by all, and which are still regarded by many, as destitute of all cohesion, are actually endowed with considerable attractive force, their molecules clinging to each other with a tenacity probably nearly, and perhaps quite, equal to that of ice. The total absence of the force of polarity, which gives the property of solidity, and the perfect freedom from true friction, observed in fluids, prevent the casual observer from detecting the existence of this attraction, and it can only be measured by ingenious artifice and skillfully conducted experiment. In solids, the force of polarity prevents the occurrence of such intermolecular movements, and enables cohesive force to be observed and appreciated; but it is evident that, so long as the power of changing interatomic distances by flow remains, the maximum cohesive resistance of the material cannot become a measure of its tenacity.
It has recently been found that any distribution of material which aids polarity in resisting the tendency of particles to slide among each other, under the action of any straining force, causes a power of resisting external forces to become evident, higher than is noted where the form is such as to permit flow. The real resistance to fracture offered by any piece, as a bolt, for example, is determined by the relative and absolute values of cohesive force and polarity, and the form of the piece, and is not, as has been so generally supposed, a simple measure of the cohesive strength of the substance.

It was shown sometime since, in an illustrated article pub. lished in the Railroad Gazette*, that a piece of boiler plate having rivet holes, whether punched or carefully drilled,was actually weaker per square inch of breaking section than when solid. It has long been known to engineers that short specimens of materials, subjected to test in the standard form of testing machine, exhibited higher tenacity than long specimens of the same material with a uniform cross section. This phenomenon bas recently been studied by Mr. C. B. Richards, at Hartford $\dagger$, and by Commander Beardslee at the Washington Navy Yard, and the results obtained are very similar.
The standard short specimen gives,almost uniformly, about twenty per cent higher resistance to fracture by tensile force than the long specimen, which has a uniform cross section for a length of several times its diameter.
A metal which exhibits a tenacity of 60,000 pounds per square inch when tested in the first form, the minimum area occurring at a single point, will usually resist with a force of but about 50,000 pounds when tested in the form of a long bolt. It is therefore very important to know in what form a specimen of metal has been tested when its so called tenacity is stated.
The majority of experiments hitherto made and quoted in books and periodicals have been made with short specimens. We are consequently very liable to be led to expect more of our materials than they are really capable of sustaining.
It may be inferred, from what is above stated, that, in con struction, we ehould always be careful to design the part exposed to strain in such manner that their form should aid in giving rasisting power by preventing, as far as may be, a How of particles and consequent stretch or distortion. This is correct when dead loads are to be carried.
Another inference would be that one large piece is less liable to yield under the attacking force than several small ones of equal total section. It is, however,to be remembered that small pieces are usually better worked and are less affected by internal strain than are large piecos. This is particularly the case with iron and steel, which are far more liable to this last kind of fault than are the other metals. Where the piece is to resist blows, or to sustain live loads, it need hardly be said, it should never be given a contracted section if it can possibly be avoided.
Since the damaging effect of a blow is measured by the product obtained by multiplying the weight of the striking body into the hight from which its fall would have given it its striking velocity, and since the resisting power of the piece receiving the blow is measured by the product of the strength of the material into about two thirds the distance it will stretch before breaking, it is seen that the proper method of forming the resisting piece is that which gives it the best opportunity to stretch to a maximum extent before breaking. This is done by making the greatest possible length of uniform section and seeing that all other por hat larger.
Thus the best bridge builders in this country make the

long bolts, which are used as braces, of uniform sectional area from end to end, except at the very extremities, which are upset for a distance equal to the required length of thread to be cut on them, and this enlarged portion at each end is given such size that the diameter at the bottom of the thread, when cut, shall be somewhat greater than that of the body of the rod.
The amount of flow of the metal is determined by the character of the metal. Hard wrought iron and tool steels, for example, exhibit it less, and are consequently more ductile and resilient, than soft iron and low steels, while the latter are weaker metals than the former. Cast iron is both weak and non-resilient, and is therefore not well fitted to sustain either dead or live loads. The harder metals are not leas affected by shape, in their power of re sisting shock, than are the softer grades, and where it be comes necessary or advisable to make use of them unde such circumstances, the same care should be taken to avoi concentrating the straining action on a short portion, or pon a single plane of cross section.
It often happens in, designing machinery, that pieces are necessarily made of such shape as to be liable to injury from the cause here considered. Should this danger appear serious, the designer migh
avoid such risk
A connecting rod, as usually made, is an illustration of a piece unfitted by its shape to bear a blow. The less the taper of the rod, the less is its lisbility to yield to shock. To secure in any given case a form of rod that shall best combine power of resisting shock with maximum endurance under heavy strain is often an important problem. The spring of the rod will often take up excessive strains, due to accidental and excessive blows caused by the piston strik ing upon wa
currences.
The body of a piston rod being of uniform section, it is well fitted to meet either static or dynamic compressive stress, but it is so seriously weakened at each end by the taper given it in fitting it to piston and crosshead, and by the slots cut through it, that it is usually quite unfit to offer maximum resistance to shock in tension.
To resist perfectly steady strain, therefore, and to carry dead loads, we should always select the strongest material, rather avoiding ductility, and, where the minimum section occurs, make that as short as possible and of such form as hall best resist flow and change of shape.
To resist percussive action and to sustain live loads, we should select that material which is at once the strongest and most ductile, avoid brittleness as certain to produce danger, and make the piece of such form as shall allow the greatest possible stretch $k$ efore breaking.
Where two materials have products of strength into elongation which have the same magnitude we would selec the most tenacious. Where two materials are equal in other respects, we would select that which has least density, since it is less likely to produce a concentration of the effect of shock near the point at which the blow is struck.
Stevens Institute of Tecenology.

## Plant Trees.

Mr. Reuben Shelmandine, of Jefferson, N. Y., is evidently a philanthropist, and he proves his love for mankind in genoral by issuing a proclamation to farmers. Why he should embody a number of very useful hints about transplanting rees in this highly official document, we cannot explain. Suffice it that the writer says that he has had an ex. perience of twenty years on a farm, and " not on a side walk," and that his remarks are practical. Transplant, he says, finest or standard fruit trees, some in the fall and some in the spring, until you have from 10 to 50 trees grow ing. No tree should stand nearer a building than twenty feet, and the trees should be about twenty feet apart throughout the entire grove or orchard. Establish forest rees along the road and the front yard, and fruit or forest trees on other sides of the house. Sugar maple, commonly named hard maple, is preferable of forest trees, and thrifty hardy apples or pears, or both, of the standard (not dwarf) kinds.
Ornamental trees should be trimmed during the first fer years, leaving the main shoot to form the trunk of the tree, in order to have the branching lower limbs of the final tree from six to seven feet from the ground. The land in such an orchard grove can be cultivated for all ordinary crops, including a garden, by plowing shallow and carefully nea e trees.
It is suggested that the first ten trees be planted on the uth side of the house, if none be there already.
If a wind break is wanted on the west, northwest, or outhwest, plant as near together as possible and havea par of the trees evergreens, to complete the thicket. The forest and fruit trees, arranged about twenty feet apart, as ahove described, will be estimated by the owner or other persons at the expiration of five years from the time of planting to be worth at least five dollars each, and at the expiration of en years at ten dollars each, with an increasing value there after.

## Inventions Patented in England by Americans <br> [Complled from the Commissioners of Patents' Journal.] <br> From april 14 to $\Delta$ pril 16, 1844, incluaive. <br> Boilre and Furnace.-D. Kenshaw, Hingham, Mass. Horsi Collar Lining.-D. Curtis et el., Madison, Wis.  NixdLe.-W. Trabue, Leuisille, Ky. PUMP.-W. D. Baxter, New York city. <br> Tripriring Apparatus.-G. F. Simonds, et al., Boston, Mass.

