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## dROP FORGING OF TOOL STEEL.

In the ordinary forging of iron the element of time is an important factor-the material is gradually and by successive blows brought into shape, the anvil work being supplemented by successive reheatings. In drop forging, although the final result is the same, the operations, which in common forging require time, are compressed into an instant, a single blow, or at most two or three, serving instead of the long continued hammering of ordinary anvil work. It is evident, however, that all the changes in the iron that are brought about by the gradual coaxings of the hand hammer must take place under the drop, only the changes are nearly instantaneous. To effect these changes so suddenly the iron must be rendered very pliant and plastic by high heating, approaching that of the welding process. For this reason it has not, until recently, been believed that cast steel-tool steel requiring the retention of all its qualities of being hardened and receiving temper-could be successfully worked under the drop hammer. But this is now done as readily as the working of the toughest and softest of Swedish iron. By means of adjustable drops, which allow of blows from varying heights, the steel may be wrought precisely as though under the hand and trip hammer, without injury to it from overbeating.
Cast steel partakes, undoubtedly, of that quality of iron known as "flowing;" that is, the metal may be pressed into forms without destroying or impairing the continuity of its fibers, merely changing their direction to conform to the outlines of the new shape. Usually this "flowing" of the metal is produced by compression-quick compression, but not a sudden blow-the metal, while plastic from heat, being forced into a mould or die. But the steel can be worked in a similar manner under a drop. Lathe-turning tools, planer tools, caliper gauges, and many other small implements requiring hardening and tempering are now made from tool steel by being struck up in dies under the drop-hammer.

## Drying Rooms.

The rapid increase in mechanical processes and the de mands of growing trade cause annual additions to the number and size of drying rooms in use. Manufacturers, too, say that the surveyors of companies are becoming more critical, and a few years ago made no objection to furnaces, and even to red-hot flue-pipes, but now the seemingly inno cent steam-pipe is overbauled, and disparaging remarks are made about its position and its relation to wood or material. It is doubtless true, says the Insurance. World, that the surveyors and special agents have been educated at the expense of the companies, as shown by the loss-books in the fire hazards of arrangements formerly supposed to be entirely safe. Meantime the drying rooms are becoming drier every year, the wood in their construction is becoming more like tinder, and the factors necessary for a tire are being multiplied. Even bricla and iron are not always as innocen as they seem, for one retains heat.for a long time and the other conducts it to more combustible material. Well-baked bricks will resist fire, but at least one manufacturer found it was unsafe to place them on boards, since they acted as reservoirs for the heat conveyed through super-heated steampipes, altered the texture of wood, and at last set it on fire, causing a loss of $\$ 4,000$.
The construction of drying rooms and boxes is very important. Perbaps the two worst can be found in a piano factory, where a box-stove outside is fed with shavings trailed along the floor, and a red-hot stove pipe passes directly through the adjacent drying box. The same factory can show a small drying room filled with light wood, with a small cylinder coal stove in the center, having pine blocks for fuel, and being kept at a red heat. The most common device to plague underwriters is the "pot furnace" to heat drying rooms, with the torrent of heated air pouring up through conductors. This has been the common way of vulcanizing rubber goods, and is still used very generally with metallic articles. A wire manufacturer placed his coils of wire, dripping with liquid from the wash room, in drying rooms, and brought them to a red heat, unmindful of his wooden doors and wooden beams to support his metal lic ceiling, until two fires forced him to suspend his opera tions and to substitute brick and iron. Steam pipes are now very generally used, as being cleaner and probably safer. But not once in a bundred times will a thermometer be found within, and many proprietors would be surprised at the degree of heat attained. In the rubber vulcanizer's, $240^{\circ}$ to $270^{\circ}$ is the general rule, and the number of steam pipes is limited to prevent the workmen bringing the tem perature to $350^{\circ}$, and thus injuring the fabrics. Instead of using a thermometer to register the heat, most manufacturers simply trust the engineer to carry a certain number of pounds of pressure in his boilers, and take no account of the accumulation of heat by radiation and reflection, especially when the room is lined with a metallic surface. Then the heat from steam pipes is intensely dry and absorbs from the wood the moisture, fitting it to conduct fire rapidly. It is well known that the motion of long lengths of pipe through contraction and expansion wears considerably upon pipes, but may it not be often true that the electricity developed by friction, especially of upper belts, may be conducted through the piping, and elicit the spark necessary to set wood on fire?
The great hazard in drying rooms is dust, and the feathery lint which gathers everywhere. It is minutely subdivided and only needs the addition of a drop of oil from machinery
to become highly combustible. This was well illustrated in a room used to dry animat hair by superbeated stem. The larger coils were carried against the outer walls, while sub ordinate coils passed through the center of the rooms, raised six inches from the floor, and a like distance below the boards used for shelving. Yet even here the dust accumulated on the pipes, took fire, and the tiny tongue of flame leaped to the shelving, costing the underwriters $\$ 2,200$, although a live steam jet had been prepared to meet this emergency.
Can these instances give any clew to necessary precau tions? 1. Make the drying box and room as safe as is prac icable. 2. Procure careful inspection by some one who will recognize the fire hazard. 3. Invite examination by an experienced electrician. 4. Keep the rooms strictly clean at all times, and prevent contact of combustible material with means of heating. 5. Take particular care when the product of manufacture is specially combustible. 6. Give special attention to the means of ventilation.

