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

In our issue of January 7, 1882, we gave an illustrated description of the "Multifold Filter," manufactured by the Newark Filtering Company. That filter was composed of several superposed compartments, the sand in which was washed by means of traveling jets of water
The plan of washing is the invention of Mr. P. Clark, of Rabway, N. J., while the multifold construction of the filter was invented by Mr. J. W. Hyatt, of Newark. The multifold jet washer filter was a very excellent filtering de vice, and very likely no change in the system of filtering would have been adopted by this company had it not been for the inventive activity of Mr. J. W. Hyatt, the president of the company. The results of his invention in this direction are seen in three styles of filters here illustrated, and which are styled the Hyatt filters.
In these machines the movement of the water through the filter and the means of removing the impurities arrested by the filtering medium are striking and novel
While these filters are adapted to the use of animal charcoal, wood charcoal, and various other filtering materials, there are very few cases where anything like the quantity and quality of water can be filtered by these substances so efficiently and economically as by the use of suitable sand. Where sand can always be kept clean and without waste, as can be done in the Hyatt filters, it is the most effective and at the same time least expensive of all filtering substances for purifying large quantities of water.
The economy of sand for filtering is shown, for instance, by the fact that the sand in a filter containing 50 bushels costs but a mere trifle, while 50 bushels of animal charcoal would cost about $\$ 150$. The sand will last for many years without deterioration, while the charcoal, which while fresh, is excellent for decolorizing water, will become unfit for use in two or three months. We shall therefore speak in this article of sand as the filtering agent employed.
The Hyatt filter No. 1 is The Hyatt filter No. 1 is
especially adapted to houses, especially adapted to houses,
small steam boilers, laundries, small steam boilers, laundries, etc., and wherever the quan-
tity of water to be filtered is tity of water to be filtered is supplied throush a $\frac{s}{8}$ inch or six almo pheres, or less Its operation is as follows The water is admitted by the compound cock, A, and passe through the valve, $\mathrm{P}^{\text {nith}}$ to the sand. The courseror the water, during the operation of filtering, is indicated by the arrows shown in the cut. A portion of the water passes upward from the valve, B, entirely through the sand by the side of the filter to the top, and then descends to the discharge pipes. Other portions traverse the sand from the side at various heights, between the top and bottom, and all escaping through the perforated discharge tubes, C, D. The upward current of wate entering from the valve, B , loosens up the sand and keeps it in a state of mild ebullition for a distance laterally something less than one-fourth of the diameter of the filter. The sand is loosened the most and has the rened the most an to the side of the filter, whil further away it gradually moves slower, and becomes closer as the distance increase from the side, until motion ceases, and the sand compan ceather and more ogether more and more by the pressure of wate passing througb. By this plan, in the first part of the filteriug operation, the coars estimpurities in the water are ctained in a distributed con dition by the portion of sand


THE HYATT RLITER NO. 2.
which is in a loosely moving state; the next finer imparities are arrested a little further away, where, the current of water being slower, the sand is not so much disturbed ; finer particles again are stopped further away by the still denser sand; and so the process goes on by gradutions, till the water comes into sand which is motionless and compact. In this compact sand, adjacent to the outlet, the fine and last remaining impurities. are obstructed, and pure water passes through the tubes, C, D, into the outlet pipe, E.
This description applies to each of the three varieties of Hyatt filters here shown. It permits a larger amount of water to be filtered by a given quantity of sand than is possible. where the silt and impurities are permitted to accumulate in a dense stratum upon the motionless surface of a filter bed. At the same time the sand is in condition to be more easily cleansed, the impurities being loosely distributed among the particles of sand instead of adhering together in a more or less tenacious mass.
The filtering process having thus been explained, the method of cleansing the sand from the accumulated impuri ties will be described. As a rule the sand in a filter should be thoroughly washed at least once a day, although this depends upon the character and amount of impurities which the water contains. In warm weather, especially, cleansing should be done frequently to prevent decomposition of the or ganic matter remaining in the sand, which makes filters which are ouly cleansed at long intervals fountains of filth instead of purity
In washing Hyatt filter No. 1, the handle of the compound cock, $A$, is turned to the left as far as it will go. This shuts off the water from the valve, $B$, and permits it to enter through the small valves, $F$, which are distributed at regular intervals in the bottom of the filter bed. From these valves the water rushes upward through the sand, loosening and carrying with it all of the slit and impurities that have been retained in the sand while filtering, and discharg ing them through the central pipe, $G$, from which it issues by one of the openings in the compound cock, $A$, into the waste pipe, V. Five or ten minutes for washing is usually quite sufficient; and if this be done regularly each day, the filter will be kept in the most perfect order and will do its work for a practically indefinite period, as there is no waste of sand, and the filter is constructed of bituminized iron and has no working parts liable to get out of order. After washing, the handle turned to the rigbt until it stops, and filtering is at once resumed.
Some of these filters are ar: ranged for the introduction of the unfiltered water over the sand instead of at the bottom. It is then filtered downward and discharged through perforated metal below. In a filter of the form and capacity of house filter No. 1, this arrangement will give finer filtration but a less quantity of water. The plan of washing the samd is, however, as above described.

Hyatt filter No. 2 is made in diameters of $40,50,96$, and 120 inches respectively. They are worked tn gangs or series of from two to ten iun number, as may be desired. The method of filtering is the same as has been descrihed in No. 1, the water passing' up from the inlet valve, B, and passing across to the cutlet screens. By reference to the arrows shown in the cuts and to the description of fllter No. 1, this method of altration will be (Continued on page 195.)

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## EDUCATION FOR MECHANICS

The question of the extent of the benefits of education to the working mechanic is an old one. Many place too high a value upon the utility of learning. To them knowledge seems all powerful; it is a key that unlocks every door It is among those of lesser culture that this opinion mostly obtains. They overestimate the value of science, while the better educated fall into the opposite error, and undervalue it. As usual, the truth is to be found in the middle. Edu cation of whatever nature exerts a certain influence upon all our actions, but is not responsible for everything. Those who are wanting in it are apt to attribute all their troubles to this deficiency. How often does some inefficient mechanic say that he would have done much better if he had only been educated. He cannot see that his faults are positive and inherent. Those who possess education, finding that their natural faults still impede their progress,
come to the conclusion that what they have learned is of come to the conclusion that what they have learned is of little value.
In the case of the mechanic it is not easy to determine just what knowledge is worth. After he has learned his trade mechanically, it is worth his while to go further and read up what has been written about it. While many of the best workmen do not use book knowledge at all, the typical intelligent workman is always a reader. He receives a scientific journal and possesses half a dozen books treating of lathe work and kindred subjects. They describe case-hardening compounds, brazing and welding fluxes, and give hints on lathe management, on cutting angles of tools or different metals, and the like. Every day he may have to go through some of the operations they tell of, yet rarely or never will he leave the beaten track. But although he may not follow them in practice, he always reads them. He does good work in the shop, and reads intelligently at home. If any question comes up with his employer about mechanical points, he will bring him the next day some of his books or papers as authorities, yet his shop work is done on principles learned by hard experience, and not by
book theory. His books and his scientific journal do not book theory. His books and his scientific journal do not seem to help him there. Clever as the man may be, he would seem at first sight to lack the faculty of applying his ject, it may edge. Yet if we go a little deeper into the submechanic that he rejects the book in practice. The hard school of experience has taught him two lessons. One has school of experience has taught him two lessons. One has
been a right way of doing things; the other has been the been a right way of doing things; the other has been the
danger of trying to improve on that way. In the apprenticeship of the mechanical arts the work of generations of mechanics is imparted to the learuer. The evolution of so many minds and years should be treated with reverence To institute a genuine and valuable improvement is far from easy.
All this proves the dignity of the posidimn held by the mechanic. He has a knowledge of shop work that is derived, as just stated, from generations of the world's work His knowledge of this work is, then, of the very best. His acquaintance with different metals, with the treatment of different steels and irons, is perfect. His application of it is an instinct. He will seldom find in his course of reading justification for leaving the way he is accustomed to. His special branch he knows so well that the books can scarcely improve it. His thorongh kuowledge of shop work attains to the dignity of a liberal education. It is not to be de spised or looked
This is a fair picture of the good mechanic as found in our shops to-day. He reads, but does not often succeed in applyivg his reading. Yet he will study, and will enjoy studying. It elevates his mind by giving it something besides itself to live upon. Seldom as the direct application of his reading comes into his work, its indirect influence affects every blow of his hammer. His intellectual being is improved by it, and his self-respect increased. His journa and bonks give it good pabulum. The benefits of education cannot be doubted in his case.

## ANALYSIS OF WATER

Chemistry will unfailingly reveal the elements and their proportions in a compound, and also the inorganic quantities yet it will be at a loss to show the organic components mor than approximately. Tests will only show the presence, not the exact parts, of the latter, and as the process by evapo ration and heating the residuum separates the volatile constituents of animalcules and vegetable compounds, their amount cannot be determined with certainty.
It is only after disease germs have been traced to water as their medium of diffusion that the water is suljected to examination. The microscope failing to show them, their existence can only be proved by placing them in conditions favorable to their development. Inorganic ingredients of a hurtful nature can be ascertained, and the proportions, which it would be dangerous to health to exceed are known. Vegetable matter can be closely calculated, but the results that would ensue by changes under certain conditions can only be obtained by a system of a priori reasoning. But the germs, the most insidious enenical action nordilution, will cradicate them, cannot be found.
The benefits accruing from the solution of this problem cannot be overestimated; physicists are bending their ener gies in this direction, and students are entering the field; it
is a wide one, and one that, if explored, will yield boundless
reward. reward.

## SITES FOR WATER SUPPLIES

The transition from a village to a city is so rapid in this country as to seem to be due to the agency of the " magic amp," and yet all the privileges and conveniences enjoyed by the old are demanded by the new communities. Un doubtedly among the most important of these, and one to which attention is forcibly drawn as spring opens and huild ing operations are resumed, is that of a perfect supply of water.
In selecting a locality whence to obtain this supply, it would be judicious to insist upon certain conditions which are vital to success. Absolute purity of the source should be he tirst characteristic. The entire watershed should be carefully examined, and everything avoided that would even be liable to produce corruption. In the case of wells, chemi cal analysis will take the place of inspection. After having obtained a source now pure, the possibilities of contamina tions in the future should be looked to. It is a well known and frequently demonstrated law that security breeds negligence, and in the case of water supplies this is often tested. mperceptibly the water will become unwholesome, and yet its true character will remained concealed until disease is traced to it, when an examination reveals impurities which have crept in and been steadily increasing.
For many reasons the quantity of the supply should be ufficient, not only for present needs, but to allow for growth and increased consumption. After these comes the nex actor, one that is, unh:ppily, often ranked as first-that of cost. The works should be built economically, but when poor work is liable to risk the whole, the economy is false. Due attention should be paid to so constructing the first system that it could, when the time came, be increased by the ex penditure of a moderate percentage of the first cost.

## The Great statue of Liberty

A singular problem in engineering is presented to the committee which has in charge the construction of the pedestal for the great statue of Liberty in New York harbor About eighty thousand dollars out of the necessary two hun ren and fifty thousand have becn raised, but nothing has been done about the work. It is probable that operations would be begun at once with the funds in hand, if it wer not that no plans have been made, and no architect or engieer has been engaged to make them, the committee not having been able to find any member of these professions willing to contribute them for nothing, or rather for the great credit" which, " if properly done," they will "refect upon the designer and engincer."
As the value of the drawings and superintendence for the pedestal alone, to say nothing of the responsibility of seeing he statue placed safely upon it, woułd be about twenty-five housand dollars, we fear that the committee will look long before they find the individuals whom they seek. The task itself, independent of any consideration of proper payment for the time and responsibility involved, is not one that the most skillful engineer would wish to undertake hastily. The statue weighs, complete, only about eighty tons, but pesents an immense surface to the wind, and stands, more over, on a comparatively small base.
Considering that it is not extremely casy to construct a brick chimney of the same height-one bundred and forty ight feet-weighing ten times as much, of pyramidal form and standing on the ground, so as to resist the force of a storm, the difficulty of raising and securing the statue, no on the ground, but on the top of a pedestal nearly one hunred and fifty fect high, is apparent There are no prece dents for anything of the kind, and it will hardly do to se cure the figure by the rope stays, like those of a derrick, which the incapable engineer would naturally resort to
The members of the committee seem themselves to have erceived something of the difficulty of the undertaking nd have telegraphed to France for instructions as to the mode of doing the work. We do not generally voluntecr advice, but it seems to us that the plan said to be employed by the Japanese for securing their light pagoda towers against the effects of wind, by means of a long weight or pendulum, hung from the top of the tower, and reaching nearly to the floor, might perhaps be employed with good effect for the New York statue.
A very similar device, applied by Sir Christopher Wren, has for two hundred years held up the spire of Salisbury Cathedral, as well as those of one or two other English churches, in which a heavy wooden framework, extending as far downward as the construction of the tower permits, is uspended by strong iron bars from the capstone, free to swing in any direction. The effort of the wind on one side f the spire inclines it until the banging framework rests gainst the opposite side, but when the pressure is relieved, he pendulum swings back, bringing the stonework with it into its original place.-Amer. Architect.

## Electric Tramway.

According to Mr. Trail, the engineer of the Giant's Cause way and Portrush Electric Tramway, the total prime cost will be about $£ 31,000$ for six and a half miles of tramway the cost of buildings, rolling stock, electric plant, engines, law, parliamentary, and engineering expenses. He say also that the electric car is able to ascend a long, continunus hill of about one and a half miles in length, and with a gradient of 1 in 35 , drawing a second car behind it, and work as readily and as well at a distance of two miles from the generator as adjacent to it.

## ASPECTS OF THE PLANETS FOR APRIL.

is morning star, and takes the lead of the planets that sing and shine while they anticipate the rising of the great luminary that will eclipse their lesser light. She is still traveling on the eastward track that brings her nearer to the sun, as she fulfills her course from western elongation to superior conjunction. Though her fair face is becoming "fine by degrees and beaulifully less," she continues to grace the breaking of the dawn, and wins the admiration of every observer who watches her progress "under the opening eyelids of the morn."
Venus varies her course with an incident on the 10th. She is in conjunction with Lambda Aquarii, a star of the fourth magnitude in Aquarius, being twenty-six minutes south of the star. The nearest approach is at eleven o'clock in the morning. But planet and star will be near enough before sunrise to form an interesting picture. Venus will be far enough above the horizon for favorable observation soon after four o'clock, and will then be seen west of the star and approaehing it. On the morning of the 11th, it will be seen that phnet and star have passed each other, Venus being east of the star. Observers will note the rapid progress of Venus northward. At the end of the month she will be in northern declination, nearly twelve degrees farther north than at the beginning of the month.
The right ascension of Venus is now 22 h .10 m ., her declination is $11^{\circ} 37^{\prime}$ south, and her diameter is $16.8^{\prime \prime}$
Venus rises on the 1st eight minutes after four o'clock in the morning; on the 30th she rises at thirty-eight minutes after three o'clock.

## mars

is morning star, but is too near the sun and too insignificant in size to be of much account. A better time is coming, and, before many months have passed, he will become an object of prominent interest as he approaches opposition. Like Venus, he is moving rapidly northward. At the close of the month he will be in northern declination, having traveled nine degrees north during the month. The farther oorth the planets are in this latitude, the more favorably they are situated for observation, and the longer is the cir cuit they make above the horizon.
The right ascension of Mars is 23 h .6 m. , his declination Is $6^{\circ} 57^{\prime}$ south, and his diameter is $4 \cdot 3^{\prime \prime}$.
Mars rises on the 1st at ten minutes before five $Q^{\prime}$ clock in the morning; on the 30th he rises a quarter before four p'clock.

## MERCURT

Is morning star until the 16th, and evening star for the rest of the month. On the 16th, at six o'clock in the morning, he is in superior conjunction with the sun, passing behind he great luminary, and appearing on his eastern side to play his short role of evening star.
Heis an active member of the solar community. On the 27 th, rushing eastward, at full tilt, with a seeming intention to get as far away from the sun as possible, he encounters Neptune, plodding westward with tortoise pace, making every effortin his power to approach the sun as near as possible, the former moving with a velocity of nearly thirty miles a second; the latter moving with a velocity of three miles and a half in a second. They have a conjunction at the respectful distance of $3^{\circ} 7^{\prime}$, and are hidden from terres trial gazers by their near proximity to the sun. They, however, windistinction, for the meeting of the planet that travels nearest to the sun and the one that travels on the system's remotest bountwis the sole planetary conjunction on the meager annals of the month. Mercury is speeding north faster than either Venus or Mars, for during the
month his northern declination increases twenty-three de grees.
The right ascension of Mercury is 23 h .59 m .; his declination is $2^{\circ} 33^{\prime}$ south, and his diameter is $5 \cdot 6^{\prime \prime}$.
Mercury rises on the 1st at twenty-one minutes past five o'clock in the morning; on the 30th he sets at twelve minutes past eight o'clock in the evening.

## NEPTUNE

is evening star, and leads the quartett of giant planets in the time of rising and setting. He is now so far from the earth, and so near the sun, that large telescopes find it diffl cult to pick him up, but his course among the stars is as ac-
curately mapped out as if he were visible to the unaided eye. curately mapped out as if he were visible to the unaided eye.
His conjunction with Mercury has already been referred to.

The right ascension of Neptune is 3 h ., his declination is $15^{\circ} 19^{\prime}$ north, and his place is in Taurus.
Neptune sets on the 1st at a quarter after nine o'clock in the evening; on the 30th he sets at half-past seven o'clock.