DECISIONS OF THE COMMISSIONER OF PATENTS.
patent tobacoo bag.-jamis d. odlp.-Appeal. [Appeal from the decision of the Board of Examiners-In. Chief in the
matter of the applicatio o f James D. Culp, for patent for Improved Toacco Packagen.-Decided April 15, 1874.]
Applican ic coalmse



In packaging the tobacco it is pressed Into a metallic tube, over the end
of which the Dag is allpped to recelve the tobacco as it 18 forced out of the Applicant proposes to knit long tubes of the diameter of a tobacco pack.
geand cut them into suitable engths to form tobacco sacks, and merely



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 Very little analogy appears bet ween a stocking or purse and a sack fo
Decco packagene.
Der tne Board reserved and a patent allowed to the applicant.
bights of rmployers $\triangle$ ND employers to inventions.
RAppeal from the dectision of the BATENT.
Coird of Examiners. In. Chlef in the
 ThaETT, Commis8ioner:
of tranilitn large citites has long is an ele evated street ralimasa. Such a means
aproject of absorbing interest to the








## 

United States Circuit Court-District of Massachusetts. atent blastio fabric.- william smith of. the glendale rlastic [In equity.-Before Shepley, Judge.-Decided February 13, 1874]
 Simplex, J.:







United States Circuit Court.---District of Massachusetts.
WADE H. Hill et al. ve. G. H. whitcomb et al.
[In equity.-Before Shepley, Judge.-Decided February 13, 1874.] The Court held as follows

 contract. tract begins witha recttal that the Allen Manufacturing Company
The con
are the owners or a patent automatic en velope printng press, Which they



























United States Oircuit Court---Southern District New York.



## zecent gmericau and foreigm zeatents.

Improved Gas Regulator,
Joseph Adams, Washington, D. C. - This invention relates to that clas of regulators in which the pressure of the gas acts upon a flexible dia turned on or of from the burner, or as the pressure varies from the street mains; and it consists in a new and improved arrangement, In which the
valve is made more sensitive to the pressure of the gas by means of a bal-oon-like arrangement of thin metal tn the diaphas by means af a dow through the valve, and, betng constantly fllled with gas, counteracts, by it buoyancy, the weight of the valve, and hence makes the diaphrag
nected with the valve, more sensitive to the pressure of the gas.
lmproved Hydrant.
John Thomas Davis, Washington, D. C.-This invention is designed to tion of hydrants, while they are also effectually prevented from freezing in the severest temperature of the winter
Improved Saw Mill.

John N. Hall, Central City, Col. Ter. $\rightarrow$ The features of this invention are An improved apparatus for adjusting the ends of the log as it rests apon
the head blocks; for adjusting the log for slabbing forautomatioally mov ing the log laterally to ward the saw after each cut, or from the saw whe

Friedrich C. Scharf, Chillicothe, $\begin{gathered}\text { Improved } \\ \text { O.-This is }\end{gathered}$
by grown-up persons and chlldren for the conveyance of parcels used horizontalframe is supported on the crank axle, to which the driving and downward extending standards are cast to forma the bearings for crank shafts, by which the motive power is transmitted from hand cranks
of the upper shaft to the driving wheel. These shafts, as well as the axle of of the upper shaft to the driving wheel. These shafts, as well as the axle of the diving wheels, are provided witn double cranks, ne crank on end
shaft being under right angles to the other. The crank rods connect the upper driving shaft with the lower crank shaft,and sultable rods co sect the ing power to them. The lower shaft is also provided with radial arms and weights, which serve the purpose of a fly wheel, and assist transmission Improved Portable Feather Renovator.
Abner B. Hutchins, Brooklyn, N. Y.-There is a perforated plate for dis tributing the steam throughout the mass of feathers contained in a cyllnder. A jacket surrounds the cylinder, to confine the steam for drying of
the feathers,and there is a flexible tube for discharging the feathers from the cylinder !nto the sack. The jacket is arranged to form the bottom,sides, and top of the truck body; also a protecting case for the steaming collinder.
The steam pipes arc provided with cocks, controlling the steam so as to let it into the cylinder, first for steaming the feathers, and afterward into he jacket for drying them off

Improved Breech Loading Fire Arm.
Joseph C.Dac, LaCrose by the barrel or barrels of a breechloader may be conventently locked
to and unlocked from the stock, and consistsin a slide that forms both part of the trigger guard and a part of the meohanism for operating the
key.
Improved Paper Box Machine.
William Gates, Frankfort, N. Y.-A roll of paper or straw board is
placed on a splndle supported by arms, and its end is carried under a siltting cylinder where silts are cut by spring cutters. The paper is carried from the siltting cylinder upward, and under the pasting roller
whence it is carried to the platen, the face of which is provided whence points, which hold the paper in place over the mold ready for the plunger. Each planger is preceded by a knife, which cuts off the paper for the box. The plunger forces the paper into a recess, and doors are then forced against its sides, forming the box. The parts are then armly pressed together by suitable mechanism.

Improved Painter's Pail.
, Joslah Smith, and James H. Flo
Francis C. Landon, Jostail Smith, and James H. Flood, Southold, N. Y. -This is an improved painter's pall, so constructed as to enable the painter to take up the ladder with him paints of different colors, and a
large and a small brush for each color, with the same facility that he now takes paint of a single color. It consists of a tray having a cover provided
and with holes nót unlike a table castor, into which two or more paint buckets may be set. Recep
suitably suspended.

Willam Guilfoyle, New York city Car Starter.
Wrums. with central or side ratchet wheels, which are keyed to the axles of the car wheels, and enclrcled by metallic springs or bands lined with leather, one end or said bands belng connected to a heavy elliptic or other palley to the brake shaft. Loose bands or shoes of the drums then friction and wear from the connecting bands, and preserve the same thereby.

Improved Device for Cleaning Bottles, Barrels, etc. standard having a perforated cylindrical extension tube, which is inserted into the bottle or barrel till the profecting stem of a conical valve at the base of the extension tube is carried down by the pressure thereon, openthe inside of the barrel. The pressure of the water che perforations to soon as the object to be cleansed is raised from the valve stem, and
ind thereby the supply cat off. This is a very ingenious contrivance for ac-
complishing the object designed for 1 t .

Improved Sewiag Machine Table and Cabinet. Fith a sewing macher ron direction therefrom to bring the drawers in prolongation of the end o table, in order to form an extension of the latter for supporting work The invention further consists in applying, to the tbottom of the drawe rame, hinged legs which can be turned down to rest on the floor for re lieving the hinges of the drawers from all strain, the bar being also hinged
so as to enable the same to be turned up against the drawer frame, in order o enable the latter to clear the base of the table or cabinet and the trea inged leaf, which is adapted to be turned against the edge of the table op for forming a flush surface, and to be turned in an outward direction from the drawers to form an extension leaf. There are two pivot plate or susta in
plates belng adjustable vertically.
Improved Device for Burning Hydrocarbons. George W. Rumrill, Lima, Peru.-This invention consists of an al urnace in spray by a steam jet to be used forproduclng a jet before steam is raised. The blower is connected with the boiler, or to the steam pipe leading to the injector. This is an apparatus for regulating the delliver of the oll into the furnace, and for shutting it off altogether and letting 1 on, so arranged that by turning the screw the steam plpe will be shifted
forward and back to open or close the annular space between its nozzle nd that of the oil pipe. This device for burning hydrocarbons has bee concerning it by addressing J. G. Holbrook, Guardian Mutual Life Insu rance Company, 251 Broadway, New York ctty.
Improved Rotory Engino.
Josiah C. Hamilton, Ashtabula, o.-The steam enters alternately from
he cut-off valve to sllding abutment valves, and from them to the pliston he cut.off valve to sllding abutment valves, and from them to the piston by a top slot on one side and a bottom siot at the other side, and vice versa
when reversed. This, with the action of a sliding tube which controls the exhaust, causes the effectlve
ton, and without dead polnts.

Improved Frame for Cultivators, Scrapers, etc.
Sis ng the running gear of a two wheeled rehicle, that it may be convenie y applied to the several purposes. The axle is bent four times at right arts into a horizontal position, or turned up to bring lts side part into vertical position without changing the position of the cross beam. It over the side part. The plows can be ralsed and lowered by simply loosen ing the nuts and bolts. The lower parts of the standards are curved to give any desired pitch to the plows. By attaching a marking plow to each
end of the cross beam, two rows, six feet apart, may be marked at a time, By attaching a third plow to the center of the cross peam, three rows: hree feel,apart, may or marked ata time. A scraper plate is bolted to the ton, corn, and other seeds, for filling up inequalitles in the surface of the sround, to move the soll loosened by the plows in roadmaking. and for
other similar uses. By sultable construction, should an obstruction be encountered, a very slight rise of the rear end of the machine will change nto a vertical saltion may be attecher may be attached to the cross beam, and enabling them to pass over the
obstruction. The machine can be used as a cart without detaching the plows, scraper, or harrow that may be attached to ft , by simply ralsing the axle into a

> Improved Car Coupling.