## French Academy Prizes.

The French Academy of Sciences have recently published a list of the prizes offered by them for essays on scientific subjects during this year, and until 1886. In applied mechanics the Fourneyron prize will be given for the best "study, both theoretical and experimental, of the different methods of transporting force to a distance." The papers must be lodged before the 1st of June next. A grand prize will be awarded in 1884 for a mathematical solution of the problem " to perfect in some important point the theory of the application of electricity to the transmission of power." The prize will consist of a medal valued at 3,000 francs The memoirs must be submitted to the secretary of the Academy before June 1, 1884, and should be anonymous, but accompanied by a sealed envelope with the real name and address of the author. The Bordin prize, which was not a warded this year, is carried on to 1885 , and memoirs must be lodged before June 1 of that year. The subject is a 'research into the origin of electricity in the atmosphere, and the causes of the great development of electric phe nomena in storm.clouds." The prize is a medal worth 3,000 francs.

## An Improved Sleeping Car.

Mr. John A. Sleicher, formerly manager of the New York State Associated Press, and more recently one of the editors of the Troy Times, at Troy, N. Y., has patented a new sleeping car, with the seats, each six feet long, extending nearly across the width of the car. They are so arranged that each seat at night can, with very little trouble, be changed into an upper and lower berth, extending transversely across the car. At the same time each section, by sliding panels exlending to the roof of the car, is converted into a private apartment, entirely cut off from intrusion. Absolute privacy, with an aisle in which to stand and dress, is thus given to each section. Ladies will especially appreciate the advantages of the "Sleicher Stateroom ©leeping Car." Ne rotiations are already in progress with a leading railroad trunk line, which desires to experimentally use one of the new sleepers. The new car bids fair to revolutionize that branch of the railroad business.

## The Brayton Petroleum Engine.

Attention is called to the manufacturers' advertisement in another column. Ten gallons of unrefined petroleum are said to give a constant power equal to five horse power for ten hours. Crude petroleum costs about six or possibly eight cents a gallon, making that the cost of five borse power per hour.
The engine is run by the combustion of the vapor of peroleum united with atmospheric air under pressure. The combustion is not intermittent, or explosive, like that of gas in a gas engine, but is continuous, and the engine is driven by the expansion of the products of combustion, the expansion being about six volumes. The motor, it is stated, has been fairly tried, and appears to be constructed upon reasonable principles. For small powers, and especially for intermit ent power requirements this motor appears to be well adapted.