## saturn

is evening star, and shines in the western sky for about three hours after sunset, when his pale disk dips below the horizon. He is now nearly south of the Pleiades, and presents no features of special interest to the ordinary observer Even the telescopist will have to take a season of rest, for he is approaching the sun so closely that he will soon he hidden from view. Hidden, but not lost, for next autumn at opposition he will be more magnificent than he was during the past autumn and winter.
The right ascension of Saturn is 3 h .26 m . ; his declination is $16^{\circ} \cdot 49^{\prime}$ north; his diameter is $16^{\prime \prime}$, and he may be found in the constellation Taurus.
Saturn sets on the 1st about a quarter before 10 o'clock in the evening; on the 30th he sets at twelve minutes past 8 o'clock.

## JUPITER

is evening star, the third in the order of rising, but he holds the palm among the planets and the myriad stars as the most brilliantly beautiful of the shining host. He distinguishes himself by no noteworthy deeds, but pursues the even tenor of his way with majestic mien, accepting with royal grace the honors due to his position as the giant member of the system, the finest exemplification of nature's fashioning hand
The right ascension of Jupiter is 5 h .36 m .; his declination is $23^{\circ} 15^{\prime}$ north; his diameter is $352^{\prime \prime}$; and his place is n Taurus.
Jupiter sets on the 1st at twenty-five minutes past 12 o'clock in the morning; he sets on the 30th a few minutes before 11 o'clock in the evening.

## uranus

is evening star, and may still be seen by the unaided eye as a faint star in clear weather on moonless nights. His positio varies little from that pointed out for March, being half a degree farther north. He is in Virgo, a little northwest of Beta Virginis, and may be best observed in the east about 8 'clock.
The right ascension of Uranus is 11 h .26 m ; his declina ion is $4^{\circ} 31^{\prime}$ north; and his diameter is $38^{\prime \prime}$
Uranus sets on the 1st at 5 o'clock in the morning; he sets on the 30 th at five minutes past 3 o'clock.

## THE MOON.

The April moon fulls on the 22d, at forty-three minutes past 6 o'clock in the morning. The old moon is in conjuncion with Venus on the 4th, Mars on the 5th, and Mercury on the 6 th. The new moon of the 7 th is near Neptune and
Saturn on the 9 th. The conjunction with Saturn will be the most interesting phenomenon of the month, the two days' old crescent passing forty-one minutes north of the planet, and the time of nearest approach being about a quarter after 8 oclock in the evening. The conjunction is much closer than that of the 13th of February, when the moon and Sat urn, imprisoned in the halo surrounding her, formed a charming celestial picture. On the 13th the moon is in con junction with Jupiter, and on the 18th completes the plane ary circuit by drawing near to Uranus. On the 22d the moon is eclipsed. The eclipse is invisible in this portion of he world, but may be seen on the Pacific coast, the Pacific Ocean, and Asia. Observers here will not lose much, for less than one-tenth of the moon's diameter will be eclipsed. The moon occults Beta Capricorni, a star of the third magnitude, on the 1st at seven minutes after 6 o'clock in the morning, the star being bidden for twenty-two minutes. The occultation takes place soon after sunrise, and is invisible, but the near approach of moon and star will afford ma terial for interesting study.

## SOME APBWERS TO CORRESPONDENTS.

E.H. P.-"Luminous paint" is used to illuminate the aces of clocks and watches. It is a compound of lime and sulphur in varnish. -R . H.-There is no difference, in result, between one square foot and one foot square. One square oot may be contained in a figure of any desired shape con taining 144 square inches; for examp!e, a parallelogram 24 inches long and six inches wide; while one foot square is understood to represent a figure measuring 12 inches on each of its sides. -O. R -The top of a locomotive wheel does not go around its axle, when running, any faster than he bottom of the wheel.-S.-Will take no more pickets to ence the hill than to carry the fence on the straight line shown in your diagram. -H. B. L.-The cannon ball fired rom the rear of a train moving sixty miles an hour will pass the mile post.-J. A. M.-The profession of civil engineering offers inducements for young men to study. There are good colleges and many good books relating to engineer-ing.-O. R.-You cannot run an electric light without considerable expense for machinery or for batteries.-W. D. T. Ordinary nut coal is the best for the purpose.-G. R. B.Butter can be made from fresh milk by means of an ordinary churn.-J. L. B.-Railway ties made of paper pulp have been proposed.-H. S.-The best-method of preserving and transporting fresh fruit is by means of the refrigerator cars. Splendid fruit is thus brought from California to the New York market.-F. E. S.-Solid iron columns are stronger than hollow iron columps of the same diameter; hut the same weight of metal that is contained in the solid column, if it were put intothe form of a hollow columb, would be much tronger than the solid column.-J. W. P.-Better write to the Secretary of the Interior.-C. R.-There are various forms of sneep shears made with guards to prevent injury to the sheep.-C. L. F.-One way to make electrical belts is to sew a strip of copper and a strip of zinc inside of the cloth in such a manner that the zinc and copper will both be in contact with the surface of the skin. An amateur can produce good pictures with a portable photographic apparatus, such as you speak of.-There is no simple photo-engraving process, such as you call for: -F. S. M.-There is no especial place where you can ro to study inventing. As for mechanical electricity, he best way will be to attend some polytechnic school. -S. R.-You can buy rubber cement at the drug stores.-C. T.
-The nineteenth century closes December 31, 1899, and the twentieth century commences January 1, 1900.-E. C. B.-There is no way to prevent the lead from coming off. -F. C. K.-Powder exploded on the top of a rock under is to drill the rock with the ordinary submarine drills, mode 'then blast it in the usual way.-E. C. S. - You will find de-
scriptions of cork machinery in the back numbers of the Scientific Americian.-J. A. R.-7he cost to erect an electrical telephone for three miles, instruments, poies, wires, and all included, would be about $\$ 150$ per mile.-A. C. L.-Dentiphones, or audipbones, are made in this country. -H. S.-See Supplement, 3 3 7, electrical balance for showing presence of metals under surface of the ground. There is no other instrument for indicating the existence of precious metals-E. L. R.-The Edson automatic steam recorder will tell you whether your fireman does his duty at night.A. L -For drawings of a timber drying apparatus see recent number of Scientific Americian Supplement.-G. M.Various forms of nut locks are in use.-T. A. M.-You can obtain the telescope glasses at almost any optical store--W. E. M.-Common whiting and alum in equal parts makes a good filling for safes.

## Steel from Phosphorized Cast Iron.

A paper by M. Delafond has recently appeared in the Annales des Mines on the preparation of steel from iron of this kind, and he finds that the problem is completely solved, both in the Bessemer converter as well as in the ordinary furnace, when basic linings of magnesian lime are employed. The removal of phosphorus is as satisfactory as could be desired, and the silicium is almost entirely removed, while the sulphur is also to a great degree separated. The basic steel is found to be purer and more uniform in texture than acid steel. The soundness of basic steel is more uniform than that of acid steel. Tires of both are found to be statically and dynamically alike. The formation of bubbles and blisters in the basic ingots has been avoided by raising the temperature before casting. In the furnace the basic process goes on more easily than in the converter, and the removal of phosphorus is likewise more complete. Metallurgists have then at the present time two different processes of forming steel, either in the converter or in the furnace: in the one pure kinds of cast iron are treated in the apparatus with acid lining, in the other impure products are subjected to basie linings. The question then arises, if, under otherwiseequal conditions, a complete refining follows as well with a basic lining as with an acid, why should not the basic lining be simply employed, so that the steel of greater purity furnished by that method be obtained?
To this it may be replied that when the furnace is used, it would in many cases be advisable to replace the acid lining with a basic one, whereby, in fact, the work would offer no obstacle. It is quite otherwise where the converter is employed. Here the cast iron cannot be worked with a basic lining so advantageously as wleen the acid lining is employed. It is rich in silicium, which introduces great difficulties when the basic lining is employed. If, hewevel, it be possible so to regulate the smelting furnace that the iron contains less silicium, the intermolecular combustion may be so regulated that no sufficient heat shall be developed to maintain the metal and slag in a iquid state. Thus it is that the preparation of pure castiron in basic converters presents difficulties. A mixed process may, it is true, be employed; the scorification, first in an acid converter, and then a further refining in a basic converter; only this process would be costly and complicated. The future will decide what is best to be done in this respect The white raw iron employed at Creusot in the baste process as the average composition: $3=\mathrm{C} ; 1 \cdot 30=\mathrm{Sl} ; 1 \cdot 50-204 \mathrm{~s}_{10}$ $250-300 \mathrm{P}$; and 0.20 S , while the basic (1) ind (2) steel contain:


The basic lining, consisting of dolomite treated with tar has the composition: $\mathrm{CaO}=53 ; \mathrm{MgO}=35 \cdot 8$; and $\mathrm{SiO}_{2}=7 \cdot 7$; while the slags at the end of the decarburation (1) and dephosphorization (2) have the following constitution:

|  | 1. | 2. |
| :---: | :---: | :---: |
| Silicic acid. | 22 | 12 |
| Lime and magnesia. | 47 | 54 |
| Iron and manganese oxides. | 11 | 11 |
| Phosphoric acid. | 12 | 16 |
| Alumina and chromium sulphates | 5 | 5 |

## A Marine Engineer's Prophecies.

Mr. James R. Thomsen, one of the builders of the steamhip Servia, at the launch of the Aurania, another large first class steamer for the Cunard Company, lately made the statement, prophetically, that the coming Atlantic steamship would be propelled by twin screws at twenty knots average speed, and would carry no cargo, her profit lying in the fact that she would make fifty per cent more trips. She would carry neither masts nor sails, ber twin machinery reducing he probabilities of aceidents, and, of course, increasing her safety, while obviating the necessity of the old-time auxiliary -sail power: There were fifty large steamships built on the Clyde last year, and about one half of that number were fitted with corrugated steel furnaces, which are said to effect a saving of from ten to fourteen per cent.

New subscribers to the Scientimic Aberican and Scien ific American Súpplement, who may desire to have complete volumes, can have the back numbers of either paper sent to them to the commencement of the vear. Bound volumes of the Scientific American and Scientific Ambrtcan Stpaji ment for 1882 , may be had at this office or obtained through news agents.

## Constitution of the sun.

In a paper presented to the French Academy (Comptes Rendu8, xcvi., 136) Faye gives his reasons for believing that our sun and the other large self-luminous heavenly bodies have not yet arrived at either a solid or a liquid state, but are gaseous all the way to the centers. Otherwise, he says, the heat radiated from them would not he so quickly replaced by heat from within, and the surface, consequently, would soon become covered with a solid, non-luminous crust.
Cagniard-Latour has, however, proved by means of some very remarkable experiments that a gaseous mass can acquire the density of a liquid without changing its state of aggregation, provided both temperature and pressure are high enough at one time. If, then, the externalstrata of the solar atmosphere, where all matter is in an elementary or dissociated state, should cool sufficiently for the elements to enter into chemical combination, if the vapors of metallic calcium, magnesium, and silicium, mixed with oxygen there, on cooling should form clouds of lime, magnesia, and silica, for example, these clouds would sink to the interior, where they would again be dissociated, while at the same time they would drive the hotter particles upward, so that an approximately uniform temperature would be maintained until the whole mass had gradually cooled to such an extent as to assume the liquid and afterward the solid state.
Faye bases his hypothesis on the spectroscopic observations of many years, and on Carrington's study of sun spots, which show that the currents are all in zones parallel to the equator, while there are none from the equator toward the pole. Besides this, the flattening of the sun and the slow motion of sun spots near the poles are more easily explained on this hypothesis of Faye than on those hitherto in vogue.

## Hluminating Gas in Russia.

The Chemical Society in St. Petersburg recently appointed a committee to determine what was to be understood by "illuminating gas of best quality." From their report we abstract the following points:

1. A good illuminating gas must give, when burning about 100 liters per hour in a bat wing burner, an illumination equivalent to 10 normal spermaceti candles, that burn 7.78 grammes per hour
[One bundred liters equals 3.53 cubic feet, while. 7.78 grammes $=120$ grains. This requirement corresponds very nearly with our 14 candle gas.-Ed.]
2: Since the material used in making. gas, as well as the way in which it is made, has an effect on the value of the gas, it will be necessary, after a standard has been fixed on for the quality of the gas, for the city to establish an inspector to constantly watch the quality of the gas sent out. 3. Not only the illuminating power of the gas, butits come position, is of importance to consumers who use it indoors, hence the comptroller or inspector must also test it with regard to its chemical purification, and for this purpose also a standard must be fixed upon.
2. After estimating the quality of the gas, attention must also be given to the methods of illumination, since a good illumination depends, not on the quality of the gas alone, but on otber causes, as, for example, on the pressure, the state of the pipes, the condition of the burners, etc.
3. The society advises sending a competent scientific per son to Paris and other cities where such inspection is carried on, to study the methods and means employed.

## Nottingham Worms.

In all angling localities, the merits of Nottingham worms for angling purposes are fully recognized; but only a com paratively few people are aware of the trouble that is expended upon them. This industry affords em ployment to a large number of persons throughout a considerable part of the year, who, every favorable night, collect the worms from their happy hunting grounds in the meadows. Naturally, the supply in wet weather is more abundant than when the atmosphere is dry, although some sort of a barvest can even then be obtained by watering the ground. The wormers are provided with lanıerns, and have to exercise some considerable agility in catching their prey, as, if disturbed by any noise, they pop back into their holes. As soon as the worms are brought in from the country, they are taken to the 'farmer,' who places them in common field moss, and there they remain until they are as tough as a piece of India-rubber, which is a proof of their being in good order to use as bait, as a freshly caught worm is extremely tender, and breaks up readily when put on a hook. The worms are generally kept in moss from three or four days to a week, which is the longest period they can be preserved in good order. The worms are frequently picked over, in order to exclude all those that are broken and mashy; and when fit for use, they are usually sold for three and sixpence or four shillings per thousand, packed up in canvas bags filled with moss. For this purpose, only the plump and healthy worms are selected. [The above from Chambers's Journal suggests a new indus. try not yet introduced into this country, and a useful hint to our fishermer sespecting the toughening of their bait.—ED.]

Is Japan, one of the staple articles of food, fresh and pickled, is the daikon, a great radthe that grows $22 / 2$ feet long and 4 inches in diameter.

## NEW FANNING APPARATUS.

We give an engraving of an improved fanning apparatus designed for cooling purposes, and to be used in hotels, restaurants, priyate residences, offices, and in all other places where it is desirable to keep the air in circulation: It may be made in various sizes, and driven by any available motive power; the smaller sizes being propelled by a spring or weight, and the larger ones by steam or water power, gas or caloric engines, according to locality, extent of use, etc.
The apparatus consists of a fan formed of a series of wings or blades mounted on a shaft and inclosed in a cas


## reimers' fanning apparatus.

ing, the casing having discharge pipes opeving in various directions aeeording to the equiremsents The apparatus floor, as in Fig. 2, or supported by a standard, as in Fig. 3. A patent has lately been granted for this invention to Mr . Jacob Reimers, of No. 1,325 Sturtevant St., Davenport, Iowa.

## NEW PILE FOR GALVANO CAUTERY.

$\mathrm{Mr}_{\mathrm{r}}$. Chardon, a Freuch manufacturer of electrical apparatus for medical and surgical purposes, has recently devised a pile which is specially designed for the practice of galvano cautery, and which does away with some of the seriousinconveniences inherent to other piles of the kind that have hitherto been employed.
In this new apparatus, which is shown in the annexed cut,


NEW BATTERY FOR GALVANO CAUTERY.
the fluid's spilling. It takes but a few minutes to mount and use the cautery, and but a few minutes also to close up he apparatus again to make it transportable.
The apparatus consists of a box, whose cover, S, and one side, $R$, are hinged, and within which is fixed a metallic support formed of three vertical columns united at their upper extremity by a horizontal crosspiece. Into the middle column, which carries a thread, enters a screw, while into the other two, which are smooth, enter two cylinders, H , that act as slides. This screw and these sliaes support, by means of a properly arranged device, a wooden tablet
on which are fixed all the pieces that are necessary for the working of the apparatus. The head of the screw traverse this tablet and terminates in a wheel, C. It. follows, from the well known properties of the screw, that the tablet, which cannot revolve because of the two slides, H, may be made to rise or descend by turning the wheel, C , in one direction or the other. Beneath the tablet and toward the extremities, at F , are situated the zincs and carbons. There are three of the former on each side, with four alternating carbons. These seven plates together do not take up much space in the box, but leave room for two quite thick sheets of rubber, I I, and four ebonite troughs. These latter are of different heights, those (L) containing the exciting liquid (solution of bichronate of potash and sulphuric acid) being nearly as high as the external case, and the others, M, being about half the beight.
When it is desired to use the pile, the tablet is raised by revolving the screw, and the troughs, $L$, half full of liquid, are placed against the extremities of the box and secured in position by means of the troughs, M. Then, by revolving the screw in the opposite direction, the tablet is made to descend, and the zincs and carbons are caused to enter the liqnid gently without splashing. If the circuit is closed, the current then begins to pass. The intensity of the latter is regulated by plunging the zincs to various depths into the liquid.
When the operation is terminated, and it is desired to carry the pile to another place, the tablet is raised high enough to free the extremities of the carbons and zincs, and the respective positions of the troughs, $L$ and $M$, are changed. Then, by reversing the motion of the screw so as to cause the tablet to descend, the sheets of rubber, I, are pressed against the edges of the troughs containing the liquid with sufficient firmness to form hermetical covers to them. The case may then be closed preparatory to removal. It may be easily seen that no liquid can flow out, owing to the fact that the troughs that contain it are tightly closed, and that the small portion that drips from the zincs and carbons cannot injure the rest of the apparatus, inasmuch as it is caught in the troughs, M.
The zincs and carbons employed are about fourteen centimeters in.width in each direction. The three zincs on each side, as well as the four carbons, are united for quantity, in such a way that two elements of wide surface are obtained. The terminals that are observed on the upper side of the tablet permit of emploving at will one or the other of the elements only. On the contrary, the two elements mounted for tension may be used by attaching the conducting wires to one of the terminals of each of the elements, communication being established on another band by a wide band of metal.
The carbons are platinized, and, toward their upper part, are invested with a layer of copper to which is soldered the strip of metal that unites the four carbons of each element to form a single one. This arrangement, which secures a continuity of the contacts, is of a nature to keep the resistance of the pile cofistant, and consequently to contribute to the constancy of the currents.
Although this apparatus has been introduced but a short time, it is being used in some of the bospitals at Lyons, Montpellier, and Brussels, and, if we mistake not, at the Bichat Hospital in Paris.-L'Electricien.