Alexader Crocker, La Crosse, Wis.-This invention consistin in a nove cannot come apart (as long as the conjoined cars remain on the track), nor turn on each other; but if one runs off an embankisent or bridge and turns
over, a wooden pin inay beat once broken, one section turned on the other and the two separated.

Improved Automatic Car Coupling.
Ezra N. Glford, Cleveland, Ohlo.-This invention relates to car couplings in making enlargements on the coupling pin to preventit from rising or falling when upheld; in reductng the pin at a certain part to enable it to be reversed; in providing the drawhead with side projections and the bur-
fer head with an incline, to hold up the coupler ; and finally, in making a short upward incline on the coupling pln, to recelve the advancing link short upward incline on the coupling

## Improved Jump Seat for Carriages.

the improvement of the ordinary jump seats of carriages, by causing the rear seat that side handle, and to allow sald support to set well forward and the bolt to so up through the seat without running into the end panels.
Improved Hand and Foot Power:
John J. Kimball, Naperville, Ill.-This Is an Ingenious combination of evers, so arranged that the operator, by throwing his welght alternately pullingupon the levers, cangive a steady and uniform motion to the shaft and through it to the machine to be driven.

Improved Car Coupling.
Jacob F. Burner, E a stationary lower jaw with hinged upper spring Jaw, which is provided
with a pivoted hook and yoke for coupling the slotted arrow or other shaped Ink, and lifting the same for uncoupling, so as to detach it from
the hook ends of the jaws. The plvoted jaw and hook are connected, by a
chain, with sultable mechanism to ralse them and unc
Improved Belt Tightener.
Charles L. Work, Cincinnati, Ohio.-This is a slmple and convenient device for tightening belts easily and quickly, and without removing them
rom the pulleys. A block, which is securely clamped to one extremity of the belt, carrles a rack parallel in direction to the latter. On this rack travels (by means of a cog and handle) a second block, which 18 secured to
the other end of the belt. By running the sllding block forward, the two ends are brought together and the belt tightened. when it can, through it s

Automatic Machine for Retouching Photographic Negatives.
Alfred S. Johnson, Waupun, Wis.-This invention consists of automatic Alfred S. Johnson, Waupun, Wis.-This invention consists of automatic
mechanism to be worked by spring power or other means, a pencll holder, a cam or other equivalent device, and one or more springs, so comblned andarranged that a rectprocating motion may be imparted to the penell to cause it to strike blows on the negative with ts
for the employment of mechanical meansiu substitutiou of the hand pro cess always heretofore employed for this purpose.

Improved Fire Shovel.
John B. Firth, Brooklyn, N. Y.-This is a durable coal shovel, which may bestamped of two parts, in such a manner that not only a stronger con-
nection of handle and shovel ts produced, but also the double use of a shovel and stove lid lifter be obtained. The invention consists in so cuttlig the back of the shovel, and lapplng the edges over each other, that a
strong connection of two thicknesses, with two rivets only, is obtained.

Improved Lumber Carrier.
ses the construc tion, in lumber yards, of long tracks, between which are numbers of trans
verse rollers. The planks are ladd upon the latter, and held against them by passing under other rollers, disposed at intervals, held in spring bear ings. Each plank passing between the rollers will be pushed against the
one ahead of t t, and that one against the one ahead of it, and so on to any extent, so that they can be carrled by this plan to any distance that mar be
required.

## 3usiness and zersonal.

 The Charos or Inerertion under milt head is 81 a Linn Theeme finest Machinery Oils, combined from
 tamous Sperm Sewing Machine oil reectived the itghees amard at tee Viemna Exposition.
Amateur Astronomers can be furnished with

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He Worke, Phlladelpha, Pa
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or Catalogue to Tully \& wilde, 20 Platt St., New York. For descriptive circulars, and terms to James H. White, Newark, N. J., Manufacturer of Sheet

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Millstone Dressing Diamond Machinesmple, effective, economical and durable, glving uni Teleg. Inst's and Elect'l Mach'y-Cheap ent Annunclator-Inst's for Private Lines-Gas Lighting Hoisting Engines, without brakes or clutch old its load; simple, cheap, durable, effective. Two
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Papers, and all applications where a bsorption is to be esisted. Also, waterproof Tin Substitute for out-
oor Show Cards. Samples on application. Crump's abel Press, 75 Fuiton Screet, New y ork.
Lishes to purcha se a lot of sea shells, for picture frame
Keuffel \& Esser, largest Importers of Draw g Materials, have removed to 111 Fulton St., N. Y. Ice Machine Wanted, that can make from
100 to 200 lbs. per hour, at a cost of not more than one or wo cents per lb. Price of Machine to be less than $\$ 2,000$. 8, Tampa, Fla.
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ractice he needs to be an engineer. Address A. M., 142 Pa st., cigar store, New York.
Partner wanted, with 3 to $\$ 5,000$, in an old newly patented machine for cutting hoops, chair ing \& Powers, 123 Main St., Loulsville, Ky
ling

$\underset{\text { Utdoor work on }}{\text { W. }}$ 2.27, virections for painting ment wood to glass by following the directions for
squartum cement on p . 90 , vol. 30 .-A. R. Is informe that polishing shirt bosoms is described on p. 27, vol. 30 .