## Intensifier for Gelatine Plates.

The chemical now mostly used in intensifying gelatine plates is bichloride of mercury in combination with ammoia, iodide or cyanide of potassium. The main difficulty of such intensification has been that it was not stable; in a short time the image on the plate, if exposed much to the light, would fade out, and spoil the negative. The intensifier given below has been found to work well, and at the same ime possesses the quality of being absolutely stable.
A stock solution of sulphate of iron is made as follows:
Sulphate of iron.
follows
Citric acid..
Water.....
15 ounce.
A second solution is made as follows:
Water... .......
Nitrate of silver
1 ounce
Nitrate of silver
0 grains.
To intensily, take enough of the iron solution to cover the plate, and add thereto from six to ten drops of the silver solution, flood the plate, and the intensification will proceed in clear, gradual, and satisfactory manner. To produce a freat degree of intensity more of the silver solution should be added, a few drops at a time.

## an accident on the great bridge.

The great bridge between New York and Brooklyn was the scene of a painful tragedy on the 30th ult., Decoration Day. At three P. M., when the footwalk was thronged with visitors, enjoying the novelty of the structure and the beauty of the river scene, suddenly, at the west stairway, a woman's cry was heard; she had fallen on the steps. The crowd on the walk above pressed hastily forward to see what was the matter; those in front, at the edge of the stairs, resisted, became locked and packed together, and in this helpless condition were borne forward by the weight of the surging crowd behind and swept down the stairs, crushing upon each other and against the railings-a writhing, bleeding mass of humanity. Thirteen men, women, and children were killed and many injured. Such was the nature of the accident. It was plainly due to the stupidity of the bridge managers. Ordinary common sense teaches that upon such a highway as this, thronged by millions of people, there should be no stairways or other man-traps. Smooth, straight pavements slould be provided. The managers have made broad and elegant passages for horses. Now let them do as much for human beings.
Our engraving shows the locality of the accident. The stairs are only twelve feet high. To prevent a recurrence the trustees and engineers are now talking about having dividing rails on the stairs, stationing more policemen, putting up telephones, and other arrangements. So long as the tairs remain the liability to accident will continue.
One of the detectives who was on duty between the staircase and the point where the foot-bridge is narrowed for thirty feet by the passage of the cables, said that he was sure no part of the bridge was better guarded than that where the accident happened. Where the foot-bridge narrows is a favorite stalking ground for pickpockets, for there is always a prospect of a squeeze there, if anywhere. This detective said:
" The crowd was not particularly large during the after" The crowd was not particularly large
oon, not so large as we had expected, for unusual preparations had been made to guard against disturbances of any kind, and the ordinary police force was about doubled, counting the detectives and special officers. I was watching for pickpockets, when there was a shriek from some women at the New York stairway, and I started that way, thinking that a fight was going on; we had a good many rough characters crossing, but until then the utmost good nature and order had pre vailed. Before I got thirty feet I was almost taken off my feet by the crow rushing behind me from the Brooklyn side. Some ran toward the crush simply from curiosity, others in mere sport and wish to create a little squeeze for the fun of hearing the women scream, and a grea many ran and struggled forward, when stopped, because they believed that the bridge behind them was falling down, and their only hope of getting to land was to press forward to New York. Very few seemed to know that the trouble was all in front of them, and not behind. The pressure of the crowd was the most terri ble I have ever known; I saw persons with the blood streaming out of their mouth
and noses from the squeezing they received. It was wholly useless to try to argue or talk to people, for the real pressure came from hundreds of feet away; you might just as well have shouted al the waves, and, besides, the noise of shrieks, cries, and curses was so great as to drown any orders. Those who tried to hold on to the iron railings at the sides of the bridge were carried along with the crowd, with their hands bleeding and their bodies crushed against the iron work. A platoon of police would have been of no avail."