An old Church in Arizona.
The most interesting of all sights is the grand old missinn church of San Xavier, nine miles from Tucson, on the Papago reservation. This mission wask founded in 1654, when the Papago (or Pima) Indians were supposed to have accepted the Christian religion. The Church of San Xavier was begun about the year 1700 and finished in 1798, excepting one of the towers, which is yet unfinished. The style of architecture is Moorish. The lines are wonderfully perfect. It is in the form of a cross, $70 \times 115$ feet, and has a well formed dome. A balustrade surmounts all the walls. The front is covered with scroll work, intricate, interesting, and partly decayed. Over the front is a life-size bust of St. Xavier. The interior is literally covered with frescoes. The altar is adorned with gilded scroll work.
The statues are as numerous as the paintings. The tiling on the floor is much defaced and' but little is left. That of the roof is nearly all as perfect as when laid. Its manufacture is one of the lost arts. There is a chime of four good sized bells in the tower that have a soft, sweet sound. Ascending to the roof, you walk up long, narrow stairs in solid walls. But one can go at a time. The same is true in guing to the gallery of the church.

It is marvelous that so long ago, and in such a place, such architecture, ornaments, painting, and sculpture were so well executed. You are admitted by two of the Papago signiors, who have it in charge. The admittance fee is 50 cents for each person.'-Denver Tribune.

According to the new act passed by the Maine Legislature, salmon, land-locked salmon, and trout, except in tide water, cannot be taken with nets, seines, weirs, or traps. The taking of land-locked salmon less than nine inches in ength and of trout less than five inches is unlawful; also the transportation of more than fifty pounds of land-locked salmon or trout by any one person at a time.

## IMPROVED FILTERS.

## Continued from first page.

clearly understood. In filters of 40 and 50 inches diameter, the inlet is at one side of the bottom and the outlet on the opposite side, so that the water must be subjected to the filtering action of a sufficient quantity of sand. But in filters of larger diameter the water is admitted through the center, and passes upward and outward to the circumference, as will be explained in description of filter No. 3. The distinguishing feature of filter No. 2 is the process of washing the sand. They are set up in series of two or more, because one of them, in turn, contains no sand, but is idle while the others are filtering. For example, in a series of three filters, as shown in the cut, two of them are filled with sand and are used simultaneously while filtering, the third standing idle and containing only water.
In washing, suppose the last in the series of three to he the idle one. The outlet valve, D, in the first filter, is closed; the waste valve, I, and the valve at the top of the pipe, E , the waste valve, I, and the valve at the top of the pipe, E,
are opened. The water coming in through the valve, B, can are opened. The water coming in through the valve, B, can
then only escape through the pipe, E. This pipe in large then only escape through the pipe, E
filters is made tapering and terminatfilters is made tápering and terminat-
ing very near the bottom of the filter. Through this pipe the water rushes up into and through the horizontal pipe H , and discharges into the top of the third filter. In doing so the water carries with it the sand from the firs filter, conveying it all into the third filter, conveying it all into the thir filter in about ten minutes. This carry ing process is facilitated by a current
of water forced from the upper part of the filter through the small pipe, C , loosening up and helping to separate the impurities from the sand during its passage through the pipe, H. As the sand falls into the water in the third filter, the separated impurities flow out with the excess of water through the open valve, $I$, into the waste pipe the sand, being thoroughly washed settles and remains in the filter. Now this washing of the sand from the firs filter into the third, being accomplished the valves, $C$ and $E$, in the first filter and waste valve, $I$, in the third, are closed; the inlet valve, $A$, in the third filter and its outlet valve on the op posite side are opened, and filtration is immediately commenced. Next the middle filter, or number two, may be washed, its contents being washed into the first filter precisely as had been done in the preceding case. Follow ing in order, at the proper time, the sand in number three is discharged and washed into number two. And so, in regular ordeir of succession, the filter are cleaused. About twenty minute or half an hour each day is all the r half an hour day is al the in perfect order.
As before mentioned, this style of filter is made in gangs or series of any desired number, one of the series being always employed in rotation for washing the sand.
The Hyatt filter No. 3 differs from No. 2, not in principle, but only in construction; the object being to make a single filter complete in itself, both for filtering and washing purposes. In the great majority of cases, where mor water is to be filtered than is used in an ordinary house or small steam boiler, the No. 3 filter will be recommended But as it occupies more vertical space than No. 2, some industries having limited vertical space might find No. 2 better adapted to their conditions.
As will be seen in the illustration, filter No. 3 is constructed with two compartments, one above the othe partment is the filter proper, and the The lower com ply a tank used only during the operation of cleansing the sand. The cut shows a filter eight feet in diameter, and, including both compartments, twenty feet in height. In this size the water is admitted in the center, and passes upward and outward to the circumference of the filter, so that all the water is filtered through four feet of sand
The operation in this filter is as follows: The water to be filtered is admitted through the valve, B, and, as it is filtered, passes through the perforated screen, $C$, which surrounds the sand and is supported by the outer shell. Ample room is provided between the screen and the shell for the passage of the filtered water down into the annular space, $\mathbf{D}$, from which it issues through the outlet valve and pipe, E. This arrangement of large filters supplied with water in the center furnishes the greatest possible filtering capacity on a given ground space, and is especially adapted to large indusries and to towns and cities.
When the sand in this filter is to be washed, the valve, $\mathbf{F}$ in the head is opened and the outlet valve, $\mathbf{E}$, closed. The
water then rises till the upper compartment is filled. Then the valve, F, is closed, and valve, $G$, at the top of the pipe, H , is opened. The contents of the filter can then only escape by way of the pipe, $H$, through its branches, which reach nearly to the bottom of the filter. The pressure of water coming into the filter forces the water and sand in a steady stream up through the pipe, H , and discharges the whole into the upper compartment. Water also coming into the pipe, H , by the aperture, O , under the bead, aids the flow of sand upward, and also assists in washing its particles free from the accumulated impurities. The water in the upper receptacle, as it receives the incoming flow, effects a complete separation of the impurities gathered in the sand, and they flow away with the excess of water into the overflow trough, I , and out through the waste pipe, K. In from ten to fifteen miputes, according to the supply of water, all of the sand in the filter (about 500 bushels in this size) is discharged and thoroughly cleansed into the upper tank. Now the filter below contains only water. To give tank. Now the filter below contains only water. To give
it back its sand the supply pipe is closed, the valve, F,
horoughly wash them once a day. The average waste of water in cleaning the sand in either style of these filters is about one per cent of the whole amount filtered. Thes remarks apply to the average water requiring filtration; but a larger percentage of water for washing, would be de manded to filter the water in some of the Western rivers, containing large quantities of clay.
In most cases filters above 40 inches in diameter are built entirely of boiler iron, and constructed for high or low pressure, as may be required. They are thoroughly bitumi nized interiorly to prevent rusting, and, it is believed, will last as long as the best constructed water mains; and as there is no waste of sand, there is nothing to repair, excep the ordinary wear of water valves, thus confining the cost of maintenance to the expense of one man about fifteen minutes a day to do the washing of each filter.
It will be seen that, with these water purifiers, the Newark Filtering Company have the means of filtering river, pond, or lake water in any quantities, large or small, and in all or lake water in any quantities, large or small, and in all ls, steam boilers, manufacturing indus-
tries, villages, or cities, they can meet any want, and claim the ability to fil ter a greater quantity of water, at less cost of installation and maintenance, than can be done by any other known means of mechanical filtration.
These filters are patented in the United States, Canada, and principal European countries

## God in Nature.

In a recent scientific lecture Profes or C. A Young, the astronomer, of Princeton College, used the following language: "Do not understand me at all as saying that there is no mystery about the planets' motions. There is just the one single mystery-gravita-tion-and it is a very profound one. How it is that an atom of matter can attract another atom, no matter how great the disturbance, no matter what ntervening substance there may be; how it will act upon it, or at least behave as if it ácted upon it, I do not know, I cannot tell. Whether they are pushed together by means of an intervening ether, or what is the ac tion, I cannot understand. It stapds with me along with the fact that when I will that my arm shall rise, it rises. It is inscrutable. All the explanations that have been given of it seem to me merely to darken counsel with words and no understanding. Tisey do not remove the difficulty at all. If I were to say what I really believe, it would be that the motions of the sheres of the material universe stand n some such relation to Him in whom all things exist, the ever-present and mnipotēnt God, as the motions of my body do to my will-I do not know how, and never expect to know."

## Arizona's Mineral wealth

It is but a few years ago that Arizona was looked upon as simply a worthless desert waste, useless alike for farming and stock raising, while the wners of a few small mines which were known and worked labored under the great disadvantage of having to ely upon the slow ox and mule teums for the transportation of their supplies and products. Communication with the outside world was not only difficult, but the pioneer miners were in constant dread of Indian raids upon them that it was impossible to develop Arizona Territory with much success
opened. Immediately the sand and water commence de scending through the opening, $F$, the sand setlling and filling the filter, while the excess of water escapes by the waste pipe.
In this operation the sand is washed through the water second time, and of course is left in a still finer condition for filtration. As the sand is descending, when two-thirds or three-fourths thereof have passed through the opening to the filter below, water is admitted into the trough I, at the top, from which it falls in small streams through perforations in the bottom of the trough, washing the sind away from the sides of the tank and carrying it all through the opening into the filter underneath; then the valves, F, G, and L, are closed, and filtration resumed.
The largest size of filter (No. 3) is 10 feet in diameter and 20 feet high, having a capacity of 750 bushels of sand, and will filter from 500 to 750 gallons of water per minute. Twenty such filters will purify the water for a city requiring $10,000,000$ gallons of water daily, and give a surplus; and the services of one man only would be required to
or profit But a great change has taken place since or profit. But a great change has taken place since the completion of the Southern Pacific Railroad across the Territory, and although the railroad does not extend directly to any of the mining camps, the increased facilities for transportation, and the opening up of the territory in consequence of it, have increased its population and developed its mining interests within the past two or three years wonderfully, and specially during the year 1882 the territory has made great advances in its resources.
From statistics recently published it appears that Arizona anks third among the States and Territories in the production of gold, silver, copper, and lead, the total production of these metals aggregating in value for 1882-\$11,702,293.-

One ton of cotton seed yields thirty six gallons of crude il, worth about $\$ 18$. The hull from a ton of seed weighs about 900 pounds, and the meal before pressing weighs 1,100 pounds. The oil cake is worth $\$ 27$ to $\$ 30$ per ton. It is calculated that there is a net profit of about $\$ 9$ in grinding the seed of a bale of cotton.

Safety Devices for Vessels.-Official Requirements.
At the annual meeting of the Board of Supervising Inspec tors of Steam Vessels, held in Washington, January, Feb ruary, 1883, in pursuance of Section 4,405, Revised Statute of the United States, the following devices were approved by the board, and have also received the approval of the Secretary of the Treasury:
Holman's life-preserving bed (when constructed of at least fifteen pounds of solid cork and cork shavings, as a life-preserver or fioat for-one person, on lake, bay, sound, and river).

Life-preserver, invented by Eliza P. Coggswell(when containing not less than six pounds of granulated cork, prepared in paraffine solution, and having a buoyancy of not less than twenty-four pounds, on lake, bay, sound, and river), with the further qualification that neither the board nor the Secre tary of the Treasury " means to assert or admit, or in any way imply, that Mrs. Coggswell is the inventor, and legall way imply, that Mrs. Coggswell is the

Renton safety boat plug; James Snelgrove, automatic boat plug; Daniel B. Eddy, patent sea life-boat; Dean \& Co.. improved diagonal life-boat (for lakes, bays, and sounds) Herreshoff Manufacturing Company, pop safety valve; $W$. E. Pierson, pop safety valve; George E. Collyer, safety valve; Edwin A. Hayes, life-raft.
Some of the rules were amended as follows:
Rule 13.-Steamers navigating rivers only (except ferryboats, freight boats, canal boats, and towing boats, of less than orie hundred tons) must have one good, substantial boat
Freight, ferry, canal, and towing steamers, of less than fifty tons, must be equipped with boats as, in the opinion of the inspectors, may be necessary, in case of disaster, to secure the safety of all persons on board.
Steam ferry-boats of fifty tons burden and over must be supplied with life-boats as, in the judgment of the inspectors, will best promote the security of life on board such vessels in case of disaster, according to the average number of passengers carried per trip.
Steamers making excursions under a permit must have at least one life-boat, and shall be equipped with other life boats, or their equivalents, as, in the judgment of the inspectors, will best secure the safety of all persons on board in case of disaster.

Passenger steamers navigating the Red River of the North, and rivers whose waters flow into the Gulf of Mexico, must, in addition to the boat required in the first paragraph of this rule, be equipped with one life-boat of the buoyancy and capacity named in the Example in Rule 12, for every sixty passengers allowed, including the crew. One of the life boats, unless exe

## be made of metal.

All metallic life-boats hereafter built shall be furnished with a suitable automatic plug.
Passenger steamers navigating rivers other than the Red River of the North, and rivers' whose waters flow into' the Gulf of Mexico, must be supplied, in addition to the boat required by the first paragraph of this rule, with life-boats in proportion to their tonnage as follows:
Steamers between 100 and 300 tons, 1 boat; 300 and 600 , 2; 600 and 900,$3 ; 900$ and $1,200,4 ; 1,200$ tons and upward, 5.

Provided, however, that river steamers required to carry more than two boats may, where the owners prefer to do so, supply the boat capacity above that number with a good, substantial life-raft or rafts, such raft or rafts to be of equal aggregate carrying capacity of the boats so omitted.
These life-boats shall not be of less dimensions than those named in the example in Rule 12, unless, where smaller lifeboats are employed, their aggregate capacity shall equal the aggregate capacity of the larger boats.
No steamer embraced in this paragraph shall be required to have more life-boats, or of a greater capacity, than suf ficient to carry the passengers allowed by the certificate of inspection (including the crew). One of the life-boats, unless exempted by the Supervising Inspector, must be made of metal. The carrying capacity of the life-boats for steamers herein mentioned shall be determined by multiplying the length, breadth, and depth together, and dividing their product by five.

Passenger steamers navigating the ocean, Northwestern lakes, bays, and sounds of the United States, must be equipped with life-boats in proportion to their tonnage as follows:

Steamers under 100 tons, 1 boat; steamers between 100 and 200 tons, 2 boats; 200 and 300,$3 ; 300$ and 400,$4 ; 400$ and 500,$5 ; 500$ and $1,000,6 ; 1,000$ and $1,500,7 ; 1.500$ and $2,000,8 ; 2,000$ avd $2,500,9 ; 2,500$ and $3,000,10 ; 3,000$ and $3,500,11 ; 3,500$ and $4,000,12 ; 4,000$ and $5,000,13 ; 5,000$ and above, 14 .
All these boats must be of proper size, and substantially built with reference to the trade in which the steamer is engaged: Provided, however, That no steamer shall be required to have more life-boats than sufficient tocarry the passengers she is allowed by her certificate of inspection, together with her officers and crew.
A portion of the life-boats required on lake, bay, sound, and ocean steamers may be substituted by their equivalents in approved life-rafts when, in the judgment of the inspectors, it can be done with safety.
All steamers built for the navigation of oceans, Northwestern lakes, and sounds (meaning in waters sufficiently rough to swamp boats), shàll be equipped with life-rafts in proportion of one at least to every twolife-boats required.

Rule 14.-All life-rafts and floats composed of hollow ylinders must be rated in their carrying capacity according to the cubical dimensions of such cylinders, in the ratio of ne person to every three cubic feet for ocean steamers, and wo cubic feet for lake, bay, sound, and river steamers. Such life-rafts and fioats must be suitably equipped with life-lines and oars.
All rubber or canvas life-rafts shall be kept inflated at all times.
Rule 23.-Steamers required to be provided with double acting steam fire pumps, or other equivalent for throwing water, shall be equipped according to their tonnage as fol lows:
For a steamer of not more than two hundred tons burden, four inches stroke and two inches diameter of plunger, or its equivalent.
Of more than two hundred and not over five hundred tons burden, seven inches stroke and four inches diameter of plunger, or its equivalent.
Of more than five hundred and not over one thousand ons burden, seven inches stroke and six inches diameter of of marer, or its equivalent.
Of more than one thousand and not over fifteen hundred tons burden, ten inches stroke and six inches diameter of plunger, or its equivalent.
Of more than fifteen hundred and not over two thousand tons burden, ten inches stroke and eight inches diameter of plunger, or its equivalent.
Of more than two thousand and not over twenty-five hundred tons burden, twelve inches stroke and eight inches diameter of plunger, or its equivalent.
Of more than twenty-five hundred and not over three thousand tons burden, twelve inches stroke and ten inches diameter of plunger, or its equivalent.
Steamers are not restricted to the above particular proportions for fire pumps; any other dimensions equal to or greater in capacity may be allowed; and no fire pump thus provided for, excepting upon ferry-boats, shall be placed be low the lower deck of the vessel.
The diameter of the pipes leading from the pumps must in no case be less than that of the discharge opening of the pumps.
A rotary pump, when driven by an engine independent of the main engine, or a steam siphon pump, may be considered as an equivalent for the double-acting fire pump, and used as such when equal to it in efficiency, and the degree of capacity required.
Rule 57.-It shall be the duty of the master of every in spected steamer carrying passengers on the ocean, lakes, gulf[s], or bays, when such steamer is under way, to cause to be prepared a station-bill for his own departmentiand
one, also, for the engineer's department, in which shall be one, also, for the engineer's department, in which shall be
assigned a post or station of duty for every person employed on board such steamer in case of fire or other disaster; which station-bills shall be placed in the most conspicuous places on board for the observation of the crew. And it shall be the duty of such master, or of the mate or officer next in command, once at least in each week to call all hands to quarters, and exercise them in the discipline and use of the fire pumps, and all other apparatus for the safety of life on board of such vessel, and to see that all the equipments required by law are in complete working order for immediate use; and the fact of the exercise of the crew, as herein contemplated, shall be entered upon the steamer's log-book, stating the day of the month and hour when so exercised, and any neglect or omission on the part of the officer in com-
mand of such steamer to strictly enforce said rule shall be mand of such steamer to strictly enforce said rule shall be cer. Unon navigable rivers, the captains of all passenger steamers shall be required to maintain a strict discipline and organize the officers and permanent crew so as to act with promptnęss in extinguishing fire; and the captain shall cause to be prepared at least two station-hills; assigning the officers and permanent crew to definite places; said station-bill shall certificate.