- Q. V. whll find drections for making gold ink on pp. ubtergarments on p. 203, vol. 30.-W. B. F. Will find the rocees of japanning casting describea on p. 123, vol.
9.-R. E. should apply a pump manufacturer.-A. . will tind simple tests for sirup detalled on p. p . 71 , ol. 30. There is ittle or no founda ition for many of the cle-A. B. D. Will Ind a rectpe foraquartum cement on
c. 90, vol. 30 . As to blowplpe mandpulation, see p. 156 , ol. 25. - A. H. M. will find directions for fnishing walnut furniture on $p$. 218, vol. 26.-P. J. H. can tin small
casting by following the directions on p. 91, vol. 26.J. S. P. will find a description of making lamp black
carbon) on p. 21, vol. 28. - M. can use hard tallow forluJ. K. asks: What is coffee, chemically?
are there not chemicals that could be substituted for coffee, that would have the same taste and be cheaper?
A. Raw coftee has been analyzed with the following result, In 100 parts: Woody fiber 34 , fat and volatile ofl 10 to 13, glucose, dextrin, and vegetable actd $155^{\circ} 5$, free caf-
feln 0.8 , ash 67 . The caffetc acld, modifled by roasting, is feln $0 \cdot 8$, ash $6 \cdot 7$. The caffetc actd, modified by roasting, is
supposed by chemists to aff ord the greater portion of supposed by chemists to afford the greater portion of
the flavor and pecullar propertles of coffee. There are manyso-called suble
the genuine article.
J. K. asks: 1. Is there a stone that will
draw the poison from the blte of a mad dog, and thus cure or preventhydrophobla ? A. No. 2. What is the nedicisal virtue of the so-called bloodstone (apis ha-
matitis)? A. An unfounded superstition. 3. What are he princlpal differences between the a ustral and boreal poles of a compass needle, and how can the pecullar
propertles of each pole be made manifest? A. The princtpaldifference is that they are attracted by the C. D. F. asks: Why is it that, to a magnet Which has become weakened, welghts may be added un-
til tis full power is reached? A. It is probably due to themolecules becoming more highly polarized under
E. G. A. asks: 1. What is the color of gold
ust, as discovered in the sand of a river? A. Yellow. 2. What is the color of platinum when alscovered in
sand? A. Silver white. 3. What it the most simple
and effectual way of washing away the sand and earth in a pau. The fine warticles of gold settle at the bottom. 4. Is the valley
of the Allegheny river considered as a part of the coal of the allegheny river considered as a part of the coal
regions of Pennsylvania? A. It is considered as be-
$\qquad$
C. R. asks: 1. Can the alkali of the great advantage? A. Some of these deposits might be ex-
perimented on with advantage. 2. How can Iget a perimented on with advantage. 2. How can 1get a
small quantity forwarded to New York? A. Apply to
Agricul'riral Bureau, Washington, D. C.
 battery consists of a thin plate of platinised silver, sus
pended between two plates,or one plate bent donble malgamated $z$ inc, and the whole immersed in dilute sulphuric actd. Bunsen's battery consists of a cyllinder of compact coke immersed in strong nitric acid, con
tained in a porous vessel, and another cyllader of am tained in a porous vessel, and another cyllader of am-
algamated zinc immersed in dilute sulphuric acid, ex erior to the porous vessel, and the whole contained in nches focus show the colors on the planet Mars? t probably would, but you could not use the full aperture unless the glass were achromattc. 3. What are the distances between object glasses and eye pleces from
twenty-four inches focus up to eighty inches? distance of the eye plece from the object glass is equal
to the sum of the focal distances of the two. 4. What the value or a pound in Engisish money compared with What are the duties on sclentific instrument 55.58 . mitroscopes, etc.? A. It depends upon the materials
F. G. N. asks: What is the best kind of arnish for covering the inside of a silver plating vat?
J. W. asks: 1. How are porous cells made? A. Porous cells are made of unglazed carthenware. 2 .
How is the thing that you pull out of an electric machine How is the thing that you pall out of an electric machine
for giving shocks, to regulate it,constructed? A. By two rods running to a point at one end and terminated by which are fastened on the tops of insulating columns, eocaps belag provided with
W. H. S. asks: What acids are said to mix rate? A. Probably muriatic and nitric actds. We can-
not tell the quantltes unless we know for what this
M. S. J. asks: How is carmine made 40 by which the quality the known? Is there any better 40, by which the quality is known? Is there any better
than No.40, or poorer than No. 12 ? Where are they made? A. Carmine is a beautiful red pigment prepared
from the cochineal insect. The insects are foundupon the eactuses of Mexico and Africa, and when matured There are many processes for the by artlicial heat. There are many processes fing depends upon the use o the purest materials and the exercise of care, skill, and
pattence. The following isan Engllsh process: Cochineal 11 lb .and carbonate of potash $1 / 3 \mathrm{oz}$. are bolled in 7 gallons of water for 15 minates. The vessel is then re
moved from the fire aud 1 oz. powdered alum added. The liquoris then well agitated and allowed to settle or 15 ininutes. The clear liquor is then decanted into a
clean vessel and isinglass $\$ /$ oz. dissolved in water 1 pint (and strained) added. As soon as a coagulum forms on tated with a bone or silver spatula, and then allowed to repose for 20 or 30 minutes. The deposited carmine must be drained and dried. Carmine is made in Europe
The numbers refer to the different qualities, from the The numbers refer to the different qualities, from the
J. E. G. asks: How can I separate very fin toat goid from quicksilver without usinga retorti A
You can remove the mercury after amalgamation by
digesing it in an excess of cold dilutenitric acid. The digesting it in an excess of cold dilutenitric actd. The
gold will remain unaffected. The mercury, however will be lost.
N. N. asks: 1. What kinds of wood are
ased in the manufacture of paper? Can pine, spruce hemlock, oak, chestnut, and white wood be used? A
All soft woods are used for paper making, such as the trembling poplar, linden, aspen, fir, etc.; the pine is of too resinous a nature to be of much velue. 2. What in
the process of reductng the wood to pulp? A. See $p$. the process of reducing the wood to pulp? A. See p
272, vol. 20. 3. C In it be made Into white paper? A.
The finest woods are used for writing paper. 4. If so what is the process of bleaching? A. A jet of chlc
S. H. B. asks: How can a polish be given purposes? A. With oxide of tin used wet on a bed c
C. R. A. says: Is the bismuth of commerce
metal much used
A. It is largely used for type ano stereetype metal. Newton's fusible alloy, which 18
sed as a soft solder by pewterers, constist of blemut

R
R. J. H. asks:
A. Dees electricity occupy
A. It does not occupy space. 2. Is lightuing spe produced by electrictty, or is it electricity itseelf?
fre
A. It ts the particles of the air renciered luminous by A.
the passage of the electric flutd. 3. Does it take a
smaller charge of electrity the Atlantic cable than it would to send one 25 miles on land? A. No. 4. Would a battery or six guns send the nolse any farther than one gun? A. There would be a
greater probabillty of the nolse belng onquenched by obstacles and disturbing causes in the case of six gune,
5. Does the notse travel any faster from the six guns than it does from one? A. No. 6. Will not a too heavy
charge of electricty goting through the cable generate charge of electricty golng through the cable generate
a gas and cause it to burst? A. No. 7. Is electrictity a gas, or do vibrations of the wire send the message? A
It tis a motion transmitted from particle to particle o the wire.
H. C. H. asks: Can you give me a rule for a hole in a vessel submerged to any given depth? A 29. The effective head will be the difference between ut the discharging vesse
P. D. R. asks: 1. What are three or four of
the best conductors and non-conducters of heat? What metal will transmilt heat and cold the quickest? A Silver will conduct most readily, and then gold, copper
zinc, iron, and tin, in the order mentioned. Feathers powdered charcoal, sawdust, woolen goods, sulphur,
are among the best non-conductors. 2. Why 18 it that a spoon in a glass jar or tumbler prevents its betn cracked or broken when hot water is poured theretn :
A. Any effect It might exert is due to the rapid absort. ing and conducting power for heat, which would di
mintsh the amount of heat which could operate upo

## containing vessel

F. asks: How can I clean very hot brass
have some brass pipes (with live steam in them) have some brass plpes (with live steam in them) tha
have to be polished. What is the best way to clea brass, warm or cold, so that it will keep its polish fo
some time? A. It will be difficult to clean the brase work in such a manner that it will continue bright fo