## Distillation of Bituminous Coal.

In an address delivered in Manchester, England, Mr. Walter Weldon, chemist, described the usual methods of burning coal to produce heat, and gave the results of the imperiect and wasteful consumption of coal in the open grate and under boilers. He said that it was difficult to insure the complete combustion of coal even in making a chemical analysis, and in the open grate it is impossible. By dry distillation a ton of coal can be made to yield twenty pounds of ammonium sulphate, worth 3s. 5d. (80 cents). The soot that lodges in the chimneys and defiles furniture and buildings would yield coal tar, the basis of valuable dyes. To these direct pecuniary losses should be added others, as charges for repainting smoked rooms, medicine and doctors' bills, caused by sickness from acid vapors in the atmosphere, and the waste of heat by building the fire at the end of a tube leading into the outer air.

As a remedy for this loss by waste and these injuries to health, Mr. Weldon said that coal should be distilled in close vessels, and all the products of such distillation should be collected. The gas would serve to distill fresh coal and to work gas engines to generate electricity for light. Theammonia would make a superior fertilizer for land. The tar would be manufactured into dyes, and the residuum of coke would be superior for domestic heating purposes and steam making to the original coal.

scene of the late accident on the great bridge.

The right ascension of Neptune is 3 h .9 m ., his declina tion is $15^{\circ} 56^{\prime}$ north, and his diameter is $2 \cdot 5^{\prime \prime}$
Neptune rises on the 1st at.half-past three o'clock in the morning; on the 30th, he rises at half-past one o'clock.

## saturn

is morning star, and contributes but one incident to enliven the records of the month, his conjunction with Venus on the 19th, previously referred to. He is now partially hidden in the sun's bright beams, but he will soon emerge from seclusion, and, clothed in glorious apparel, will grace the summer nights with his serene radiance.
Theright ascension of Saturn is 3 h .57 m ., his declination is $18^{\circ} 37^{\prime}$ north, and his diameter is $156^{\prime \prime}$.
Saturn rises on the first soon after four o'clock in the morning; on the 30th, he rises ahout half-past two o'clock.

## JUPITER

is evening star. Though drawing very near the sun, and approaching his greatest distance from the earth, he will be a bright and beautiful object in the evening sky during the month. Never in his departing glory has he put on a more attractive aspect. No observer can behold him gracing the twilight sky and serenely shining without being impressed by the majesty and princely dignity of his presence. While near proximity to the sun obscures every other planet but Venus, Jupiter shines with a brilliant luster in the nea presence of the great orb he closely resembles. A period of ntense activity is passing on the Jovian borders. The great spot has disappeared, but the wondrous belts take on every manner of varied form, and every tint of the rainbow, thus bearing testimony to the tremendous commotions that agitate his chaotic mass, and that millions of years hence will make the giant orb a fit abode for animal and vegetable life The right ascension of Jupiter is 6 h .24 m ., his declinaion is $23^{\circ} 21^{\prime}$ north, and his diameter is $32.6^{\prime \prime}$.
Jupiter sets on the 1st at a quarter after nine o'clock i the evening; on the 30th, he setsat a quar ter before eight o'clock.

## URANUS

is evening star. On the 10th, at one o'clock in the morning, he is in quadra ture with the sun, half way between oppo sition and conjunction.

The right ascension of Uranus is $11 . \mathrm{h}$ 21 m ., his declination is $4^{\circ} 58^{\prime}$, and his di ameter is $3 \cdot 6^{\prime \prime}$.
Uranus sets on the 1st at one o'clock in the morning; on the 30th, he sets at a quarter after eleven o'clock in the evening.

## MERCURY.

is evening star until the 7th, and morning star the rest of the month. On the 7th, at 11 o'clock in the evening, Mercury is in inferior conjunction with the sun. After this event, he passes to the sun's western side and swells the list of morning stars to five members, including Mars Venus, Neptune, Saturn, and himself.