The Atlantic near the North American Coast.
At the recent annual meeting of the United States Nationa Academy of Sciences, Professor Verrih, of Yale, gave the results of various observations made during eleven years off the coast between Chesapeake Bay and Labrador by th United States Fish Commission. One of these results is,
that there is an error in maps and charts, in placing the warm that there is an error in maps and charts, in placing the warm
belt, or Gulf Stream, too far from the shore by 30 or 40 belt, or Gulf Stream, too far from the shore by 30 or 40
miles. From the shore to about 60 miles out the fauna is Arctic; in the warm belt it is tropical or sub-tropical. The 100 fathom line has been taken to mark the border of the Gulf Stream; but it would be more correct to say the 65 or 70 fathom line.
Professor Verrill holds that there is no variation in the body of the stream (as has been supposed) in summer and in winter, though there is some variation in the surface water. The proof lies in the distinct line of separation of the two kinds of life on the bottom; if there were variation there, the sub-tropical life would be destroyed. The portion of the
warm belt south of the New England coast, 70 to 120 miles from the coast, teems with life. In 1880 the dredges brought up 800 species of fauna, over one-third of which were wholly new, including 17 kinds of fishes, 270 of mollusks, and 90 of crustaeea. To the 100 fathom point there is a gradual de1,000 from the shore, then comes a precipitous descent to
down this precipice only about 125 fathoms. Among othe points noted in the animals found at great deptlis is their generally) red or orange-yellow color; supposed to be a means of defense by rendering invisible. The bottom of the Arctic belt is a coarse gravel or sand; but that of the Gulf Stream is of sand so fine that the grains can only be distinguished with the microscope. Mixed with minute shells, this sand seems to form a bed as level and hard as any fioor Bowlders are sometimes found on this bottom among the dense animal and vegetable life with which it is carpeted they have probably dropped from ice cakes. The dredge sometimes brought up a rock, possibly of Pliocene age, filled with fossil shells, like those now found on the bottom. The absence of all vertebrate fossils is remarked on. The dredges, also, never brought up any evidence of the existence of dead vertebrates, though the water swarmed with sharks, dolphins, etc., nor was any evidence of man's existence met with, except an India-rubber doll, dropped from some ves sel. Yet the territory dredged was in the track of European essels, many of which must have gone down there and lives been lost. Such facts led Professor Verrill to doubt the negative evidence in geology.

## Coal Dust Explosions in Mines.

There can be no doubt that rich coal dust is inflammable and dangerous, especially in the presence of marsh or coal gas. The behavior of some dust shows that when thickly suspended in air and ignited, the flame runs along similarly to a train of gunpowder. In the presence of so small a quantity of gas that the Davy lamp is incapable of detect ing, its violese is much more marked; and in this way it
es a vehicle conveying flame from one part of the
ggs to another. The gas may not be in the necessary
tion to cause an explosion, but by the concussion of a powder shot dust is dislodged and may take fire. If this happens in the neighborhood of a local accumulation or 'pocket" of explosive mixture, combination takes place, and the heat generated would be sufficient to subject the particles of dust to destructive distillation, and coal gas would be generated, which would ignite explosively and xtend the work of destruction.
A charge of $11 / 2$ to 2 pounds of powder will carry flame in ar about 20 feet; with coal dust in suspension it will carry lame double the distance; and with a small proportion of gas and dust it will go still farther, especially in the direction of the ventilating current of air. Firing shots and bringing down the coal wily sometimes liberate pit gas, as will also falls of roof and changes in the barometric column; and although the firing of the gas thus liberated would not be in ell cases at all a serious matter por se, yet when the mie occurs tra turty therspmere the effects of the explosion are aggravated according to the quantity and character of the dust. My own opinion is that coal dust will not of tself explode except it be in a dense cloud, so dense that the particles, being very close together, are able to communicate gnition to each other, and the temperature, I think, must be higher than that experienced in the air of a mine.
But assuming the above conditions, and the ignition of he dust to have been effected, the production of coal gas by the decomposition of the coal dust would probably be so rapid that the oxygen of the air would soon be used up to form carbonic acid, water, and sulphurous acid. The dreaded after damp would permeate the eutire workings, to the destruction of life. Flour, rice, and cotton dusts have caused explosions in mills both here and abroad; destroying life, and setting fire to the premises. Doutless coal dust is a source of great danger in mines, especially such dusts as those from superior gas producing coals. The dangers are increased by the presence of minute quantities of pit gases, and dusts which refuse to infiame in atmospheric air will do o if a small quantity of coal gas or pit gas he added there-o.-C. E. Jones.

## American Pig Iron in 1882.

From reports received from all the makers of pig iron in the United States, the American Iron and Steel Association finds that the product of pig iron last year was $4,623,323$ tons, or nearly half a million tons more than was made the year before. The yields of the different kinds of pig iron for the two years are shown in gross tons in the table helow


The stock of pig iron held unsold in the hands of makers t the close of 1882 was 383,655 tons. At the close of 1881 the stock on hand was 188,300 tons.

## Mica Prisms.

At a recent meeting of the Physical Society, Mr. Lewis Wright read a paper on the "Optical Combinations of Crysthline Films,". and illustrated it by experiments. He exhibited the beautiful effects of polarization of light, and the erronian retardation by means of plates built up of thin mica films and Canada balsam. The wedges thus formed gave effects superior to those of the more expensive selenite and calcite crystals. The original use of such plates is due to Mr. Fox, but Mr. Wright showed many interesting varieties of them, including what he termed his "optical chromntrope," formed by superposing a concave and one-fourth wave plate on each other. Norenberg's combined mica and selenite plates were also shown,

## Coverapmatare.

## "6 Flying."

To the Editor of the Scientific American:
Notwitastanding all your amusing correspondent has cited u the issue of Feb. 22, concerning that remarkable turkey, the albatross still remaius, I think, the largest flying bird, that is, it is the largest bird whose efforts at flying may be taken as a high example of the expenditure of vital energy for that particular form of locomotion; it is, in short, the highest type of "flying creature" considered essentially as such, and in flying will undoubtedly surpass any other large bird. and in flying will undoubtedly surpass any other large bird.
Though less perbaps in weight than the turkey, he spreads a far greater flying surface to the air and performs the mere act of flying in a far more representative manner than other birds of greater strength.
In the article to which Mr. Goodsell refers I think neither weight uor bulk, or more properly speaking volume, is meant, but rather that the albatross is simply the largest approximation to a flying machine that Nature has given us, and as such is the best model, and in so far he is undoubtedly right. In the next paragraph, however, your correspondent states that which is far more open to criticism.
"The bird," he says, speaking in a very general way, " has the same relative advantage with his wings in the air as the man has with his legs on the ground, has he not?"
Well, I should say most emphatically not, and at the same time I believe this same misconception lies at the base of most devices for fiying that have been condemned on their first trial. There is no use in being scientify halves, and I think, had the author of that interesting comparison between the five turkeys and the man made a simple deght, illustrating what the turkeys may be fairiy estimated do at one end of the rope and what the man will do at the other, he would have seen the absurdity of the situation. And yet the birds do have in a certain sense greater muscular power than the man; but this assertion must not be taken with too broad a meaning; it only means othat they have greater proportional strength for a particular purpose; in other words, exerted through a particular set of muscles; or, ta be still more precise, of the total amount of vital energy of his system the bird can use a far greater proportional part in the exercise of those particular muscles adapted to locomotion than man or any vertebrate animal can do; and fortunately for the mechanic, to make things consistent, we find conversely that Nature hasalso made a far greater proportion of the entire machinery of the bird system subservient to this method of expending its energy. A muscle burns more or less carbon and develops more or less heat in propor tion to its size. In no other animal dowe find any muscies
to ompare in rylative sizotor the wreast muscles of the bird, eonsequently no such relative expenditure of the totalenergy of the system. It is for these reasons that the comparison instituted was absurd. Mathematically speaking, the quantities compared were not homogeneous. Aerial navigation is probably not beyond the contrivauce of human ingenuity; aerial flight however is, and is evidently not within the de sign of Nature.
F. Jartis Patten.
U. S. Army.

## The Bohemian Waxwing.

To the Editor of the Scientific American
This erratic straggler from the north being rarely met with, and his babits as yet but imperfectly understood, it may not be amiss to record his visits to our latitude, which are both irregular and infrequent.
I have observed two small flocks of this species (Ampelis garrulus, L.) in the neighborbood of Burlington, Vt., which may have been the terminus of their southern migration, in the first instance on November 24, 1882, and latterly on the 21st of January. Their low, plaintive note, a sort of conversational undertone, first attracted my attention. Like other denizens of the frozeu zone, they have not yet acquired a fear of man, and seem wholly indifferent to his presence. In one instance a.party of eight individuals were perchedon the lower branches of a cedar, leisurely preening themselves, making their toilet evidently before resuming flight. Though close upon them, their sleepy eyes took no apparent notice, and when wishing to see them fly, I had almost to shake them from their perch. They take to flight simultaneously, and are off in a flash, uttering, as they whirl past your head, their characteristic note of $z i-z i$.
It has been suggested that these birds are either forced to their southern migration by the scarcity of food in their polar home, or else are brought down by the great cold waves which are known to arise in bigh latitudes. Their trig appearance, when they reach us, at least, would suggest anything but a scanty diet; yet, as the food question is paramount among all animals, it may in this case partially determine their movements.
These dwellers of the byperborean regions forsake their Alaskan and Siberian evergreens, aud, borne, perhaps, on the crest of a wave, suddenly alight before your door.
The name chatterer, which bas been frequently applied to them, as far as the species is concerned, is a cruel satire on its remarkably silent babits. The Bohemian waxwing is the personification of mystery, and seems to go about with a bundle of secrets under its wing. As evidence of this, but especially, of course, owing to his circumpolar residence, we see how long it, has taken to collect the little information we now have respecting bis history. Wilson, who traveled, as
he tells as, ten thousand miles in the pursuiti of birds, made no report of the species, which Bonaparte did not observe east of the Mississippi. Audubon met with it in Maine, and it has since been seen at rare intervals in the Northern states, Massachusetts being usually its southern limit for New England.
It is interesting to note the superstition with which this bird was in more ignorant times associated. His visits to Europe are historically recorded, and were looked upon as the precursors of war and pestilence, at times appearing in such numbers (as an old writer observed) as to obscure the sun.
Preferring the inhospitable forests which circumscribe the pole, he lives far from the baunts of men, only occasionally permitting them to form a brief acquaintance by his infrequent visits to their latitudes.
F. H. Herrick.

Burlington, Vt., March 16, 1883.

## Natural and Artificial Paraffines.

F. Krafft, of Basel, Switzerland, contritétes an arte to the Chemiker Zeiturig on the identity of normal paraffines with the paraffines from brown coal, from which we trans late the following:
Owing to their chemical actions and composition, we are wont to consider the paraffines as mixtures of the higher members of the marsh gas series, $\mathrm{C}_{\boldsymbol{n}}+\mathrm{H}_{n_{2+2}}$. (Marsh gas, $\mathrm{CH}_{4}$, the first member of the series, is also called methane, and the other members, $\mathrm{C}_{2} \mathrm{H}_{6}, \mathrm{C}_{3} \mathrm{H}_{8}, \mathrm{C}_{4} \mathrm{H}_{10}$, etc., are called homologues of methane.), On comparing the observations made from time to time on the paraffines with recent investigations made on synthetic homologues of methane, this hypothesis of their identity gains much additional strength. In order to settle the question more definitely, Liitzelschwab has carefully studied one of the commercial paraffines, which melted between $52^{\circ}$ and $54^{\circ}$ C. $\left(1251_{2}^{\circ}\right.$ to $129^{\circ}$ Fahr.), but began to soften at a lower temperature. He submitted it to systematic recrystallization from alcohol and ether, combined with fractional distillation, first in copper retorts, then in glass vessels heated in metal baths and under reduced pressure to prevent any change in composition from the action of heat. From the lower boiling portion of this paraffine we separated the normal hydrocarbons, $\mathrm{C}_{22} \mathrm{H}_{48}$ and $\mathrm{C}_{24} \mathrm{H}_{50}$, previously prepared by me, and also the two followng, homologues, $\mathrm{C}_{28} \mathrm{H}_{54}$ and $\mathrm{C}_{28} \mathrm{H}_{58}$, which were readily and easily identified as "normal" substances, calculating their properties by interpolation in the table that I had previously given for this series. The results of this intvestigation, as compared with my previous experiments, can be seen in the followingicebles:
I. ISOLATED FROM COMMERCIAL PARAFFINE.

II. ARTIFICIAL NORMAL PARAFFINES.

|  | $\mathrm{C}_{22} \mathrm{H}_{46}$. | $\mathrm{C}_{24} \mathrm{H}_{50}$ 。 | $\mathrm{C}_{26} \mathrm{H}_{54}$. | $\mathrm{C}_{28} \mathrm{H}_{58}$. |
| :---: | :---: | :---: | :---: | :---: |
| Melting point. | $\begin{aligned} & 44 \cdot 4{ }^{\circ} \\ & 0.779^{2} \\ & 0244122^{\circ} \end{aligned}$ | $\begin{gathered} 5 \cdot 1 \cdot 10 \\ 0.7886 \\ 243^{\circ} \end{gathered}$ | $\begin{array}{r} 570 \\ 0.7790 \\ 0.761^{\circ} \\ \hline 260 \end{array}$ | $\begin{gathered} 611 /{ }^{\circ} \\ 0797 \\ 0799^{\circ} \end{gathered}$ |
| Boiling point............ |  |  |  |  |

[Degrees given in table are Centigrade, and boiling points were measured under a pressure of 15 mm ., or about onebalf inch.]
The perfect coincidence of the properties of these substances throughout both series, establishes their identity with great certainty. These four preparations obtained by us mounted to about 8 or 12 per cent each, and together made up about 40 per cent of the whole material used. Traces of homologues melting at higher and at lower temperatures were noticed. The larger intermediate portion of course still contained a considerable quantity of the above hydrocarbons, and perbaps others of the uneven members. Absolute proof of this would be tedious and offers no special interest, and thete is still less need, at present, for such a study of the lower inelting, and ordinary liquid paraffines, unless it should be necessary to prepare them in a pure state on a large scale for special uses.
All the lower members of the series obtained as secondary products from the action of strong heat on the higher nor mal paraffines, when freed from adherent olefines, are of course themselves normal. For scientific purposes the artificial products deserve the preference because they alone are perfectly pure paraffines.
On the other hand, the important question presents itself of how commercial paraffine is made from brown coal, and indirectly what is the best way to make it from this source. From the foregoing it will be seen that the paraffines are mixtures of no less complicated nature than has been generally supposed.
The proof that has been adduced of the identity of their constituents recalls the fact that was recently mentioned by me also, that the higher members of the natural fatty acidss, from capric to stearic acid, are all normal. The inevitable explanation of what at first seems strange, is that normal substances are morepermanent than their isomers, and hence the greater tendency to their production.

Dr. Bolton on Chemical Symbols.
At a recent meeting of the New York Academy of Sciences, Prof. H. Carrington Bolton, of Trinity College, gave an interesting sketch of the bistory of chemical symols from early times to the present day. Until less than a century ago letters were rarely used, and the hieroglyphics assumed many curious and grotesque forms, which served rather to conceal than elucidate the subject treated of. Dr. Bolton exhibited several rare old books contaiiaing lists of symbols, some of which be had transferred to large sheets of paper and bung about the room. One peculiarity of ancient alchemistic nomenclature was personification, using names of persons and animals for metals or compounds; thus, gold and silver were called the king and queen, antimony the wolf, iron was Mars, and salammoniac was the eagle, while the name of Mercury was given not merely to the fleet footed god, but also to quicksilver and to a planet. The well known symbol of the sun (a toothed wheel) was used for gold, that of the moon for silver, etc. But in additiof to these, many substances had more symbols than they had names, nearly 90 being used for sodium chloride.
Dr. Bolfon has attempted the classification of alcbemistic symbols, making five groups. In one class the first letter or letters were used; in another they were pictorial, as waved lines for water, etc. ; in another they were symbolic, like that of the sun for gold, of the moon for silver, etc.; in the fourth they were purely arbitrary, and no connection could be detected between sign and signification. In the fifth class be placed mixed symbols, as when a inverted delta or triangle combined with $R$ is used for aqua regia, delta and $F$ for aqua fortis, etc.
The various attempts to establish a scientific set of symbols were described, and their faults noticed, until, finally, Dalton, in 1787, bit upon the present simple and expressive code, which is hardly capable of further improvement.