S. J. says: I have a few gallons of lubri-
cating oll. What can I mix with it to make axie grease . Try adding ta
clently foruse
E. T. H. asks: What alkali and acid (used Sclentific and Practical Information," In No. 16? A.
Carbonate of soda and murtatic acti. 2. What is glase tching, and how is it done? A. By mixing powdered leaden ressel, and allowing the vapor arising from the
misture to come in contact with the glass where it in
C. B. L. asks: 1. What causes the report of
gun? One friend says that it 1s the air rushng back agun? One friend says that it is the air rushing back der cleaves the air, and, coming together with the great
force which it possesses, causes the report. A. Sound elng propagated by waves, any cause which puts the airln vibration gives rise to a sound, more or less loud eport of a gun is due to concussion, a sudden striking of the air, as it were, and the propagation of sound
. What causes thunder? A. Thunder is the waves. 2. What causes thunder? A. Thunder is the the same way as above. Your specImen seems to be a
thin fllm of oxydized ofl or gelatin colored with Pras stan blue.
C. K. asks : Is not a car wheel by which the cratculty of running on curves may be obvlated a desid-
a. If you mean a wheel so constructed that erve than 10 experience no greater resistance
W. J. E. asks: 1. What is the best method f keeping steam bollers clean and preventing scale
ithin the boller? A. See p. 116, vol. so. 2. Will the the same power as the fiat valve engine, the dimension of both englnes betng the same? A. For that point of
ut-off, it is hardly necessary to have a separate cut-oft
H.C. asks: 1. What should be the diame er for a boat 25 feet long and of 6 feet beam, to get a
peed of 6 miles an hour? The engine is of 2 horse power. The engine is not large enough for that speed.
R. C. M. says: I have a 2 horse power verean out the shell; how can I do it without damaging hem? A. If you mean without spolling them for use
the same boller, we do not think that it can be done.
N. L. asks: 1. Does wood shrink endwise? rrina says that boards on a rence, if put on green,
ould shrink end wise so as to draw them off the posts. . The shrinkage, if any, is exceedingiy slight. 2. How hould a pulley be turned to keep the belt stralght,with
n angular or a curved face? A. Make the axes of the two pulleys parallel. 3. I lately had occasion to repair a cupola fan with four half diamond paddles. After it
was done. we tried it, closed up the holes aso that no alr was done. we tried it, closed up the holes so that no air
ould pass out of the fan, gave it the regular speed, and could pass out of the fan, gave it the regular speed, and
opened the plpe so that the fan threw out the wind. To ur surprise, the speed decreased nearly one half. Why
was it? A. It had more work to do in the latter case. I. asks: 1 . Please give a brief description of
the Gunther's scale ( feet long), and tell the significa. ion of the legends "Lea,"" "Rum," "Cho,""sin.""Tan,"
$\mathrm{S}^{*} \mathrm{t}$, "etc. A. On one side is a scale of 24 inches, dirded Inte tenths of an inch. Below this, on the left, is
acale of inches and haif inches, divided tnto hunel's track by departure and distance. They are used with small quadrants, which can be drawn by the naviator, with a radius of two or three inches. The icales
or these quadrants are in the middle. On the lef is the cres these quadrants are in the middle. On the left is the chords for the compass divided into parts of $111 / 4^{\circ}$ each), a scale for the (nch) rhumbs, middle latitudes, and chords. On the ents of rhumbs; numbers, sines, versed sines, and tangents of degrees; and lastly, scales of meridional and
even parts, for a chart on Mercator's projection. The even parts, for a chart on Mercator's projection. The
ase of the scale is described very fully in Bowditch's Navigation." 2. In a globe or sphere revolving on tts axis, is in tiself immovable, whiles, however minute, revolvearound it? A. Yes, if you can concelve the line of particles to have a single dimension. 3. Would a alliond bridge across the Atlantic be possible and
practicable? $A$. It has been proposed by some eng.eers. Past experience would not justify a positive
W. F. McD. asks: Should the bed of a veran angle of $15^{\circ}$, will it make as true a hole as if it were
evel? Does therule applying to the vertical drill also pply to the horizontal drill, lathe, and planer? A. If any position.
L. D. B. asks: With what sort of tools are
crews made on the softer woods? I have no trouble chasing a acrew by hand on boxwood, but a many-
oothed chaser does not do for soft woods. A. Try an ordmary toorand
L. D. H. says: 1. I have heard that salt lectly fresh. A. It will freeze if the water is motionless and the cold is sufficlently intense. 2. How does the sait separate? A. In rreezing, water crystalizes; and
the crystals of ice, in forming, reject the particles of
dirt and impurities. As to transmision of power by dirtand impuritles. A
belts, see p. 389, vol. 28.
.
$\underset{\text { Which }}{\mathrm{D}} \mathrm{H}$ can plate steel springs without process by lue coloring? A, Iry rubbing with weak muriatic
acid, and then wiping clean with water and dryiag. What is the best way of taking the coloring off? Is there any way of covering them with copper (without
a battery), so that I can plate them with allver ? A. mmerse the steel spring ,after belng freshly cleaned as
D. P. W. asks: Does ice sink in the spring? nd float a way, but that it sinks out of sight. I think
hat water forms or fallis on the surface of the ice, thus
making it appear to sink. A. Your explanation
P. H. C. says: It in a popular belief among
he mase of farmers that the nnu nunce of the moon nas an Important bearing upon various young plants as thes
happen to come forth elther $!$ her
her 1 ght, as full moon, happen to come forth eltber in her 1 Ight, as full moon,
etc... ortn her wane. This Idea 1 I ridculeded and entirely
 scientific farmers. Is it not a fact that the light of the full moon on a young plant Just come forth: would have
some effect on t , different froun the darkness which
俍 prevalls in the moon's absence, and do not these tender
 tap, the clonds are wholly or tin great part absent, and the effect of the absence of cloods becomes very evident when a hermometer isplaced in the focus of a silvereit
mitror and turned towards the unclouded sky. The hermometer falls with great raplditt, tts heat being ra diated out tnto the abysses of space, which are estima ted to have a temperature vastily below the zero of our
thermometric scale. When a cloud pasees between the mirror and the sky, the thermometer rises rapldily, the
logs of heat belng interrupted. The clond acts like woolen blanket, preventing the escape of heat. Now what the thermometer is in this experiment, so in na ure tis the plant. On a moonilght clondiess or partly clouded) nght, it may radiate so much hest that injury greas telescope has deteceted the heat radiated bbt the
moon, but tis is an tncredibly minute quantity, and can E. L. S. asks: How can I construct a blow-
ptpe? Illuminating gas 18 not to be used, and the atmo Pipe? Mluminating gas is not to be used, and the atmo
spherrc atr tit to be suppled by beme arrangent
worke may be used, and fastened between the legs of a table,
with welghts on the upper chamber, and a treadie play Ing agatnat the lower chamber, so as to give the requis Ite pressure. A pipe leadng from the nozzle of the
bellows, throug the table top, 18 made to end in ta pered jet, an mounted that its direction may be altered at pressure. The jet plays a short distance above the wick of an ordinary lard lamp.
Y. M. C.A.asks: What are the chemical inas sleg, the kind that runs from a mrought fron pudduling samples from puddlling furnace: Iron $54-33$, oxygen 16.87
 ${ }^{99} 62$
W. H. N. asks: 1 . What is type metal com-
posed or, and what are the proportlons?
 lead 15 parts, tin 1 part, antimony 4 parts. 2. Can you
give mearectpe for an Ink that shows plandy when glve me a rectpe for an ink that shows platnly when
written with, but fades entirely amay a short time at-
B. \& \& . say: In trying to make a zinc cast
ing in a plaster mold, on pouring ta the zinc it splat tered so that $1 t$ would not atay in the mold. Then we holes. Next we tried a sand mold, but this also was ful Of air holes; and lastly ne tried another plaster mold
and, atter stand Ing over the stove alld ay, we found th and, arter standling over the stove alld day, we found tha
the zinc apluttered same as before. We thought all the dampness bad been dried out, but there was something wrong. In lookting at some zinc castings, we found they
looked very smooth. We melted scrap zinc. Will you looked very smoth. We melted scrap zinc. Will you
intorm me what was the matter, and how to cast zinc A. The difflculty has been that the plaster molds have prevented it. The wooden molds of course formed gases In contact with the molten metal. The sand hae not been dry enough. We have never expertenced any
difficulty. Molders' sand, just molst enough to work, talne In this way, even with common scrap $z$ Inc. To be more
gaure, vent holes may be punched with $a$ wire, and the mold may be stlll further dried, but these precautiona $\underset{\text { preses on on highly calendered,dry paper, we are at times }}{\text { J, A. . . . . }}$ very much troubled by the paper becoming charged with electrictity in its pasage through the press. Can charged? A. In the Times newspaper offleetn this ctit they obvate similar trouble from electrictity by attach
Ingilghtnng rccis to the printing press. The rods ex tend down Into the earth.
H. B. S. asks: Why does ice form upon the four miles per hour? The tce seems to form in clear cold meather, and can be geen to rise durtin the day,
bringing with it gravel stones of considerable size.
 and th would speeddyl become corered with a thick sheed o
Ice. Now tce is ormed Ice. Now ice 18 formed by the unlon of innumerable tng lighter than water, carrled off, while those crystalis, which in the process of
formation freeze fast to the stones at the bottom, and form potnts or attachment for still other crystals, re mann there an
W.T.R.asks: 1. What are the acids used and water? A. Saturate as much water as will ill the cells with powdered Due vitriol, and add one elghth, of
the bulk of this 1 quald, of of of of vitrol. s . How many cells should I use for plating small artclees, such as
spoons, etc.?
A. Two are amply sufflent. 3 . How can Itell When the current ts pasting? Should it be strong
enough to be felt by holding the wire? A. By the fact that metal is being deposited upon the mold to be electroplated. 4. To there a liquid blue vitriol, or ormast it be
made by dissolviog the crytala in water? A. By dissolving the crystals.
T. A. says: 1. I read of a new material
called Parkestine (rrom the inventor, Mr. Parkes), com. calied Parkeesine (rrom the inventor, Mr. Parkees), com.
posed chiefly oo collodion, castor oill, and chloride of
 retort, and condensing the vola tlle chloride of sulphur thas formed.
E. R. asks: 1. How is the double sulphate of nickel and ammonia used for a bath? A. See $p$.
91, vol. 29.2 . Are the two salts mixed with distiled Water? Wwill the nickeldissolve in the bath? A. The
double sulphate of nickel and ammonia is one sait, not not two. Useenough to make a atrong solution in the dis. twled water. The nickel plates will disolve. 3. How
longatcer maxing is it till it 18 ready for plating? A. at once.
 hirdamo of electrolysia as follows: " The oridation of water into its elements. Thus $\delta \cdot 45$ gralns of $z$ zinc dis solved In the battery occasions the electrolysis of $2 \cdot 3$ rranno of water. But these numbers are in the ratio or 32:5:9, the equivalents of zinc and of water." 1. Now
does this mean that the dissolution of 8.45 srains ofzinc in each cell or couple of the hat tery to required to oc caslon the electrolyals of $2 \cdot 3 \mathrm{gratns}$ of water, or does it mean the sum of the several amounts of zinc dis-
solved tin each cell or couple of the battery (making 10 all 8.45 grains) canees the electrolysis of $2: 35$ grains of water? A. For every 8.45 graing of zinc dissolved in the batery, $\begin{aligned} & \text { bhatever the number of cells, } 2.25 \text { graing } \\ & \text { of waterare electrolyzed; zo that the amount of }\end{aligned}$.ast decomposed is found by adding the amount of zznc con In the elect rolystis of water with a Grove's oxygen and yen and hydrogen liberated by the current equal to the egpectlve amouLt a aborbed by the act of combtnation each cell or the batery,or are they equal to the whole quantlty of oxygen and hydrogen liberated by the elec.
trolysis of water is proportional to the whole amount zinc consumed in the battery, whatever the number
W. D. S. asks: Will ripe fruit keep in a
 ting anythine in to preserve it? if it will keep, what the reason that frult t 18 not put up tn thts manner? A
rult containg germa of decay, which muat tirst be d royed, otherwise the formation of a vacuum abou them will notsuffice to preservethe fralt
S. G. N. asks: 1 . Will it be cheaper for me
omake my own pure silver anodes for rom coln silver, or to buy them from 1 siveramith
A. It will probably be cheaper to purchase it. 2 . How ensty? er. The Intensity of a current 1s directly preportional the tangent of the angle of deflection, provided the dimenalons of the needie are sufflentily small as com.
pared with the diameter of the clrcult.
The relation between the intensity and the quantity is that the for-
 large must a copper wire be for a i Bunsen battery, con-
sisting of two 1 gallon cells? $A$. A wire the $1-10$ th, of an nch employed. 5. Should melted zinc be stirred while on he fre? A. There is no advantage in so dotng.
J. F. W. asks: What will remove cham-
pagne staing and grease spots from a black velveteen coat? A. Rub the stains Arrat with ammonla and after
J. H. P. says: My hydrogen lamp does rot
uite meet my expectation. The gas has no ffect uon the eponge till I blow upon it with my mouth, when in a Second or two the sponge turns red and Igntites the gas. sen with the oxygen of the air by what is known as "contact action,", or the power which a clean surface and thus bringing them within the range of their mu-
anal atraction, and causing comblnation or combueHon. By exposure to the alr the surfaces become dirty. leating for a moment with the
best mode of restoring the activity.
A. S. B. says: Please give me the process Gypsum is calctined in an oven or tiln. It is built of walls of strong masonry, gpanned by 1 fis arch. In this
coom tis placed the gypsum only, the fire belng 11 ghted oom sir paced the gypsum only, the fire beting ilighted
tn a sertes of small chambers in the lower part or the
 loor, the gypsum beling introduced into the apper urace, the fames from which, driven by a dratt, are carried to play upon the lower part of the arch, the hot
ar and gase pasing into the upper rooms. The
S.T. W. says, in reply to correspondents , ng: strip off bark, and bury about one foot deep in the Fill Ind no didmectity. Thats was the only way by which We conild 8 eason the sapadillo or mountaln mahogany th
the Slerra Nevada, It belng one of the hardest and most brittle kitnd of wood known. I have two canes now of ins wood, nearly as heasy as iron.! In company with
three others I cut them on July 4, 1873 . The tree was
Then cut at an eleration of 10,000 feet; ; it grows ery slowly,
and seldom to over four inches dlameter and 10 or 12 ret hight. It flowers in June, usually, in favorable lo W. R. A. R. says, in reply to W. W., who olve 20 gratins chloride of gold in a solution of cyanide