The right ascension of Mercury is 5 h 17 m ., his declination is $21^{\circ} 52^{\prime}$ north, and his diameter is $11 \cdot 16^{\prime \prime}$.
Mercury sets on the 1 st at eight o'clock in the evening; on the 30th, he rises about
morning MARS At the beginning of the month, he is the irst of the four planets ranking as morning stars to appear bove the horizon. The order of succession is Mars, Venus, Neptune, Saturn. The ruddy planet is really coming into notice, and may be found shining as a small red star in the constellation Aries, being more readily picked up as there are no stars of note in bis vicinity. He wanders undisturb ed on the celestial track until the 26th, when he is overtaken by Neptune at eleven o'clock in the evening. The two planets are then in conjunction, Mars passing $1^{\circ} 7^{\prime}$ north The conjunction is invisible as far as Neptune is concerned, but it illustrates the adage that "Things are not what they seem." Both planets are moving westward, and though Mar in reality is nearer to us and travels faster, he is apparently overtaken by Neptune, who passes him and reaches opposi tion two months earlier.
The earth revolves twice in her orbit while Mars revolves once in her orbit, and then it takes her fifty days to catch up with bim and come into line or complete a synodic revolu tion. In the case of Neptune, the earth revolves once in he orbit, and only requires two days more to come into line with him and complete a synodic period. It must be remembered that we are viewing our brother and sister planets from the earth, which is a moving observatory, and though the move ments of the "wanderers" in the heavens are apparently malous, they are in reality as symmetrical as clock work The right ascension of Mars is 1 h .59 m , his declination is $11^{\circ} 14^{\prime}$ north, and his diameter is $48^{\prime \prime}$
Mars rises on the 1st about a quarter before three o'clock in the morning; on the 30th, he rises a few minutes before two o'clock.

## neptune

Mars ing star. He meets Venus on the 8th, and overtake At the end of the month he is the first of the morning star to appear above the horizon.

## quarter after three o'clock in the morning

## the moon.

The June moon fulls on the 20th, at twenty-three minutes fter eleven o'clock in the morning, Washington mean time. The old moon is in conjunction with Mars and Venus on the 2d, and with Neptune on the 3d. The sender crescent less than a day before new moon is close to Saturn on the 4ti, being two minutes north at four o'clock n the morning. Unfortunately for terrestrial observers he sunlight hides the beautiful phenomenon from mortal view. This conjunction, as well those of March, A pril, and May, show how nearly the moon's path coincides at present with that of Saturn, and how near the conjunctions are to occultations. Saturn is occulted in his geocentric position, that is, as seen from the center of the earth, nine times during the year, though in no case is an occultation visible in Washington. The conjunction of the moon and Saturn on he 9th of April, a simple conjunction in Washington, New York, and New England, was a superbly beautiful occultation as observed in Illinois and Iowa. The new moon of he 5th is near Mercury on the evening of her advent, at her nearest point to Jupiter on the 6th, near Uranus on the 2th, the day of the first quarter. She pays her respects to Neptune for the second time on the 26 th, and ends the month's work with a second conjunction with Mars on the 30th, three days after the last quarter, planet and crescent making a picture fair to see on the morning sky.

At a German ultramarine manufactory, managed by pupil of Liebig, the director has observed that for fortyfour years none of his workmen have ever suffered from consumption. He attributes their immunity to the fact that the process of manufacture involves the constant production of sulphurous acid, by the burning of sulphur. Accordngly he suggests a new method of treatment for consumptive patients, by bringing them into an atmosphere moderately charged with sulphuric acid.