## On the Ammonia in the Air and in Rain, etc., at Great Heights.

It has long been known that the small traces of ammonia in the airare carried down to the soilby meteoric precipitates, and Schlösing bas shown that it is fixed directly by the oxjdizing action of the soil and of the leaves. In connection with these investigations be also called attention to the sea as the great reservoir which supplied the air with ammonia. He devised an ingenious method, which enabled him to operate on large quantities of air, and with it he examined the currents of air circulating near the ground.
Recently Muntz and Auber (Comptes Rendus, xcv., 788) have been estimating the amount of ammonia in the air on the top of Pic du Midi, which is 2,877 meters (nearly two miles) above the level of the sea. The tests were made morning and evening in a laboratory especially erected for the purpose. The average was 1.35 milligrammes in 100 cubic meters. These numbers, although so extremely small, do not differ perceptibly from those obtained at the earth's surface.
They also made 13 analyses of rain, 7 of snow, and 5 of fog. In rain water they found between 0.34 and 0.80 milligramme per liter, in fog 0.19 to 0.64 milligramme, and ini gramme per liter, in fog 0.19 to 0.64 miligram liter.
snow 0.06 to 0.14 milligramme of ammonia per

## Fulflling the Covenants in a Lease.

The absurdity of some of the "covenants" in leases is sufficiently illustrated by the advertisement of an out-going tenant, who advertises for five hundred rats and about ten times that number of weeds, he having covenanted to leave the premises in the same state as he found them. The rats, adds the humorous advertiser, must be able-bodied and no cripples. The advertisement is a practical, albeit humorous, commentary on many of the usual covenants contained in leases. The tendency of modern legislation, and of modern legal procedure, says the Building Times (London), is to prune the redundancy which once was the delight of the legal profession and the despair of litigants. The covenants were mostly of a sort which no person could keep altogether; and in effect they were and are generally broken. The advertisement we have alluded to is the reductio ad absurdum; obsblete covenants and provisos are, we trust, in a fair way to be consigned to the same place as many other legal absurdities.

## Artificial Coffee

At the present low price of coffee it would hardly seem the best time to bring outa new substitute, but a M. Sornani, of Pavia, in the Ann. di Chim. appl. Farm. et Med., announcesthat he has discovered quite a new and serious adulteration of coffee, which is being practiced by the manufacture of artificial berries.) These berries are composed of the meal of beans and acorns, with chicory and some quartz powder to bring the mixture to the requisite speciflc gravity. A dough is made of these ingredients, which is cut by a special machine into the shape of coffet verries, and after drying has exactly tbeir color.' Sornani says he has found as much as 50 per cent of these artificial berries mixed with the genuine. On roasting they take just the same color as the genuine, but they are discovered by soaking in water, when the false berries soon fall to pieces.

The Belgian Academy of Sciences offers a prize of $\$ 600$ or the best treatise on the destruction of fishes by the pollution of rivers. Those competing for the prize must send in their work before October, 1885

## Treatment for smake Bites sad eiydrophobla.

Ata recent meeting of the Lower Rhenish Philosophical and Medical Association, held at Bonn, Professor Binz described an interesting series of experiments carried on under scribed an interesting series of experiments carried on under to the poison of serpents. He remarked that numerous specifics are heard of among the native pupulation of India, which, as a rule, are found to be of themselves inoperative. Professor Binz stated his opinion that when a real Indian poisonous snake has bitten a person in the usual manner, spirits can only serve to prevent or to alleviate the spasms of suffocation which are induced by the action of the poison on the respiratory nerves. Atropine and other specifics against imminent results of an analogous character, caused by narcotic influences, have been found ineffective against this deadly virus. The most favorable tests made were with chloride of lime, a filtered solution of which was injected into the same place where the fatal virus bad previously been inluted. In seventeen trials made in succession, the poied animal survived without the slightest disturbance of its healthy condition. In five succeeding experiments, when a relatively insufflcient dose of the antidote was adminis tered, or when animals suffering from disease were operated upon, the chloride of lime served only to retard the fatal effects of the poison. The suggestion was made by Professor Binz that the adoption of this treatment in cases of the bites of dogs suffering from rabies might possibly be attended with favorable results, inasmuch as chloride of lime has heen shown to have nuch greater power than any of the caustic substances now usually applied to dog bites, which bave been proved to be scarcely, if at all, effective against the cousequences of snake bites.-Lancet.

## Ammoniacal Liquor as a Fertilizer.

The Journal des Usines a Gaz, on the subject of the use of ammoniacal liquor as a manure, states that it was so highly appreciated by the Belgian agriculturists that the entire production of the gas works at Malires was bought up in the crude state at the rate of 1 fr .25 c . per hectoliter (say $\$ 1$ per 100 gallons) on the spot. Upon newly cleared ground the liquor was used just as it left the works; but for irrigation purposes it was diluted with three or four times its bulk of water. The effect produced on the soil by the use of the liquor is stated to be exactly the same as when stable dung (which is usually considered to be the best kiud of manure) is employed. The writer found that in rainy seasons the liquor might be used in an undiluted condition; and when spread over the ground in the proportion of about 1,500 gallons to the acre, a perfect dressing was ohtained. In dry weather, however, the liquor had to be diluted with an equal bulk of water, and a double quantity of the misturewsed, to produce similar results. But even in this condition it was found to possess the same value for agricultural pur poses as stable manure.

## BUGGY BOW SPRING.

The engraving shows a device to be attached to the rear bow of a buggy top for the purpose of guarding against the breaking of the bow when the top is suddenly thrown back, and to carry the weight of the top when down.
The device consists of a curved spring of steel or other suitable material, pivoted at its lower end on the bolt, which forms the pivot on which the bows are hinged, and fastened at its upper end to the rear bow by means of a clip. The spring is a curve, of which the rear bow is the chord, their only points of contact being at the ends of the spring, and the curve lies wholly on the rear side of the bow.


MaELEANEY'S BUGGY BOW SPRING.

When the top is thrown back, instead of the bow striking the pivot of the hrace, the interposed spring strikes on the pivot and receives the force of the blow. The bows are rigid, and it frequently happens that when the top is thrown back suddenly the force of the fall breaks the bow, whereas when the device shown is used, the yielding spring acts as a cushion, and breakage is impossible. When the top is down the weight is. borpe by the spring, which rests on the bolt, and forms a yielding support, taking off the strain caused by any sudden jar from inequalities in the roadway passed over.
This useful invention has been patented hy Mr. Samuel McElhaney, of Polo, IIl.

## IMPROVED HAT HOLDER

We give an engraving of a very simple, inexpensive, and efficient holder to be applied to the backs of opera seats, church pews, seats of public halls, to the sides of railroad coaches, and to be used wherever a thing of this kind is applicable. It is formed of Bessemer steel wire bent into the form of the treble clef in music, the straight portion being secured to the back of the seat by suitable fastenings, which permit of swinging it out for use or out of the way and against the back of the seat when not in use. The upper loop of the holder is capable of springing sufficiently to receive the brim of any hat, and the lower coil will receive an umbrella or cane, as shown in the engraving. The wire is in a single piece, and where it crosses itself is left free to move, so as


LINDSEY'S HAT HOLDER FOR OPERA SEATS, ETC

## accommodate wete"to the objectro be hela by it. The

 ower end of the wire is provided with a hook which may be brought into engagement with the adjacent loop. It may be provided with a simple round knob to give it a finish, and to prevent the clothing from catching in it. These bolders are nickel plated and nicely finished, and an ornament to the seat rather than otherwise. This improvement is being put in theaters of several large cities, and it is now regularly manufactured in Baltimore.This useful invention has been patented by Mr. "George W. Lindsey, of Baltimore, Md. (P, O. Box 797).

## Basic Furnace Linings.

It appears, from a recent paper issued by Junghaug and Uelsmann, in Dingler's Polytechnisches Journal, that soda and potash carbonates are used instead of the corresponding chlorides of those metals, and that the durability of the lining is said to be increased by the addition of cryolite. The following modification of the usual method of preparing the lining has been found to answer admirably: The raw or calcined masses of lime, dolomite, or magnesite are ground and mixed with the flux; the mixture is then burnt to dust and worked up into bricks, the dust being rendered plastic with tar treated with 3 per cent of flux. When the flux is made up of alkaline carbonates, ground calcined phosphate or bone black, with the addition of a few per cent of the alkaline carbonates, are used in the preparation of basic bricks, muffles, etc. André states that the basic masses are to be burnt at a high temperature, then pounded and ground, and the powder thus obtained is formed into bricks by the addition of freshly prepared lime sulphate. Two per cent of the lime sulphate suffices to form a plastic material. Borsig proposes to mix dolomitic limestone, either in a crude, cal cined, or finely divided form, with from 2 to 2.5 per cent of crude boracic acid, or 3 per cent of fused and pounded crude boracic acid, or 3 per cent of fused and pounded
borax. The mixture is used in a dry or wet condition for borax. The mixture is used in a dry or wet co
lining furnaces or for the preparation of bricks.
According to the Society of Mines of Hörde, and the Rhenish Steel Works at Ruhrort, limestone, free from mag nesia, containing not more than from 15 to 20 per cent of silicic acid, alumina, iron oxide, and manganese oxide may be used for the preparation of basic linings. The quautity of iron oxide present should not exceed 6 per cent. It was, further, found that phosphorus can be got away in the slag without the after blow, by the use of fluor spar equivalent to one-tenth part of the tribasic lime phosphate formed. Instead of fluor spar, alkalies, alkaline earths, or cryolite may be used. The dephosphorization is also effected by blowing air into a reverberatony furnace having a basic hearth. Immediately before the introduction of the metal into the converter lined with basic bricks, it is recommended to add lime or a mixture of eight parts of lime and one of ferric oxide. The mass is heated and air blown in for from six to ten
minutes, when the converter is emptied, and the metal treated with a mixture of from two to three parts of lime and one part of ferric oxide free from silicic acid. The quantity of flux in the first blowing amounts to twice the weight of silicium and phosphorus contained in the original charge, while the quantity used in the second operation depends on the durability of the converter. The object of the addition of the second flux is to obtain a slag containing more than 36 per ceut of lime and magnesia. The basic flux may be replaced partially or wholly by manganese ores, cryolite, fluor spar, and caus,tic or carbonated alkalies, while phosphorite or hone-black, mixed with clay or asphalt, is used as a lining. After the decarburation of the iron bath the oxidation of the remaining phosphorus is effected by the introduction of oxidizing agents, as ferric and manganic oxides, into the iron. This operation takes the place of the after blow.

## Purifying Carbon Di.ulphide.

Palmieri recommends the following practical method of purif ying carbon disulphide on a large scale. After removing the water that usually covers the commercial article, 2 or 3 per cent of dehydrated copper sulpbate are added and then shaken. After the blackened sulphate settles and no more odor of sulphydric acid is observed, it is filtered or decanted
To getit absolutely pure the carbon disulphide is rectified over anhydrous copper sulphate, when it loses all unpleasant odor. To preserve it odorless it must be left in contact with copper sulphatewhich can be regenerated by igniting, treatiug with sulph
cid, and igniting it again.-J. Prac. Chem.

## THE NORDENFELT GUN.

Tbin has been adopted by the British Admiralty. The report of trials proved that the hardened steel bullet of $71 / 4$ outices weight, at a range of 300 yards, penetrated. at an angle of 45 deg., the side and boiler of a torpedo boat, a represented by a ${ }_{\mathrm{T}^{1} \sigma}$ inch steel plate 18 inches in front of a second steel plate $1 / 2$ inch thick. When firing directly end on at a torpedo boat, the bullet penetrated the steel bow plate $\frac{1}{18}$ inch thick, at an angle of 10 deg., and four bulkheads at right angles; striking the builer, the builet then indented the half inch steel plate representing it, to a depth of half an inch. At a subsequent trial at Portsmouth, under similar conditions, the plate was perforated altogether.
The accuracy was found most satisfactory, the mean deviThe accuracy was found most satisfactory, the mean devi-
ation at 300 yards, of 10 rounds fired slowly, being 5.6 inches, while the mean deviation of 24 rounds fired in rapid volleys was 183 i nches.
 thirty seconds., During another the gin was fired at sea from H. M. S. Medway when runving at a speed of 9 knots. In this case the target was the bow of a model torpedo boat; during a run of 1 min .45 sec . and over a range of from 500 yards to 100 yards, 115 hits were made out of 135 shots fired, equal to 65 hits per minute. In a subsequent trial at Spithead in July, 1880, the gun was placed on board H. M. S. Iris. On this occasion two runs were made at a speed of 17.2 knots, directly against the bow of a torpedo boat model. Firing from 700 yards distance until close up, both runs occupying 2 min .19 secs., 110 shots hit the target out of 213 rounds fired, so that even at this high speed 48 hits per minute were recorded. Running past the torpedo boat at 200 yards range and at a speed of 17 knots, 58 rounds were fired in 22 seconds, and of these, 38 shots hit the torpedo boat, being at the rate of 103 hits per minute.
The four barrel gun is illustrated by the perspective view.


THE NORDENFELT GUN.
The gun consists of a rectangular framework of wrought iron, the sides of which are connected by three plates or transoms. The four barrels are placed side by side in the frame, their nfuzzle ends passing through the front cross piece, while the breech ends are screwed into the middle transom.
In rear of the middle cross piece is the action block, which is capable of movement backward and forward. In front of this action block are four breech plugs, corresponding to the barrels. These are of steel pierced with a channel, in which a firing pin or striker moves freely, and they are furnished with an extractor on the right side. Behind each plunger is a hammer, with a projecting tenon, and behind the hammer a strong spiral spring.

## THE ABCHER FIBE.

The archer fish (Toxotes jaculator) belongs to a group or sub-family of the scale-finned fishes (Squamipinnes), so called because the " vertical fins are more or less densely covered with small scales." The principal characteristic of this tish is the elongated lower jaw. The inhabitants of Java, its native island, keep these fish in their houses as pets. They are sometimes twenty centimeters in length. The coloring of the upper part of the fish is greenish-gray, the under part silvery; there are four short, wide band across the back, dark brown, with a shade of green.
With few exceptions, all of the scale-finned fishes are found in the upper stratum of the water and near the shore; some of them descend into the ocean, and others occasionally wander out into the sea, following ships for their refuse, or chasing other prey. Most of them, especially the beauti fully colored species, belonging to this family, are found, as a rule, iu the vicinity of reefs, or above shallow places, play ing in the sunshine. Their beauty is very much heightened by motion.

Heuglin says that in the Red Sea they are commonly ob served in the deep chasmsor well-fike depressions betweay the coral reefs, where the water is always clear and quiet, al though there may be a high sea outside

When a ship anchors in a dark nigh between the reefs, the presence of these flsh may be perceived by their phos phorescence.

They may be observed, often at a considerable depth, faintly glowing spots; suddenly they disperse like scatterin arks, move slowly to lind scattering arks, move slowly to and fro, gatber
gether in groups, and separate again.
Nearly all the fishes of this family are carnivorous, feeding upon smal medusæ, coral insects, etc These fish, Heuglin says, play around the coral bianches in the same manner as birds hover around trees upon the land.
In crowds they stand still for a few minutes before a branch of a coral suddenly dart forward, bite at the cora insects on the branches, and hasten a if inspired by a spirit to another place, to go through the same play, and be gin again the same ehase.

As soon as the archer fish sees a fly or any other insect sitting upon a plant hanging over the waterfert opproaches to withimwoentimeermunerand a hal meters, and spurts from its mouth a dro of water, so violently and with suc accuracy that it seldom misses its prey.
It has this habit even in captivity and the rdpanese make a household pet of it. They keep the fish in wate basins, and place irr the middle of the vessel a stick, sometimes reaching ou over the water sixty centimeters. In the stick wooden pins are fixed, and insect are fastened upon them. Soon after this isdone, thefish swims around the stick, comes up to the surface of the water, raises its eyes toward the surprised in sect, suddenly spurts a drop of water upon it, throws it down, and swallows it if its shot is successful; if not, it swims around the stick and tries again. The certainty with which they throw this jet of water upon their victims is won derful.
In order to observe this, Hommel thrust a needle through a fly and fas tened it to the stich. Without intermission, rapidly, and in regular order, all of his fish attempted to throw the fil down, without once missing their aim as they shot the drops of water upon it.
Insects appear to be the most natural food for this species. and seem to be preferred to every other kind of food. -From Thierleben, by A. E. Brehm.

Wisdom or Plants
As an example of the curious property of plants in select ing from a soil only those materials proper for their nourishmept, the ice plant, which is found abundantly on the Mediterranean coasts, is one of the most striking. It has lately formed the subject of some experiments by M. Mangon, who has cultivated it for many years. Its popular name is derived from the little vesicles filled with water which cover its stem, and have much the appearance of frozen dewdrops.

Analysis shows that it sucks up from the soil a large quantity of soda, potash, and other alkaline salts; indeed, it may be said that the plant represents a solution of alkaline salts held together by a vegetable tissue only, weighing two per cent of its mass. M. Mangon believes that the plant might be useful if planted on unproductive soils where such salts are in excess, thereby rendering the ground suitable for ordinary cultivation.

## Carbonic Oxide in Common Furnaces.

According to Mr. J. Lowthian Bell, every furnace wherein a high temperature is attained is virtually a carbonic oxide gas furnace. He shows that carbonic acid, the product of the perfect combination of carbon and oxygen, cannot exist at a high temperature, in consequence of dissociation taking place. Therefore, if a great heat is desired from solid fuel it is impossible to avoid the waste represented by the formation of carbonic oxide at some region above the fuel, and where there is usually no provision for using it. It has long been known tbat carbonic acid breaks up at high temperatures; but Mr. Bell has shown that the same effect is produced at comparatively moderate temperatures-a view in which he is supported by M. Berthelot. He mentions the well known phenomenon of the carbonic oxide flame just above an ordi nary open coke fire; and says that this is not merely due to the fact that the gas can only inflame in contact with fresh air, but also that it could not burn in the hot fire below. Thus every furnace is a carbonic oxide generator; the only differ ence between those which avowedly produce gas and thos in which the work is doneby the primary burning of solid


## THE ARCHER FISH.

 his hints:
## Indigestion and Bisease.