 ed on the zinc, ruba little shellac varnish on it. The chloride of gold may be prepared by dasooling gold in
aqua regia in the proportions of 16 graing gold to 1 oz.
D. M. says, in reply to C. L. C's enquiry for
 constructed thas: : Take any bottle; ; pour colored water
Into tit, about one fourth of the quantity the bottle will hold: ingert in it ta glase tate, from three to oror feet
long and passing airtight through the stopper, which cording to any scale of division, say into Inches and ractions of an Inch, be glued to the glass tabe. Blow Into the glass tube, so as to canae the water to ascend
the tube a few finches, say 10 inches, and the Instrument is constructed. The bottle must be placed in another rial,,from the tnfuence of changes in the temperature
of the atmosphere. This very senalbie instrument records falthfully any change in the denalty or the exter nal alr, and the approach of a storm will infallibly be
indicated by a sudden rise of the water in the
cabe. L. W. Bays, in answer to M. B. A., who
Gked how to remove tallow and white lead from ma
and
G. H. M. Mays, in reply to several corress
ondents Heat lard oll to where you want to cut the jari; then il; the unequal expansion will check the jarall round the surface of the oll, and you can lift off the top
J. A. O. says: Allow me to add to the list ou on p. 252 in reply to $J$. M., the following: Loulisiana, ou on p. 252 in reply to J. M., the following: Louisiana,
Mo., St. Paul, St. Cloud, and Brainard, Minn.,making a otal of fifteen.
C. B. L. says, in reply to several correspon-
dents
who asked how to reweve tattoo marks from the skin: Blister the part with a plaster a little larger than the mark; then keep the place open for a weet with an
otatment; finally, dress it to.get well. As the new skin rows, the tattoo marks will disappear.
S. P. N. says, in explanation of the excres-
cence on the plank, and the means by which it was produced: " I am a farmer, and sometimes have occasion
or a tight trough. In making it, I joint up the plank and then, with a wide punch, set down a groove about
$1-16$ Inch deep the whole length; then take of two or Whee shavings more, and put the trough together gain just the thickness it was at first, and of course wo or three shavings thicker than the plank, and so loses all up tight. Wood can also be ornamented by
punching down carefully in patterns, planing tie, and then wetting; the parts punched down show in rellef above the planed surface and make quite a
M. S. T. says, in answer to M. B. A., who
asks how to remove tallow and white lead that has been applied to polished parts of machinery to prevent rust : ting with an old scrubbing brush. It answered in a case at similar to yours.
Minerals, etc.-Specimens have been received from the following correspondents, and examined with the results stated
Y. N.-It is yellow hematite, and contains about 8
E. G. A.-The grainsare mica, and the rock is grante
J. E.-Both are pyrtes, and are not valuable.
huret of lead.
W. F. H. -Your specimen is impure crystalitized limeJ. W. H.-The minetal is sulphide of iros. If a small xtended examination than could be given in a prelimi aryanalysis, to determine it.
A. L. asks: Can you give me a recipe for
making artidial honey?-J. T. asks : What kind of
 that IC take that possible to make as alloy by fusing glass and a
Is it
metal together ?-A. asks. What can I put on paper musiln to o prevent the paint spreading?-J. H.asks: How can I mase chewing gum and stencil paste?-D. H.s. lower edge to the inside face of the next rib below ; so hat the flour shall not illde agalnst the rib and be car f cloth and on to the next, falling the the one plec rib only. Will this plan work well?-J. W. T. S. asks What will cure chickens affected, with a disease called
the chicken cholera, and what will prevent them from catching the disorder ?-C. H. R. says: You credit,
James Bogardus with the invention of the "ring flyer." made and inform me when and where the the frat spinning frame was put in operation, and if it is in ex-
istence now?-E. T. C. says : Some wagon makers boil their hubs till soft and drive the spokes while the hub

## COMMUNICATIONS RECEIVED.

The Editor of the Scientific American acknowledges, with much pleasure, the recaipt of original papers and contribution pon the following subjects
On a Column for Boys. By D. W. H
On the Mississippi Overflow. By H.S
liso enquiries and answers from the follow ing:
.H. B. - M.J.T.-S. $\dot{\text { M, }}$
Correspondents whose inquiries fail to appear should
peat them. If not then published, they may conclud that, for good reasons, the Editor declines them. The
Several correspondents request us to publish repile ot their enquirles about the patentability of their inlenlons, and the parties should give their addresses. Correspondents who write to ask the address of certa manufacturers, or where spectifed articles are to be had partnern, should send with their communications a mount suffclent to cover the cost of publication unde devoted to such enquarles.