## A NOVEL AIR MOTOR.

The engraving shows an air motor in which the expansion and contraction of air in a flexible receptacle is the motive power. It is a well established fact in pneumatics that air will expand three-eighths of its bulk between a freezing temperature and the boiling point of water-in other words, that eight measures of air at the freezing temperature become eieven at the boiling point of water. It is also well established that air preserves an equable rate of expansion at all temperatures. Its increase of bulk, for example, being the same from zero to $100^{\circ}$ as from $100^{\circ}$ to $200^{\circ}$, and as its expansion from $32^{\circ}$ to $212^{\circ}$ Fahrenheit amounts to threeeighths of its bulk at $32^{\circ}$, it follows that every degree on this scale corresponds to a change in its bulk amounting to $\frac{1}{480}$ of the bulk at $32^{\circ}$.
If a hermetically sealed vessel containing air be subjected to heat, the expansion of the air within it produces a pressure increased in proportion to the heat applied, and, under certain circumstances, in proportion to the volume of the air contained within the vessel, and it is with a view of utilizing this power that the apparatus shown in the engraving has been devised. A flexible cylinder, preferably made of silk, impervious to air, and having solid heads fixed to it at either end, is provided with rings placed at intervals in the silk cylinder to prevent collapse when subjected to external pressure. If this hermetically sealed cylinder is collapsed, and at the same time contains a certain volume of air, it follows that, owing to the construction of the cylinder, should heat be applied to it, the expansion of the air within it will force its two heads apart, and these heads will again come together when the air within the cylinder has cooled down to its original temperature.
To utilize this expansion and contraction, the lower head of the cylinder is fixed to a table. The other end is provided with friction rollers held opposite to each other on the said head, and brought in contact with the vertical guide bars. The cylinder is in this manner held in a vertical position, while it is free to move by the expansion and contrac tion of the air within it.
Two rods connect the top with a crosshead provided with friction rollers, which work on the vertical guides. The weight of the cylinder head and crosshead is balanced by counterbalance weights, connected to the crosshead by chains passing over pulleys beld in brackets in the framework of the machine. By this system of counterbalancing the force produced by the expansion of the air will have exactly the same effect on the mechanism as an equal force produced by the contraction of the air within the cylinder.
An endless chain passes round pulleys and through holes in the crosshead, and the crosshead has pivoted on it two dogs, one of which is set against the chain, so that it will engage it when the crosshead ascends, while the other is set so as to engage with the same chain, but on the op posite side of the pulley, when the crosshead descends By this axrangement of dogs the pulleys will alway revolve in the same direction, whether the cross head moves up or down in its guides. As the vol ume of air within the vessel or cylinder would not in itself be sufficient to produce a power applicable for practical purposes, an additional vessel is pro vided which is also hermetically sealed, and con nected by a pipe to the flexible cylinder.

The number and size of the reservoirs can be in definitely increased, but five only are shown in our illustration.
Although the greatest motion will be produced when the temperature changes to the greatest ex tent, it will be understood that upon every sligh change in the temperature the motor will be affected more or less. If exposed to the bright rays of the sun, the air will expand. Should the sun become clouded for a short period, the air will naturally contract, and so on during the whole day, at each and every change of the temperature, the air either expands or contracts, and consequently the appara tus imparts to the motor a power given out as described.

As the movement of this apparatus will be irregu lar, sometimes fast and sometimes slow, and some times imparting uo movement at all, the inventor applies a spring mechanism devised tọ store the power produced by the motion of the apparatus.
This machine will hardly be classed among per petual motion machines of the usual types, as it has an ever varying force of nature behind it which will cause it to operate so long as heat and cold alternate or until the machine is destroyed by wear or time.
This motor has been patented by Mr. Benjamin J. Foster, of Glen William, Ontario, Canada

## Zapallo Fruit.

The fruit of the zapallo, a cucurbitaceous plant of Uruguay, appears to afford a most wholesome food. It is cut up with the saw, because the rind is too hard for a knife to penetrate. It is firm, of a yellow color, a sweet amylaceous flavor, and slight smell resembling that of the carrot. The most esteemed quality, called rubango, has a ligneous rind of a dark green color, with orange pulp, and white oily seeds. The relative proportions are: Seeds, 4; pulp, 39; and rind, 57. According to M. Sace, the chemical composition is as follows: Gum, 0.44 ; sugar, $2 \cdot 52$; starch, $13 \cdot 73$; fibrine, 0.47 ; lignose, 0.22 ; ash, 0.81 ; water, 81.81 ; total, fibri
100.