Dr. Henry Reynolds has an article in the Phrenological Journal on indigestion which seems to deflive the nature and ymptoms of the complaint very closely.
Many suffering from dyspepsia will find their own feelings described in the following extracts, taken from Dr Reynolds' paper, and we hope some will derive benefit from

The important relation of indigestion to many diseases which people suffer is not sufficiently realized. Difficulty in breathing, occurring spontaneously, or on slight exertion may be caused by indigestion.
Indigestion causes alterations in the general nutrition of he body, which are manifested in various ways, among which are the following: Anæmia, or a depraved state of the blood, involving a deficiency of the red globules of the blood, and causing persons thus affected to be unnaturally pale, especially about the lips; decay of the teeth; graynes of the hair: excessive liability to inflammation, from slight causes, of the mucous membranes, especially the eyes a throat; to which may be added, in cases of those predis posed to such affections, łlability to gout and rheumatism, and affections of the lungs or kidneys. Consumption has frequently been regarded as due in many cases to long continued derange ment of the digestion, whereby the general nutrition of the system has be come impaired.
The inflammation of the mucous membrane of the throat, known as "clergyman's sore throat," is a product of indigestion, and the removal of the cause by the adoption of a suita ble dietary, exercise in the open air and observance of the laws of health generally will be the best treatment for it.
Indigestion is the cause of various alterations in the skin manifested by general coldness or chilliness, especial ly of the extremities; by changes in its color or, texture, which may be earthy or sallow in tint, or dry and coarse, and by various eruptions, among which are the well known ecze. ma, acne, impetigo, and nettle rash Most of the cases of skin disease qffecting children are best treated by attention to the diet, making the diet easily digestible, and sufficiently limited to insure complete digestion.
The causes of indigestion may be due to the food or condition of the stom ach. The food may be defective in quality. There may be excess or de ficiency of the normal ingredients, sac charine, starchy, albuminous, or fatty, or some of the naturally indigestible materials which form a part of all food. The food may be introduced in an indigestible form on account of defects in the cooking of it, or imperfect mastication, or from its having undergone putrefaction or fermentation, which arrests the functions of the stomach. Imperfect mastication of food is a very common cause of indigestion among Americans.
Eating too much is probably the most common of all causes of indigestion. The secretion of the gastric juice in the stomach seems to be proportioned to the amount of material required for the nourishment of the system. Food taken in excess of this amount acts a a foreign substance undergoing fer mentation and putrefaction, and occa sioning much disturbance in the system.
Much may be done for the cure of fuel being that the former turn to good account what the indigestion by eating very abstemiously of suitable food, latter produce to waste. © The lesson to be drawn from these observations is that the only way to burn coal or coke to advantage is to first convert it into carbonic oxide, and afterward buru every atom thereof in the right place. Unless this sequence of operations is followed by design, it will assuredly be observed by nature. According to this view, the gas furnace is less revolutionary in principle than has been supposed; it is simply a method of regulating and rendering profitable a natural and otherwise wasteful process.

A French surgeon says, that on ciloroforming some mice and lifting them by their tails, they tried to bite, but on laying them again in a horizontal position, they resumed insensibility. Acting on this hint, when a patient showed signs of collapse under a dose of chloroform, he dropped the patient's head over the bedside and raised the feet quite high. The patient at once becon.e conscious; when. laid straight on the bed he became insensible again, and a return to lowering the head and raising the feet for ten minutes was required to counteract the chloroform. It is thought that by this treatment anæstbetics may be used with great safety.
indigestion by eating very abstemiously of suitable food, thoroughly masticated, taking exercise in the open air, rally. The amount of food should be reduced until the quantity is reached which the stomach can digest without evincing any symptoms of indigestion.

## The Marsellles Tea Trade.

Within the last few years there has been a singular de velopment of the tea trade at the port of Marseilles. In 1850 the arrivals did not exceed 12,000 kilogrammes, most of which came from the warehouses of the Hanseatic towns and from London. Ten years later the direct relations with the East caused a great movement of tea to Marseilles, the annual imports being 229,114 kilogrammes, of which 223,813 came directly from China. Since then the trade has been very greatly ou the increase, the quantity for 1881 being $3,198,430$ kilogrammes, of which $2,878,675$ were from Chìna. Of this quantity 52,593 kilogrammes were for home consumption, the duty upon which amounted to $111,471 \mathrm{f}$. The imports of tea for the whole of the French ports were $3,572,268$ kilogrammes.

Steam Plowing in Scotland and the United States. At the recent session in Chicago of the National Agricultural Convention, a variety of other interesting topics were discussed, includiug that of steam plowing. Among those present was Mr. George Greig, of Scotland, whose long experience with steam plows enabled him to give some very practical and useful information. He gave a description of the great farm of the Duke of Sutherland, in the countiesof Ross and Sutherland, comprising one million four hundred thousand acres, and of the efforts of the Duke to accomplish the reclamation of this land, heretofore, a vast waste, by the use of steam power.
The land is laid out in forty acre fields, with roads for the cultivating engines at each side. The steam cultivator consists of two engines and the plow, which is intended to travel hetween them. The engines are constructed very much in the same way as the ordinary steam cultivating engines of this class. Each engine is fitted with a drum upon which the rope which hauls the implement is coiled, and they work alternately, pulling the plow backward and forward. The plow here is the great object of interest. It if entirely of a novel character, and has cost, in its development to its preseut perfection, not less than $£ 10,000$ in experiments. The result of its action in the soil is very much like that of ordinary trenching by manual labor. It is provided to take two furrows about twenty inches broad. The first one cuts off the vegetable matter and throws it into the bottom of the trench, while the second one takes up the subsoil from below and places it upon the top of the vegetable matter, the depth of the two furrows being from two and one-half to three feet. The first plow is provided with a discolter, which is set to work at a lower level than the share, and thus carries the first plow over any bowlder with which it might otherwise get engaged. The second plow is hung on the end of a strong lever, which is held down with a given tension from the rope, so asto engage the stones passed over by the first plow and drag them out. Small stones are thrown to the surface, and large ones are dragged up and left to be hauled out by the wire rope on its return journey. The cost of trenching land by this system to a depth of two and one-balf to three feet has been found, with the latest improvements, not to exceed $£ 4$ per imperial acre, and this includes the payment of men in the trench throwing up the stones, which fall back into the furrow after
the plow has passed. To do this trenching entirely by manual labor, to leave it in a condition as efficient as the steam operation, would cost at the present time not less than $£ 25$ to $£ 30$ an acre.
The next operation in connection with the reclamation is the clearing of the stones, fifty tons to the acre. The device was a cteam sledge which carries from-four to flve tous of stone. This sledge bas been so constructed that when it reaches the end of a field with its load, and the motion is reversed, it turns a somersault of its own accord and leaves the load behind it, returning to be refilled. This sledge was not only found to be a very economical way of carting off the stones, but a great benefit in consolidating and leveling the surface of the land on its passage.
The next operation is the liming of the land, at the rate of from four to five tons an acre. The lime is brought from England, a distance by sea of five hundred miles, then carried by railway twenty miles. A small engine of four horse power and of three tons weight answers the purposes of carting, reaping, rolling, and driving. With it the lime is taken from the railway station to the fields and deposited at the end of each field in large heaps, to be again drawn into lines through the fields with the wire rope and larger engines, using the stone sledge as the carting machine. The sledge has a capacity for six tons, and when it arrives at the part of the field where the lime is required, it tips it out in the same manner as has been described with the stones.

The fencing is made in the usual way with stones taken from the land, and where there are no stones iron fencing of a novel description has been devised in order that it may be folded down on the ground when necessary, so as to allow the steam plow ropes or cartages to pass over it at any point. The standards, which are fixed in stone, are hinged at the bottom, so that when the holt which fastens the stay is taken out the fence falls over. This fence has been found to be great economy where large snow storms occur; through being laid down all winter and lifted up in spring, the snow in this way cannot injure it.
The execution of the under drainage on the reclaimed lands has given rise to greater difficulty than the other opera tions, in as far as no direct effort was made to accomplish this by steam power. Until lately there was no known im plement that would have coped successfully with the bowlders which are to be met with in a drain four feet and a half deep. I feel sure, however, that in the future the plow which I have descrihed for trenching, with very slight modification, will successfully cut out drainage to a depth not exceeding five feet, and at a price not exceeding one tenth part the cost of manual labor.
In the view of putting it under crops, the surface cultiva tion of the land has also been undertaken by steam, and for this purpose a novel implement was produced in the shape of a machine which works very much on the principle of
the American disk harrow. This implement runs over the the American disk harrow. This implement runs over the land at a rate of six miles an hour, and pulverizes it to an extent to make a seed bed for the smallest and finest seeds.
The primary object of the reclamations has been fully realized, in as far as the farms that bave been operated upon are now self sustaining. Referring to the possibility of
making tanks upon land for the purpose of retaining water for the use of stock, I will mention a very interesting incident. The engines which have been introduced by the Duke pose of making tanks for storing water. A machine has been constructed with something of the characterof a scoop. Thisscoop is arranged upon wheels under the engine and controlled by the man who sits upon it. The engine is placed upon that end of the ground intended to be excavated, and this machine runs down and fills itself, and is run up again and is emptied by the action of one man. The success of the first machine taken to New Zealand was such
that a large demand sprang up for them, and great tracts that a large demand sprang up for them, and great tracts
of country in Australia, which formerly could not be grazed are now being stocked with sheep.
The cost of the entire set of machinery for ditching by steam, including two engines of fourteen horse power, with a ditcher, would come to abont $\$ 10,000$.
The steam cultivating engines are from six to twenty horse power. These small engines are in use in many portions of Scotland, where the fields do not exceed ten acres in extent.
The expense of plowing an acre of ordinary land in Scotland with horses, common plow, and common attendantis I estimate at $\$ 3$ per acre.
Mr. Grinnell (of Iowa): Since we have got these broad Clydesdale horses and the French horses-" necks clothed with thunder," and all that sort of thing-and our farmer boys to ride the plow, we plow for seventy-five cents an acre, and there are plenty of people who want the job at that rate. That being the case, do you think we can be seduced into introducing steam plows when we have Clydes-
dale horses?
Mr. Greig: I am not prepared to recommend the application of steam plowing when land can be plowed for less than one dollar an acre.
For ordinary surface cultivation I am not prepared to tell you that steam plows have supplanted horses or mules; but when you want very deep cultivation, such as is required for grading roads, sugar cane crops, and that sort of thing, I am quite satisfied that steam cultivation will compete with horses very successfully. And one of the advantages of
steam cultivation is, that you get a much better kind of cultivation than you can with horses; you plow deeper and it gives you a mixture of soils, and you get much better results than could be gained by simply turning a furrow. We can run a cultivator at the rate of six miles an hour, but we don't jnteresting thing that has only now come to light. Heretofore we have been restricted in the breadth of the implement. We fontione entad only cut a certain number of fur rows. Our plowing machine has always been under the power of the engine. If we could cut the number of furrows the en gine could plow, we would be able to double the work and reduce the cost one-half. We have now hit upon a plan by which we can work more than one implement on the same road; and I have no doubt that in the course of two or three years you will find that steam plows will be coming into use
in America. With a couple of engines and a steam plow you can turn from twenty to thirty acres of prairie land in a day, and you would consider that a good day's work. I am quite satisfied, from what I have heard of the prairi land and the manner in which you plow, that thirty or forty acres will be within the power of the engine under this new
system.
Mr. Grinnell: The preparation of the soil costs $\$ 16$, and liming $\$ 5$. That makes about $\$ 21$ or $\$ 22$ an acre. The question is, then, how in the world you can induceanybody the soil $\$ 21$ or $\$ 22$ an acre-what persuasion is used, what forcible argument or entreaty, to keep them from leaving the country? I don't understand it.
Mr . Greig: I must tell the gentleman, in answer to his question, that I have been standing in Scotland as if on a hot brick. It was only circumstances I could not overcome which prevented my being in America years ago.
Mr . Charles H. Wood (of Chicago): This subject of steam ditching is one with which I am, so to speak, loaded to the muzzle, and I am going to answer some of the questions the gentleman from Iowa suggests. He was comparing the cost of plowing in Scotland with the cost of plowing here in America, which he places at 75 cents an acre. It is only is done in England and Scotland would cost, with our implements and our experience, and the same expense of feeding and wages, probably $\$ 1.50$ to $\$ 2.00$ an acre. They do it more thoroughly, and the soil is more difficult to work.
In regard to the applicability of the English steam plow to American uses, there are parties who have faith in its success here. Some have been introduced in the Red River region, and one or two in other places. Several years ag()fifteen or twenty-one or two sets of English plowing tackle were brought into Illinois, and, I think, all of them have been abandoned, except one which has been operated on a sugar plantation south of New Orleans by Mr. Lawrence. It has yeen demonstrated in that.region, by actual results, that the hundred pounds under steam plowing where the ordinary crop without it was about 1,000 or 1,200 , which makes an increase of forty or fifty per cent. That is not a fair gauge of what it would be worth in our prairie country, because down there the great advantage is that they can do the work more thoroughly and plow deeper than they can with horses
and they find that deep plowing greatly enhances the quantity produced per acre. Another thing, the climate there is such that they cannot get the same power out of horses practically that we can, and it costs more to feed their horses. I have given this matter a good deal of study, and have en deavored to learn all I could in regard to what has been done in England and Scotland, and I have learned something further from the gentleman's remarks this afternoon. But what I have learned convinces me that the English plowing apparatus, the cable system, a wire rope steam plow, where the engine is stationed at each side of the field, never can be a practical success in a general way in this country; but a steam plow for this country must be a traveling locomotive engine-that has been moderately successful. There have been experiments in that direction which show that it is possible to do it, but it has not yet been found practical to do it. The steam plow was tried here in Chicago, and it worked pretty well on dry, hard ground, plowing at the rate of three acres an hour. I think there were eight plows; they made a track six feet in diameter, and everybody was convinced then that it was the coming way for plowing. The next year, I think it was, it was tried at the agricultural ex position at Freeport, and there they found some soft, wet ground, and when they got into that field there was no friction to hold the drum against the ground, and the drum gave way, and the result was the plow stopped. They put on more steam and turned the plow faster, but it wouldn't work. At Decatur, about the same results followed, and one or two more experiments have been made to bring out a locomotive steam plow.

It is hardly while to go into details in regard to them all; but it is evident, from the experiments and fail ures of past, that the direction in which further efforts should 6 tade is by some means of putting snow shoes on
the engine. I will further illustrate what I mean in this way I suppose most every farmer here has heard of, if not tried, the experiment of wooden clogs upon horses' feet, for the purpose of hauling a load of hay on soft meadow ground. It is a matter of common practice with some farmers, where they have soft meadow, in order to haul hay off of it, to put on the horses' feet wooden clogs, and they found where a team could hardly get over the ground without the clogs they could do so without any trouble and haul a load with the clogs. I suppose, in connection with that, they had broad tires on the wheels. If.a main wants to travel over snow, after a snowstorm, he puts on snow shoes. This distributes his weight over a larger surface, and he succeeds in walking on top of the snow, where otherwise he would sink before getting out of sight of his starting point. There are a great many men working at the problem of a traveling steam plo $\begin{gathered}\text {, } \\ \text { some are wasting their efforts trying to get something }\end{gathered}$ very light-something that don't weigh anything. Now, it is evident that an engine, to have force, must have weight; it is evident that a pony never can pull the load that a heavy Clydesdale horse can; it is evident that a heavy Clydesdale horse must have greater width to support him on soft ground than a pony. If you want to have a good engine of twenty tons weight, you must have broad feet for it to rest on. Now, if some practical means can be brought out to dis tribute that heavy weight over a broad surface and a fiat surface of ground,' it will be practical to make a traveling locomotive steam plow with the capacity of going over soft ground without miring, and you will have something that can be used wherever desired. You can use heavier imple ments than you do now; you can use a kind of implement that would not be safe for a moment now, or at all practi cable. I believe, Mr. President, that the subject of steam tillage is one of the most important, and will soon claim as much attention as any other subject which can be brought before this convention; and I think, in connection with your proposed exhibition next year, it would be a very desirable thing, and of great importance to the general interests of the agricultural classes, that encouragement be offered in the way of a premium for something of this kind
We may add as a postscript to the foregoing that the steam plow has, within the past few weeks, been set to work in California, with much success. A weent number of the Stockton Independent gives this report:

I saw the steam plow work yesterday. Engines, 2; distance apart, 460 yards; width of land plowed at each passage, 4 feet; number of plows used, 8; 4 used at a time; there hould be 5 , making 10 in all, but 2 are being tempered; ime of cutting a furrow, from 4 to 5 minutes; power of en ines each, 40 horse; character of land, tough, black sod alt grass growing; depth of furrow, 6 inches; every part f the machinery working well; cost of fuel, $\$ 5$ per day for both engines; capacity, from 40 to 60 acres per day in sandy
soil. The writer is of the opinion that, with very few altera tions on the plows, the machines will prove an immense suc cess, and will supply a long needed want for plowing land in California: Land plowed by this machine will produee at least one-fourth more crop for a period of six or seven years than by the ordinary plowing in nse in this State."

According to the Milling World, sackcloth or canvas can be made perfectly impervious to moisture equal to leather by steeping it in a decoction of one pound of oak bark with fourteen pounds of boiling water. The cloth has to soak twenty-four hours, when it is taken out, passed through running water, and hung up to dry. This quantity is suffi cient for eight yards of stuff. The flax and hemp fibers, in absorbing the tannin, are at the same time better fitted to resist wear. This recipe is useful to millers who sack flour.