## [OFFICIAL.]

## Index of Inventions

Letters Patent of the United State tere grantrd in the wefk endina April 21, 1874,
and rach bearing that dater [Those marked ( $\mathbf{r}$ ) are relssued patents.]
AcId, making sulphuric, H. Sprengel.......... Alarm, burglar, G
Alarm, electric
Alarm, electric tre, etc., G. s. Sbute.............
Alarm, electric steam boller, w. C. Baker.. Annealing box
Auger bite, tw
Augers, earth, W.
Auger, hollow, M.

| Aur |
| :---: |
| Bat |
| Bale |


$\xrightarrow{149,844} 1$ Bath, vapor, MIller \& Colafor Bath, vapor, Miller \& Cole
Beenive, J. and W. Barnes.
Beehlve, C. D. RIggs........ Binder, temporary, A. A. Goldsmith. Bit stock, J. Uhl.................
Blind slat hnlder. I. H. Smith.
Boat, ufe, A. G. and A. T. Sterlilng.....
Boats, sliding seat for row, J. Blakey.
Boller siriculture
Boller, agricultural, H. G. Bulkiey...
Boller attachment,
Boller attachment, wash,
Boller cleaner. G. Hicks.
Boller cleaner. G.
Botlers, deflector f
Bolt, V. Ladham...
 Boot heels, burnishing, O.
Boot last, J. H. Lvingston
Boot lasts, head block for, H. Rose................ $14 . . . . .149,823,149,824$,
Bracelets, Baker et al.......

Bracelet, Morphy \& Pooliman
Brick machine, A. H. Keay...
Brick machine, H. Martin...
Brick mold, the, J. Shrefle
Bridges, girder for iron. C. W.
Bronzing machine, D.
Bronzing machine, D. Heston...
Brush, whitewash, E. D. Van
Brushes, manufacture of, E. Clinton.
Buckle, L. Merser...
Buckle, E. F. Russell
Burner, revolving gas, J. O. Belknap.....
Butter, curb for packing, S. F. Spaulding.
Can and box, fruit, etc.
Can, oil, G. Dryden.....
Can, oll, G. Dryden......
Car brake, M. M. PIckett
Car brake, G. Westinghouse, Jr..
Car coupling, W. H. Hammond
Car coupling,
Car coupling, M.A. Keller.
Car coupling, J. Lelth......
Car coupling, J. McMurtry
Car coupling, L. Recht.
Car, freght, R. Eaton...
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Car, propelling street, G.s. Grier
Car spring, w. Palmer........
Car startere, E. G. Goodda
Car starter, E. Günther
Car wheel, N. Thomas.
Car cinder fender, D. E. Dutrow....
Cars, fiextble pipe for, w. s. Deeds.
Carriage axle, Noyes \& Stratton.
Carrige, chndd's, J. L. Cortelyou.
arriage, chlld's, P. Gendron.
Carriges, IIghtIng gand heating, o. Ed...........
Castligg metal, J. L. Jackson.

hair, foldnting, A. W. Stewart.
Cgar mouthplece , J.
Clapboard machine, Johnson \& Ansell
Clothes pounder, Balley \& Dean.
Clutch, friction, E. D. Hubbard..
lutch, friction, T. Symonds........
Coke from ovens, drawing, J. H. Connelly
Combing machine, Mirfield \& Scott.... ompass, solar, $\mathbf{H}$.
Cooler beer, c. Relf..
Copy holder, J. B. Harper.
Cotton scraper and thinner, C. T. Dollahon.
 cultrvator, S. Luney......
Currycomb, C. B. Bristol
Curtaln cord retainer, H. Hol........... entist's gold foll, R . S. Whlliams (r).
Doll heads, etc., hollow,
Dough kneaderand cutter, F. Möckli.
Dress elevator, M. H. Bergen
Drlll chuck, w. Knight........
Druggist's measure, W. Vom Hofe
Earth boring machine, Blair \& Paul
Elerators. driving gear for, F. P. Candeld
Engine, rotary, A. C. Gallah
Equallzer, draft, Terry et al.
Fare box, J.T. Moses ...
Fence, Iron. W. C. Groff
ence, iron, T. Rogers .......
Fence, portable, J. L . Griftn
Fertilizer distritutor, M. Hockman.
FIre arm, magazine, Swingle et al .
Fire aim, magazine, Swingle et al ..
Fire arm, revolving, B. H. Willams.
Fire kindler, w. Laramy....................
Fish scale for art use, E. and J. Huebner.
Flour, manufacturing, W. F. Cochrane (r).
Flower staud, J. C. Kelley................
Flower staud, J. C. Ke
Furnace, etc., petroleum, , c. Hillber
Gage, pressure, P. Hugon ....
Gas, illuminating, L. Bots, flis
Gas, llluminating, L . Bots,
Gas machine, A. Rand.
Gas retort, closing, A. Thomson................
Gas into oxygen, atmospheric, C.M. T. Du Motay
Gate, automstic, G. R. Meas
Gate, farm, D. Kaufman
Gratn binder, C. Jewell...
Grain dryer, W. J. Demu
Grate, G. W. Gardner........................... 15
Grates, blower for fire, w. D. Guseman........ 14
Grinding wheel, J. T. Hen
Hammer, C. Bilharz
Harness saddle, J. Maclure
Harvester, Webster
Herveting dram, E. R. Weesto
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Lantern, signal, J. C. McMullin....
Latch, reverstble knob, W. Grifth
Latch, reversible knob, W. Grimt
Lathe chuck, metal, P. J. Clever.
Lathe, metalt turning, J. E. Spencer. ............. Lock, J. Gwynn........................
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Lubricator. Galvin \& Lynch
Map exhbiter, E. F. Kussel
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## Scoop, N. Smith.

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Sewer basin, E. L. Meyer....
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Vault light, J. M. Wilbur
Vehtcle dqsh board, J. M. Munson
Vehtcle wheel, P. Gendron.........
Violin bow rusiner, T. H. Hathway
Wagon body, extenston, A. E, Het
Wagon brake, B. G. Steward......
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Watch case pring, , . Stone
Water wheel, N. Conner....

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WIndow screen, G. F. Sarles...
Wood panel lemplet, L. M. Hells

APPLICATIONS FOR EXTENSION
Applicatlons have been duly fled and are now pendlng tngs upon the regpective applications are appointed for
the days herelnafter mentioned:
29,299.-School Globr.-J. R. Agnew. July


29,335.-GRAIN SEPARATOR.-A. J. Vandegrift. July 8 ,
29.38.-CABLE RRLIEvRR. - J. BIngham July
29.374.-Tri ABHing Macirim. -I. Hart. July 15.
 $\underset{\text { July } 29}{29}$

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on application for Reissue.............
On application for Extension of Patent
On granting the Exten
On filfng a Disclaimer....................
On application for Design (7 years).
On application for Deslign (14 years)