## RECENT INVENTIONS. <br> mproved Car Coupling.

This invention, although applicable as a coupling for aillroad cars generally, will be found particularly adapted to freight cars, and, taken as a whole, forms a strong, reliable pin-and-link coupling, which may either be operated automatically or by hand from opposite sides of the car, or fromithe top of it, and avoids all risk of accident to trainmen. It may be readily applied to the drawheads in common use with the ordinary form of coupling link, and provides for uncoupling standing cars which are not required to be immediately separated, and holds the link in position in one drawhead and the coupling pin raised in an adjacent drawhead, ready for coupling at any time that may be required by merely dropping the raised pin. The pin is operated by means of thc lever, which can be moved by a person at
the side or top of the car. The pin is retained in an elevated position by a pivoted bar which is pushed back as the link enters the drawhead, thus permitting the pin to drop through the link. The same pivoted bar also holds the link in position to be engaged by the drawhead of the adjacent car. The coupling is also provided with device for holding the lever and pin in an elevated position, independently of the pivoted bar. This is to permit the cars tobe uncoupled when desirable, without separating them. This invention has been patented by Mr. E. D. Cain, of Winthrop, Missouri.

## Improved Injector.

The engraving shows a steam injector which will force a solid stream of water under any pressure of steam. The body of the injector has a removable cap at its upper end to facilitate cleaning. The
steam supply pipe extends through the top and connects with the lifting tube, and also with the inclined forcing tube. W ater supply pipes communicate with the water chamber of the lifting tube. It will be seen that this injector is double. The vertical one
 lifts the water and the in alined one forces it into the boiler. Both tubes are supplied with suitable regulating and waste valves. All of the parts of this apparatus are accessible. It will deliver either hot or cold water, and works equally well whether hot or cold. We are informed that it is giving excellent satisfaction wherever it is used. This invention has been patented by Mr. Orson H. Wheeler, of Charlesworth, Mich.

## Car Window Deflector.

A car window deflector to prevent dust and cinders from entering the car ard for keeping up a circulation of air in the same has been patented by Mr. Henry B. Mears, of 1,429 Walnut Street, Philadelphia, Pa. The deflector consists of two sashes, one of which is attached rigidly to slide bars in such a manner that it may be slid backward and forward in the space in the side of the car. The other sash is attached to this rigid sash by spring hinges. The sashes are pressed out of the opening or space inside of the car by an elliptic spring attached to the back of the sash, and whic iberates the hinged sash that it will be swungout ward liberates the hinged sash so that win be swong out ward to the extent permitted by the coil springs upon which it is hinged. Strips are provided which retain the deflectors in
their outward position, and a stop block is likewise attached their outirard position, and a stop block is likewise attached
to the sill, which limits the movement of the blind and closes

the space between it and the sill. For moving the deflectors inward and retaining them to the angle required, levers are provided which are operated from the interior of the car by key. The deflectors are arranged on both sides of the windows, but only those deflectors are brought intouse which are located toward the head of the train, the other deflectors remaining in the recess provided for them till the direction of the train is changed, when they come into use and the others are shut back into the recess.
The accompanying engraving represents two windows of
a passenger car, showing the deflecting devices applied. The inventor claims that by the use of his deflectors the traveling public are not only rendered more comfortable, but that it is a great saving to railroad companies, as they preserve the upholstering of the cars from cinders and dust.

## Combined Cradle and Seesaw.

This is a combined cradle and seesaw, in which side rockers are used that make the undulating motion in lin with the body, so that when using the device as a cradle the tossing of the body and the turning of the head of the child from side to side are avoided. The chairs or seats are ad justable. Springs are used to ease the motion, and a pulley

and cord are employed to work the teeter. When the device is used as a see saw the seats are separated, as in the engrav ng: but when it is used as a cradle, the two seats arefastened together. By adjusting the seats at different distances a light child and a heavy one may balance each other. The cradle is provided with a treadle, which enables it to be operated by foot. This useful invention has been patented by Mr. J. Wayley Hill, of Cairo, Ill.

## Improvement in Heating Stoves

This a hollow side perforated cone, used to admit air aterally to the center of fire and into the combustion chamber above the fuel, so that a more perfect combustion may take place in all parts of the fire. The air which is admitted is so warmed by its contact with the inner surface of the cone that it more readily supports combustion, and but little is carried up by the draught before its oxygen has been utilized. This device economizes fuel, and increases the efficiency of the stove to which it is applied. It is very simple and inexpensive, and is applicable to
 toves and furnaces of various kinds. A patent has been issued to Mr. John Kilshaw, of St. Paul, Minn., for this invention.

## Improved Car Coupling

To the under side of the cars are secured the diverging timbers, between which are held the hollow tapering bellmouthed castings, which*constitute the drawheads of the cars. These drawheads have vertical movement at their outer ends between the timbers, so that the hooked connecting bars will enter the drawheads when the cars are brought together forcoupling, whether the cars are of the same beight or not; and for this purpose the drawheads are cast with trunnions, and the timbers have recesses which receive the trunnions. Springs hold the outer ends of the drawheads ele vated against the bottom edge of the cars, as illustrated, but permit the drawheads to be moved downward. Buffer springs are placed in recesses, against which the runnions come when the cars are in motion. The coupling bars are each formed with two hooks, which are adapted to engage with each other for connecting the cars, and they reach back through the drawheads, and arc provided at their rear ends, outside of the drawheads,
 with coiled springs which furnish a yielding draw. Flat springs are secured in the throats of the drawheads, for causing the connecting bars of the opposing cars, as the cars are backed together for coupling, to engage each other on entering the opposing drawheads, and to keep the hooks engaged with each other until the bars are forced apart for uncoupling. The means for forcing the connecting bars apart for uncoupling consists of a vertically movable bar having a slot through which the connecting bar of the car passes to hold it in place. This invention has been patented by Mr. Wanton C. Barber, of Villisco, Iowa.

## Formation of the Solar System.

At a recent meeting of the London Physical Society, Mr Braham gave an experimental demonstration of the vorticel theory of the formation of the solar system by rotating a drop of castor oil and chloroform in water until it threw off other drops as planets.

## Electrical Units of Measurement.

Several correspondents of the Electrical Revievo have dealt with the vexed question of the "unit" of measurement for the general supply of electromotive force, and have endeavored to translate the technical expressions in use among electricians into equivalents comparable with the ordinary measurement of gas. Mr. Moulton, F.R.S., has proposed that the charge for domestic supply shall be based on the consumption of " 1,000 watts for one hour." It appears, bowever, that a "watt" is not a quantity at all, but is simply a rate of doing electrical work. Another writer says that the usual methods of measurement are something analogous to calling " a cubic foot of gas at normal pressure the amount which will run through a certain pipe in twetze minutes at the rate of 5 cubic feet an hour." He thintss new term, the "vomb," would be euphonious and impressive for an electrical unit. In this way a "megvomb" and "megwatt" are brought to mean the same thing, and are somehow shown to be equivalent in incandescent lights to about 30 cubic feet of 15 candle gas, or with arc lights.to about 100 cubic feet of gas. It is confessed that there is a chance of great confusion among the electrical units. It would appear, from these and similar letters, that the confusion is not only coming, but has arrived. Quite lately one of the most important electric light companies was reported to have offered to supply electrical energy at the rate of 6 d . per 1,000 " erg hours." We now learn from an electrician that there is no apparent way of connecting hours with " ergs." As a way of escape from impending bewilderment, we are bidden to "study the coulomb, volt, ampere, ohm, watt, and above all the vomb." It will then be just possible for the student to understand a bill for a domestic supply of electromotive force for lighting. The main fact to be gathered from this interesting discussion is that, whatever the unit may be called, its price is proposed to be equivalent to common coal gas at 8 s . 9 d . per 1,000 cubic feet. To this would have to be added the consumer's expenses for renewals of lamps, which are assumed to add another 1s. to the cost per 1,000 cubic feet for equivalent gas liơhting.-Journal of Gas Lighting.

## a New Test for waste Pipes.

A Boston paper relates a discovery which may prove to be a better test for leaky waste pipes than heretofore used. The invention is accorded to a woman. Noticing an offensive odor in her parlor, she suspected a defect in the waste pipes, and sent to the agent to request that a plumber might be sent to examine them. The agent was incredulous, and refused. She tried the peppermint test. To make her proofs more convincing, the woman, after borrowing two cats from her friends, purchased some oil of valerian, and, stationing the animals in the parlor, went up stairs and poured the valerian into the basin in the same way that the peppermint had been previously applied, and then descended to watch the result. Cats are extremely fond of the odor of valerian, and it was not long before both of them began to sniff the air, and move toward the door of a closet through which the waste pipe ran. The door was opened for them, and they immediately sprang upon a certain shelf, where they remained purring with satisfaction. A third time the woman went to the agent, who, though still unbelieving, consented to send a plumber to make further investigations, and on cutting away the plastering so as to expose the pipe, a joint was found completely separated at the place where the cats had indicated

## slates Bad for the Eyes

Professor H. Cohn, of Breslau, believes that the use of slates by school children tends to produce short-sightedness; and would substitute either pen and ink or an artificial white slate with black pencil, manufactured in Pilsen, and already introduced into a few German schools. In 1878 Horner found (Vierteljahrschrift offentl. Gesurdheitspflege, x, 4) that B and E could be read, if black on white ground, 496 cm .; if white on black, 421 cm .; and if gray on black, 330 cm .; and ascribed the greater difficulty with white letters to irradiation. The reflection of light from the surface of slates is, it is said, enough alone to cause their disuse. The school board of Zurich has forbidden the use of the slate after the first term (primary year), and many teachers and oculists advocate the substitution of white-boards for black $\bar{b}$ oards. The noise of slates; dirty habits formed by erasures; bad positions favored by reading the less legible script; a heavy hand; and the babit of twisting, lcarned with a pencil, and to be unlearned with a pen-these, it is said, are obviated by the use of pen and ink at the outset. 'The obvious objections are, that children can occupy themselves better with slates, a
harder.

## Artesian Well at Denver

While the miners were sinking a blind shaft for coal in North Denver, Colorado, a stream of water was struck at a depth of 375 feet. This is the first artesian well opened in the State, although nearly $\$ 100,000$ has been expended by the Government and corporations in experimental sinkings. It is proposed to systematically establish wells in the neighborhood of the accidental discovery, with a view to developing the rich lands there for horicultural purposes.

ENGINEERING INVENTIONS. Messrs. Columbus B. Tucker,of Angerona, W. Va.. and Josephus Tucker, of Coolville, o., have
patented an improved car coupling, which possesses the patented an improved car coupling, which possesses the
feature of having neither springs on levers. The parts ment.
Mr. Eberhardt Nicolaisen, of New York city, has paiented an electric mail conveyer, the object of which is to onstruct an electrical rail.way for
the conveymnce of mail matter from station to station, and to provide for the automatic transfer of the cars from the main track to the side tracks of the several
An improved nut locking device has been patented by Mr. George Cade, of Milan, Tenn. A fixed washer is so placed under the nut that in screwing the
latter to the rail, the nut is permitted to turn readily on the bolt. When in position the nut is held fast by a tumbler. so that it cannot become loose by any jar-
ring motion of the rail. By raising the tumbler it is ring motion of the rail. By raising the tumbler it is
possible to so disengage the washer as to permit the nut to be turned off as desired.
An improved automatic switch stand bas been patented by Messrs. Oliver J. True, of Port Clin-
ton, aud Henry H . Houghton, of Elyria, O . The object of the invention is to provide for automatically replacing the tongues after they have beea displaced by a train on the main line so that the switch will be in tion on the main line, so that the swith will be in
proper order for the next train running in the reverse
diretion of ter trin proper order for the next train running in the reverse
direction of the train that has displaced the tongues.
The object of the invention is praiseworthy, and we The object of the invention is $p$
hope it may be practically tested.
An improved packing, possessing flexibiliy, durability, and self.lubricating qualities, and designed to be applied to valve stems, stufting boxes, etc.,
has been oatented by Mr. William P. Woodruff, of New has been patented by Mr. Wiliam P. Woodruff, of New
York city. The packing is composed of canvas or other cloth, asbestos paper, and sheet rubber, or Indiaof fragmentary metal. Between the different materials used in making up the packing a thin layer of plum-
bago mixed with tallow is interposed to prevent the bago mixed with tallow is interposed to prevent the
layers adhering and for rendering the packing flexible. An improved car coupling has been patented by Mr. William T. Van Dorn, of Lincoln, Neb. The nvention consists in a coupling bar having at its end a downwardly projecting catch, which engages with a
bevel coupling pin locat d horizontally in the drawhead. The coupling bar is forced down on the pin by a head. The coupling bar is forced down on the pin bya latter is furnished with a coil spring. The advantage
claimed for this simple invention is, that the coupling claimed for this simple invention is, that the coupling
bar may be readily applied to the pin and link coupling bar may be readily applied to the pin and link coupling
now in general use. Mr. Benjamin Bennett, of Hyde Park, Pa.. has patented an improved car brake. To the platform of the car is attached the permanent portion of a rose
clutch, and the movable portion of the clutch is atclutch, and the movable portion of the clutch is at-
tached to a staff, so as to turn with it by a square or ther form, but to slide freely up and down on the same. A pivoted foot lever is inserted through a slot in the
flxed portion, so that by pressing the lever down with the foot the movable portion will be raised, disengaging the staff, so that the brakes will be disconnected from
the wheels. When the foot is removed from the lever, the wheels. When the foot is removed from the lever, the weight of the movable portion will bring it into en-
gagement with the Iower portion of the clutch, when the brake will be reary for.operation.

## mechanical inventions.

An improved drag saw machine, in which the saw is suspended at its shank by a pendulum and
has a handle attached for working it, has been patented by Mr. Jomn C. Wygant, of Outvile, o. The invention further consists in the manner of adjusting and
controlling the pendulum. A novel combination tool has been patented by Mr. Harry U. Kistner, of Bordentown, N. J. almost every perone has occasion to use very often The same handle accommodates a number of tools,
among which are a cork screw, gimlet, skate sharpner, etc.

A means of communication between a raiload train and any station on the line or any telegraph office within the circuit through an electric wire. has re-
cently been patented by Mr. W. 'T. Waters, of Atlanta, Ga. An insulated conductor is suspended along the side he train. Connection betwetor on rollers conductor and one of the cars by a rod propels the former. The
improvement pertains particularly to the construction of the movable rolle
A machine for scrubbing floors is the recent invention of Mr. Patrick Gallagher, of New York city. A barrel-shaped tank for holding the soapsuds is mounted on rollers, and just outside this cylindrical tank and
attached to it is run a vertical shaft. to the lower end of which are attached the scrubbing brushes. These brushes are made to revolve by turning a crank which is geared to the shaft. This machine both scrubs and
dries the floor, and will be found specially useful for polishing waxed floors, and cleaning large halls, piazzas,

An improved street sweeping machine has been patented by Mr. Patrick Ryan, of New York city. The invention relates to that, class of street sweeping
machines which carry the sweepings into a receiver orming part of the machine, from which the dirt is dumped at intervals into piles. The brush is supported by a chain and cog wheel, by means of whichit is ro-
tated, and the dirt deposited in the lower portion of he dust pan or apron, from whience it will be raised into he dirt receiver by means of the buckets provided for this purpose.
A novel
A novel revolving hat blocking table has been patented by Mr. Marl A. Cuming, of Brooklyn, N. Y., which consists of a revolving steam box or ves-
sel adapted to carry the hat dies or moulds, also in
a stuffing box for preventing the escape of steam. Clips
for holding the stumng box on the supporting table are
provided, and the same revolve on its longitudinal axis. provied, and the same revolve on its longitudinal axis,
The invention further consists in an enlargement formed
in in the lower part of the stea
An electric device for regulating the ventilation and heat of incubators is the subject of a paten
recenuly granted to Mr. Frank Rosebrook, of Elmira, N. Y. By the use of the electric appliance of Mr. Rose brook it is claimed that the destruction of eggs will be rated. The invention of the incubator has proved a monotonous portion of her life, and now comes in an electric contrivance which by mechanical means, still further facilitates the hatching process.
A novel device in the form of an auxiliary rifle barrel for guns has been patented by Mr. Harry T. Martin, of Fort Robinsol, Neb. The invention relates ing extending a short distance along the barrel beyond the cartridge chamber, and having a flange at the base corresponding to the flange of the large cartridge, by which means a smaller cartridge may be used than the
one for which the rifie was originally intended, and thus much expense saved in case the rifle is to be and in gallery practice. A spring or springs to secure the bushing in the barrel is also provided, and a shell ex-
tractor contrived to be worked by the rifle sheil extractor
An improved screen cleaning device bas been patented by Mr. Thomas Holman, of Salem, Ore.
A frame of any approved form is furnished with a reA frame of any approved form is furnished with a reciprocating inclined screen sliding on ways. This screen
is operated by a spur wheel that gears with a pinion is operated by a spur wheel that gears with a pinion screen by a rod, or it may be reciprocated by any other suitable mechanism. A roller rubbing frame, arranged beneath the screen, may be stationary or may be re-
ciprocated in direction of the screen by a shaft connectciprocated in direction of the screen by a shaft connect-
ing it with a crank wheel. The sifting screen ing it with a crank wheel. The sifting screen is
cleaned by its contact with the rubbers, which are mounted transversely with the screen and in such relation thereto as to clean the screen wilhout injuring it nately fixed and rotatable
An improved rice beating machine, the object of which is to facilitate the treatment of rice, to nel after inner skin. and to clean and polish the kernel after the rice has been hulled has been patented by
Mr. James Decker, of Surrency, Ga. To the central bar of the frame of the machine is journaled a crank shaft, to the middle portion of which is attached a pulley to receive a driving beit. To the cranks of the shaft
are pivoted the upper ends of pitmen, the lower extremities being pivoted to bars which slide up and down along the central brace of the frame, and to which bars at their lower ends the beaters or pestles are attached.
The mortar is cylindrical, and is pivoted at its center in such a way as tol bed means of worm wheels which are actuated by a rotatingshaft. By this arrangement all the rice in the mortar is brought in
contact with the pesile. A new machine with curved or partly curved edges, has been patentdith by Thomas F. Gilroy, of New York city. The ly on a vertical shaft, so as to rotate in a horizontal plane. Its lower end rests upon a pivoted lever, the
latter of which is provided with an adjustable balancing weight for regulating the pressure of the wheel on the glass. The abiading wheel is set in action by a
belt which passes around a series of pulleys located on the supporting shaft. A sponge is fastened on a rod so as to press against the periphery of the abrading wheel, to prevent the water from being thrown off by
centrifugal force. The glass to be beveled is held be centrifugal force. The glass to be beveled is held be-
tween clasping plates, and is pressed upon the revolving stone, the pressure and degree of bevel being regulated by a feeding scre
An improved animal trap bas been patente by Mr. Talton B. Turley, of La Mine, Mo. It consists in filed with water, and provided with a tilting pivoted platform. At the furtier end of this platform, upon a sliding hook arranged above the platform, is fastened the bait. The bait hook is made to slide when the bait is pulled upon by the animal, as he sinks downward
with the swinging platform, in order that ke may not be startled and turn back before it is too late. A small an additional bait, and for some kinds of animals a pin he animal is in a prope position to be caught. A spring is arranged above the platiorm which prevents it from turning too far on its
pivot, and which throws it back into place when the pivot, and which throws it back into place when
animal has been precipitated into the tank below.