## CANADIAN PATENTS

List of Patents Granted in Canada. April 17 to April 27, 1874.
3,329-R. Barclay, Paris, $\overline{\text { Brant }}$ county, Ont. Improve"Barclay's Clock and Watch Escapement." April 17 184.. W. Perry, Jr., Montreal, Can. CombIned chemi cal and Water Fire Engine." April 17, 1874.
331.-I. C. Tallman, Montreal, Can.-Improvements on beer and milk refrigerators, called "Tallman's Beer and Milk Refrigerator." Aprill 18, 1874.
 3,333.-I. C. Tallman, Montreal, Can. Improvements on Milk Safes, called "Tallman's Milk Safe." April 18, 1874.
334.-C. E. and Z. B. Grandy, Stafford Spring, Folland county, Conn., U.S.-Improvement on saw sets, called
"Grundy's Saw Set." Aprll 24,1594 . Improvolding, Ipswbined hay rake and spreade called "Houlding's Improved Hay Rake and Spreader, April $24,1874$.
, $336 .-$ R.
H. Th
A,336.-R. H. Thurston, Hoboken, Hudson countr, N.J.',
U. S. Improvement to automatic testing machines called "Thurston's Autographic Testing Machine.
AB7.-J. Kirkpatrick, Hamilton, Ont., assignee of A
Paraf, New York city, U. S. Improvements on purifying and separating fats, called "An Improveme Purifying and selatine, Earnestown, unitedcounties Lennox and Addlngton, Ont. Improvements on por-
table fences, called "Asselstine's Portable Fence." April 24, 1874.
ments on table leaf supporters, called "/ Improvements on table leaf supporters, cal
Table Leaf Support." April 24,1874 .
, 840. -G.A. Martin. Bolton Center, Broome county, P.Q.
Improvements on machine for cutting veneer, called "Martin's Veneer Cutting Machine." April 24, 1874. , $341 .-\mathrm{P}$. Keen, Upper Wharl, Shad Thamks, Surrey
county, Eng., and J. Dence, London, Eng. Improvements on machinery or apparatus for ralsing or ele-
vating corn, mineral, coal, gravel, sand, or other materials, applicable for discharging or loading vessels,
dredgiog, pumping, and other similar purposes, called dredging, pumpling, and other similar purposes, called
"Keen \& Dence's Improved Radial Elevator." April $\xrightarrow{24,1874 .}$. Alake, New Haven, New Haven county Conn., U. S.-Improvements in stone crushers, called
"Blake's Improvement in Jaw Plates." April 24,1844 "Blake's improvement in Jaw Plates." April 4, 1844,
3,34s.-I. A. Blake, New Haven, New Haven county, Conn., U. S., and S. L. Marsden, same place. Im-
provements on a machine for breaking stone, called "Brake \& Marsden's Improvement in Stone Crusher."
aprll 24, 1874. April 24, 1874.
3,344.-D. A. Johnson, Boston, Suffolk county, Mass. straying or running away, to be used as a substitute
for a wetght or hitch strap, called "Johnson's Device or a weight or hitch strap, called "Johnson's Device
for Preventing Horses from Straying or Running

3,44 er-I. H. Dietrich, Galt, Waterloo county, on:- Im-
provement on saw handles, called "Dietrlch's Combl provement on saw handles, called "Dietrich's Combl
nation Saw Handle." Aprill 2,1 1874. 3,s46.-A. Bingham, Hamilton, Wentworth county, Ont. Improvement in machine for cutting circular pleces out of tin, sheet metal, and other materials, called
"Bing ham's Adjuatable CIrcular Chisel." April $27,1874$. "Bingham's Adjustable Circular Chisel." April 27,184 ,
3,347.-C. B. Jeeck te, Hamilton, Wentworth county, Ont Composition of matter to be used for washing pur pose
1874.
1848.-T. De Ceu,Houghton, Norfolk county, Ont. Machine for washing and cleansing solled clothing, called
De Ceu's Suction Washing Machine." April $2 t, 1874$ 3,349.-W. Wade, Morpeth, Kent county, Ont. Improve ment on self car couplers for coupling and uncoup ling cars, called "Wade's Improved Self Car Coupler.
Apr11 27. 1874. April 27. 1874.
Improvements on a machine Cuyahoga county,O.,U.s coupling pins, called "Leonard's Machine for Making Rallway Car Coupling Pins.' April 27, 1874.
,351.- W. Heston and J. W. Sabin, Akron, O., U. s. Im provements on rubber packing for piston rods, valve
stems, pumps, and presses, called "Heston's Concave Rubber Packing." A pril 27, 187
3,352.-E. R. Shorey, Mapanee, Lennox and Addlagton countles, Ont., and R. A. Shorey, same place, assign-
eces of A. O'Dell, Boumanville, Durham county, ont ecs of A. O'Dell, Boumanville, Durham county, Ont
Improvements on washingmachines, called "The Royal improvements on washingmachine
Canadian Washer." April 27, 1874.
Pas3. T. B. Worrell, Philadelphis, Philadelphia county rell's Bank Lock." April 27, 1874.
provements on the "Raymond" and similarly
on structed sewing mechines, called "Farr's Imarly con Raymond Shuttle Sewing Machine." April 27, 1874. , 355 .-W. T. Bunnell, Ottawa, Carleton county, Ont Improvements on washingmachines, called "Bunnell B,356.-T.A. McMartIn, Montreal, Montreal D1st.. P.Q Improvement on apparatus for raising water, exca
vated earth, or ore, or other goods or materials, calle 27, 1874. ${ }^{1}$ slagle stroke Lever Elevator." April 27, 1874.
357.
-C.
county, Conn., U. S. Improve called "Parker's Hammers." April 27, 1874.
,358.-T. W. Strange, Bangor, Penobscot county, Me U. S. Improvements on churns,
minion Cburn." April $27,1874$.
minion Cburn." April 27, 1874,
$3,359,-$ H. S. Davis, Camden, Cam
and S. Pancont, Hamilton, Went
An improved guard for interfering horses, calle
"Davis' Improved Guard for Interfering Horses."
,-T. Good. Toronto, York county, Ont. Improv ments in street culverts and waste water drains, called "Good's Improved Culvert and Drain." April 27, 1874 ty, Cal., Uavis, San Francisco, san Francisco coun
called "I. W. Davis' Fastening for Sastenting seame, Aprim ${ }_{3,362 .-J .}^{184}$. Desmond and A. L. McMillan, Chatham, Ken county, ont. Improvement in steam engine pistons called "Desmond \& McM. April 27, 1874.
$3,363 .-W$ Ellot
ments in millstonan, Grey county, Ont. Improve Millstone Gear." A prill 27, 1874.
New York city, renovating feat S. Capled "Manley" machines Ho vator." April 27, 1874.
,365.-D. H. Iseminger, Heyworth. McLean county, m called "Iserovements on saw sharpening machines 271. 1874 .
366.-G.
,366.-G. F. Simonds and J. A. Forson, Fitchburg, Wor ing saws, etc., called "SSImonds' \& Forson's Improve Method of Tempering to Form." April 27, 1874.
3,367.-E. J. Devens and H. M. Jones, Coldwater, Branch
county, Mich., U. S., assignees of D. Duesler, same place. [mprovements on grain cradles, called "Due ler's Grain Cradle.". April 27, 1874.
3,368.-H. Carter and D. Stewart, Aylmer, Elgin county Ont. Improvements on fly traps, called "Carter's Fly
Trap." April $27,1874$. Trap." Aprll 27, 1874.
, s69.-H. R. Barnes, Rock Stream, Yates countr, N. Y
U.S. Improvement on hoes, called "The Barnes Hoe
April 27, 1874.
s,970.-A. D. Cole, Toronto, York county, Ont. Improve
ment in turbine water wheels, called "Cole's Improve Dominion Turbine." April 27, 1874.
$3,371 .-\mathrm{W}$. Ellwood, Hamburg, N. $\mathbf{Y}$
ter, called "Bowden's Tyre U. Y., U. S. Tyre upset з,372.-D. Perrin, McGregor, Clayton county, lowa, U.S. Improvement on cutters for tonguing and grooving
lumber, called "Perrin's Cutter for Tonguing and lamber, called "Perrn's Cutter
Grooving Lumber." April 27, 1874.
s73.-T. Hall, Keene, Cheshire county, N. H., U. S Improvement on steam botlers, calle.
proved Steam Boiler." April 27, 1874.
s,374.-G. Bradford, Toronto, York county, Ont. Im proved Self Olling Bearing." April 271874 $3,375 .-$ W. G. Rawbone, Toronto, York county, Ont. Improvements on breech loading cartridge creasers." $\xrightarrow[\text { A.s76-J. J. M. Dick, Buffalo, Erie county, N. Y., U. s. }]{\text { s. }}$ Improvement on wool drying machines,
Wool Drying Machine." April 27, 1874

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