## agricultural inventions.

Messrs. Richard E. Caviness and George McCormick, of Beckwith, Iowa, have patented an imvention relates to a trip wire for check row corn plant-
ers, constructed with eyes at regular intervals, and hav ers, constructed with eyes at regular intervals, and hav-
ing rings secured in them. The rings are grooved to prevent them from slipping in the eyes of the trip wire Mr. Artbur W. Cash, of Decatur, Ill., is corn planters, in which he provides for lengthening direct action from the reel shaft to the seed slide. Owing to the simplicity of the arrangement of the several parts of the machine, it is not liable to get out of working
order, and it possesses many advantages not found in ther check rowers.
An improved straw stacking machine bas been patented by Messrs. Henry S. Stone, of Orange, one end of the thrashing , or tyine is levator or carrier which takes the straw from the This elevator may be raised by a windlass attachment
to any elevation that may be required, and further may be swung to the right or left, when
distributethe straw in forming the stack.
Mr. William Sinclair Craig, of Courtney Texas, is the inventor of a new cotton chopper which
consists of two hoes secured to a pair of bars, which are separated and held in position by a spring. These pivoted bars are attached to the azle of the sulky, and are slotted so that they slide up and down to conform comprising the machine are yery few number of part comprising the machine
ment of them very simple.
An improved straw stacker has been pa ented by Messrs. Lewis W. Berger, Edward A. Peter and Oliver P. Chavey, of Groveport, O. The invertion consists in an elevator frame mounted upon a fou to any inclination and held in any position. The ma chine is designed with the object of receiving the straw
as it as it comes from the

An improvement designed to promote the strength of the individual teeth of harrows has been patented by Mr. John L. McKay, of Franklin, Tenn
This invention consists in harrow teeth constructed in This invention consists in harrow teeth constructed in
an approximately V -shaped form, one prong being per an approximately $V$-shaped form, one prong being per-
pendicular and the other arm being inclined. The forward arms of one row of teeth are connected to one beam of the harrow, and the rear arms of the same row that the teet a second beam, adjacent row
A novel bundle carrier for harvesters ha been patented by Mr. James W. Reid, of Union City,
Mich. The invention consists in a bundle carrier for Mich. The invention consists in a bundle carrier for
harvesters, constructed with gear wheels connected with the harvester mechanism ard carrying a swingin shaft having curved arms to carry the bundles, and pro-
vided at its inner end with a trip arm to turn the gring ing shaft, to raise its arms to receive a bundle, and todepress the said arms to discharge the bundle. To the rear part of the harvester frame is hinged a table to re the rear of the harvester. To the end of the shaft tha drives the carrier is attached a curved arm to push the bundles forward as they are deposited upon the re-
ceiving table, and make room for tbe bundles following.

An improved tobacco planter has been tented by Mr. Sidney S. Neblett, o!? Whittle's Mills, Va The invention consists of a frame with a crosspiece at
the top, provided with a central orening through which passes a spring-actuated perforator designed to whic hile in the ground for the admission of the plant. the lower extremity of another movable bar is pivote funnel-shaped device or holder, in which the plant is inserted. This holder is then slid down until the plant
is deposited in the opening in the ground. The open ing is then filled with earth by means of a scraper whic is located at the extremity of a third rod or handled bas necessity of the operator stooping when setting out the plant.

## MISCELLANEOUS INVENTIONS

A novel toy pistol, adapted to explode caps and project marbles through the air by a compressed
coiled spring in the barrel, has been patented by $M_{\text {r }}$. coiled spring in the barrel, has been
An improved coffee or tea pot has been pa tented by Mr. Patrick H. O'Hara, of Philadelphia, Pa. or other material all their essential strength retaining at the same time all the fragrance and aroma.
An improved earring fastener has been patented by Mr. George Krementz, of Newark, N. J., the
object of which is to facilitate the opening, closing ${ }_{9}$ and endering secure the fastening.
Mr. William E. Goodenough, of Newark, graph frame, the object of which is to provide frames or photographs and other pictures, so constructed that they ca
sizes.

An improved hand truck has been patented by Mr. James H. Strugnell, of Toronto, Ontario, Canada. The invention consists in cleats attached to the or belt which is attached to the cleats and is used to Mr. W. H. Murphy, of Brenham, Texas, has recently patented a shaker or knodier for the mixing of drinks or liquids. In form it is similar to those strainer attached to the vessel, tbrough which the liquid Mr. Marion E. Po
Mr. Marion E. Porter, of Leon, Iowa, has patented a cooking attachment for oil stoves, the object of which is to provide a new attachment for oil
stoves, whereby an increased quantity of food can be cooked than heretofore on an oil stove. An ingeniously the heated air evenly throughout the attachment on
Mr Willias to be cooked are place
Mr. William J. Morand, of Passaic, N. J., has invented a machine for rolling buttons on whips, ing of the buttons parallel rollers provided with a driving mechanism and short roler piwed to a singing lever, whereby the buttons are rolled and finished while the whips and Mr. Benjamin N. Sbelley, of Anderson, Ind is the patentee of a new wheel intended for any kind o road vehicles. On the main ayle a steel sleeve is
placed on the spindle of the axle, which receives the enplaced on the spindle of the asle, which receives the en-
tire wear of the wheel boxes. These sleeves are made of the hardest steel, and will last probably as long as any vehicle body, but should they become worn they
can be readily removed and replaced by others spindle of the axle is tapering, and is provided with a thread at its front end forming a close, oil tight joint, which faclitates the lubrication of the avle.

An improved harness loop has been patent d by Mr. Henry A. Pott, of Cape Girardeau, Mo. The ing an intermediate, a top, and a bottom plate, con ected together by the side plates, and having the to located out of the plane of the rive upon the center of the rivet instead of trace is hro ing thus equalized, there is less danger of the parts Mr. Mathias Pabst, of Washington, D. C. has patenteda means for preventing overflow from back
water. This invention, which takes advantage of the water. This invention, which takes advantage of the
principle of equalizing the level of the high water by principle of equalizing the level of the high water by
means of a stand pipe; consists in making this stand pipe detachable, with its lower end adapted to be fitted simply telescoping into the sewer. By this means, whe the water rises in the sewer from whatever cause, it simply rises in this tube to its own level withont flood-
ing the cellar, and damaging any goods that may be ing the cellar, and damaging any goods that may be A corset of improved make has been patent ed hy Mr. Richard V. Cable, of Poughkeepsie, N. Y The improvements consist in providing upward exten
sions of the breast swells toprevent the dress falling in above the npper edge of the corset, and in the construc tion and attachment of skirt supporters, to prevent th waist line being unnecessarily enlarged, and ai the sam time the weight of the skirts is moslly thrown upon the houlders of the wearer
An improved sewer and drain tile for sur d for different localities and under varying condition fuse, has been patented by Mr. George J. M. Porter Finceton, Ill. The invention consists in a pipe conand provided with a half band at one end, made inte gral there with; these sections being adapted to re-
ceive a cover or top tile having its ends fitting under the alf bands of two adjoining lower tile sections.
Messrs. E. B. Greene and C. J. Emerson, r., of Westfield, Mass., have recently patented an im he object being to simulate by a beater or baton the or dinary movements given by hand, so as to indicate di ectly the length of each note in a bar of music. Th or baton which is operated by a cylinder that is rotated or baton which is operated by a cylinder that is rotated
by spring power. The cylinder is provided with pin by spring power. The cylinder is provided with pin
on its surface similarto the arrangement of a barrel in a music box. An escapement of novel construction regulates the rotation of the cylinde
A patent has been obtained for the manufacture of anhydrous snlphide of zinc by Mr. Thomas Macfarlane, of Acton Vale, Quebec. The invention
consists in producing zinc sulphide through the inter consists in producing zinc sulphide through the inter-
vention of the ammoniacal liquors of gas works, which vention of the ammoniacal liquors of gas works, which
consists in treating the latter with sulphide of barinm, consists in treating the latter with sulphide of barium, decomposing the ammonia liquid filtrate with a salt of zinc, so as to obtain a precipitated zinc sulphide. This is rendered anhydrous by mixing it, when dried, with a salt of ammonia, and heating the mixture in a furnace, which removes the wa
A novel folding desk has been patented by Mr. Magnus J. Hafgar, of Chicago, Ill. A desk is pro-
vided with two hinged or pivoted swinging end wings vided with two hinged or pivoted swinging end wings
which have their outer surfaces or sides ornamented to represent the front of a closed desk. The desk itself, as well as the wings, is furnished wlth pigeon holes, compartments, drawers, etc., to receive books and
papers. When the wings are swung open they will rest papers. When the wings are swung open they will rest
transversely against the ends of the desk. and there mefting will be at the front of the desk. By this arlittle space but dhk when folded occupies but very Mr. Charles R. Groff, of St. Paul, Minn., has recently patented a process for preparing a coffee lar to the essence of coffee now so extensively sold by grocers. The ingredients used are coffee roasted and
ground which is boiled in water to the proportion of two quarts to one pound coffee. After the coffee has boiled sufficiently, alcohol or cologne spirits are added, after which the liquid is again boiled for a short time,
when giycerine and burnt sugar are added, which complete the process of manufacture and renders the article the coffee botting. Connected with the manufacture of the coffee compound, the inventor uses
for boiling and treating the ingredients.

An improved padlock has been patented by Mr. Thomas Donahue, of Terryville, Conn The inis somewhat as follows: To release the shackle the notched key is inserted and the key turning the tumblers,
the notches are brought into line beneath the pawl, so that the pawl falls in the notches. By further movement of the key the tumbers engaging the pawl carry the bolt backward, thereby releasing the sbackle, which is immediately thrown upward by the spring. Upon
the shackle being pushed down to its place again, the the shackle being pushed down to its place again, the
block in which it fits, and which carries the spring, is block in which it fits, and which carries the spring, is
moved down into its place, and the bolt springs forward and locks the shackle. The whole is of a simple con-
struction, while at the same time the lock is not acted upon by the weather, and cannot be readily picked
An improved cooper's bevel, to be used in tbe manufacture of tubs and tanks, has been patented ject of the invention is to furnish an instrument by which the angles in a variety of sizes may be obtained, so as to avoid the necessity of a separate instrument for
each size of tab or tank. The instrument consists of woo blades, one of which is termed the "base " of the instrument. and the other the "adjustable arm." The base is furnished with two parallel aud longitudinal
slots, and the arm is made with two similar slots, The arm is attached to the base by screws passing throngh adjustment of the arm upon the base at right angles or in any position as may be desired.

## 

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HIN'S 'TO CORRESPONDENTS
No attention will bepaid to communcations unless companied with the full name and address of the
Names and add

## iven to inquirers

Werenew our request that correspondents, in referrin fors ander will be kind enough of the question.
Correspondents whose inquiries do not appear reasonable time should repeat them. If not then pub ished, they may conclude that, for good reasons, the Persons desiring special information which is pure of a personal character, and not of general interes, hould remit from $\$ 1$ t. $\$ 5$, according to the subject we cannol be expected to spend time and
obtain such information without remuneration
Any numbers of the Scientific Aurican ENT referred toin these columns may be had at office. Price 10 cents each
Correspondents sending samples of minerals, etc or examination, should becareful to distinctly mark label their specimens so as to avoid error in their ident
(1) W. B. writes: 1. I read that lead put in sweet oil and set in the sun would make good oil to days a white sediment falls. What is this sediment ombination tell what the white sed contained in the oil Is there any quicker way to make the oil than by the un? A. None. 3. Is this oil poisonous if it was taken
y accident? $A$. The lead is poisonous, but the mi ture would probably be harmless. 4. Will it hurt gun (2) C. H. by bing it on the works or barrel? A. No (2) C. H. D. asks: What benefit is it to have castings blued? I think it opens the iron, and th it, please etate it through your paper: How much fro is required for japanning sewing machine work black brown, white. green, and blue? A. The heating of iro work, or bluing as it is called, is to make the japa take evenly, and also to clear the work of any oil o rease that may remain in the corners or on the porou arface, which interferes with evenness of drying. Th heat required must be suited to the kind of japansused and must be ascertained by trial, as the same kinds and vary very much in their baking qualities. As a rule, the best strong black requires a heat of $250^{\circ}$. Co red japans require from $2^{\circ} 0^{\circ}$ to $240^{\circ}$, according to the ature of the pigments, oxides generally drying easie
(3) S. W. asks: 1. What are the com ponent parts of smoke, or of what gases is it composed nd in what proportion, both of wood and coal, an incombustible? If the oxygen of the air in passing hrough the fuel cause its combustion and is burne with it, what becomes of the nitrogen? A. The result a perfect combustion of either wood or coal are carbon roxide and water, bnt as there is generally insufficient oxygen to combine the carbon, small particles of it pass ffect color the smoke. Nirogen inert, and has no that passen combusion at all. 2. Is there anything bustible; or can everything that escapes from the fuel or that passes out of the smokestack, be burned or uti zed? A. Most combustions are imperfect, and there fore it frequently happeus tbat vapors pass out of the decomposed water) ever been used to any advantage in making or assist in making steam; or is there an in common usefor illuminating and heating purposes.

Minerals, etc.-Specimens have been re ceived from the following correspondents, and xamined, with the results stated:
F.G.-The sample is iron sesquioxide (limonite) containing iron sulphide (pyrites). The latter may contain of the amount of iron would be the same.-G. L N. The specimen is a clay iron ore. It is composed of pyrites (iron sulphide) which has become oxidized ex-
ternally by the influences to whicb it has beengujected ternaliy by the influences to whicb it has beensulojected -A. B C.--The powder has the appearance of being micaceous mineral pulverized. We do not think that contains sumicient al
terial for fire brick.
[OFFICIAL.]

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| Potter's table and carrlage, combined, M. W. Jor- <br> dan. <br> 274,001 |  |  |  |
| ess. Se | Twine hotder, M. E. Stephenson................ ${ }^{\text {a }}$ 274, |  |  |
| inted sheets, drying, G. D. Carronl............. 273,816 |  | nd Power Lathes, Drill P Saw trachments, Chueks |  |
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| Pump, G. M. .onway............................... 273.988 | Velocipede, J. S. S. Carr............................ 272,885 |  | H. Forbes, President. $\quad$ W. R. Dreasurer. |
| Pump bucket. rubber, J. W. Voglesong............ ${ }^{\text {Pr4.061 }}$ | 5 |  |  |
| mp, rotary. G. W. Hunter. - ................. | ${ }^{805}$ |  |  |
| Copeland................................. 273,965 | Wagon brake, J. F: Moore....................... 274.4 |  |  |
|  |  | DROP RORGINGS OF IRON |  |
| dil joint fastener, G. F. Hoeffer.............. .... ${ }^{273,735}$ |  | BEECHER\& PECK, NEW HAVEN CONN. | decided this to be the true meaning alidity of the patent has been sustal |
|  | Wash stand, E. F. Colins........................... 273.710 |  |  |
| ilmay switch, F. . . We. Weir...................... 273,785 | Washing machine, strader \& wittich.............. 28.7876 Washin machine $J$ wison 274072 |  | his company also orns ani coontrois all |
|  |  |  |  |
| aming machine, , hand, M. Flather............... 273,976 | Watch, dust-proof. A. Bitner...... .............. ${ }^{273,938}$ |  |  |
| Refrigerating catafalque.J. J. Slevin.... ........... gas regulator. Temperature regulator. |  | ills, E |  |
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|  |  |  |  |
| 16 | Wood, solution for seasoning and preserving, J. |  |  |
| ngand evaporat- | ${ }_{\substack{273,861 \\ 27373}}^{2}$ |  |  |
| e same. apparatus for heating, M. R. | $\begin{aligned} & 237,736 \\ & 273,860 \end{aligned}$ | OHLS for Machinists, Amateurs, Jewellers, Mo | Acknowledged to be an indispens. able tool Manufactured by He tool Manuatured by HoWARI) BROS., Fredonia, $\mathrm{N}_{\mathrm{C}} \mathbf{Y}_{\text {. }}$ |

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