## IMPROVED WATER HEATER.

We give an engraving of an improved apparatus for heating water in large or small quantities, without trouble and with very little expense. The heater is more particularly designed for use in places where water backs and hot water boilers are not provided ; but it may be used to advantage wherever hot water is required. It will be found very use ul for stablemen, dairymen, farmers, and others.
The apparatus is to be submerged in water contained in a barrel, tank or other suitable receptacle. The fuel used is oil or gasoline.
The body, $a$, of the heater is made of sheet metal, and has faring sides and a broad base. In one side there is an open-


WEBSTER'S IMPROVED WATER HEATER.
ing closed with a screw cap, which is packed to make it water-tight. This opening is to give access to the burner for lighting or adjusting. The closed top of the body, whic is of copper, is provided with a series of tubes communicat ing with a central tube, $b$, which leads upward and forms a chimney to convey the products of combustion above the surface of the water in which the heater is placed. Two inclined draught tubes, $c d$, extend above the surface of the water and supply air to the flame in the body, $a$.
The burner used in the heater may be of any approved pattern for burning kerosene or gasoline. The liquid fuel is


FOSTER'S ATMOSPHERIC AIR MOTOR.

supplied through the tube, $e$, from the reservoir above. To heat a quantity of water with this apparatus the cap is unscrewed, the burner lighted, and the cap. replaced after the flame is properly regulated. The heater is then plunged in the water, which, being in contact with highly heated surfaces, soon becomes heated
This apparatus is convenient for heating water for bathing purposes, for laundry and for indoor as well as out of door uses.
This useful invention has been patented by Mr. John B. Webster, of Los Angeles, Cal., who may be addressed for further information.

The total number of puddling furnaces in operation a he end of 1882 in the United Kingdom was 4,369, being 814 less than in the preceding year.

## Protection for Glass Vessel

Dr. E. Schaal, a chemist in Stuttgart, writes as follows in the Wurtemberg Gewerbeblatt:
In chemical laboratories it is customary to put a coating of clay on glass vessels that are to be exposed to a tempera ture that would soften or melt the glass, or where they are liable to be broken by draughts of air. Sometimes cow's hair or asbestos is mixed with the clay to strengthen it. Al though this mass is cheap it is liable to fine checks and cracks, or it scales off, which frequently causes the glass to break.
I have recently been using, with better results, a mixture of infusorial earth and water-glass, which, if properly ap plied, will last for weeks and hence is not expensive, while it protects and strengthens the vessel to such an extent that I have, for the sake of experiment, heated thick but cracked retorts that were protected in this way to $400^{\circ}$ or $500^{\circ} \mathrm{C}$. $932^{\circ}$ Fabr.) when exhausted almost to a vacuum, and ye they did not break, or collapse. It is important to make this mixture so that it shall form a soft and somewhat elastic, but not liquid, paste. A mixture of one part by weight of infusorial earth with 4 or $41 / 2$ parts of water glass will fulfill this end approximately; the exact propor tions cannot be given because commercial water-glass differ in strength, and the infusorial silica is not always dry.
The part of the vessel to be protected is covered one-fifth to two-fifths of an inch thick and dried at not too high a temperature, and it is better to dry in a drying closet or on a support over the stove. If the temperature is too high at first, it will cause air bubbles in the mass and it is not so good then. It can be dried by swinging it back and forth over a flame, the bubbles being prevented by pressing them out. If a crack appears, it is plastered over with more of the mixture and ailowed to dry again. If some parts of the vessel are to remain transparent, they may be protected by water-glass alone by applying several thin coats and letting each dry before putting on the next
There is no doubt that the same mass can be used to cover gas retorts, furnaces, stoves, and walls, just as well as for glass and porcelain utensils.
The editor of the Gewerbeblutt adds that the disadvantages which the author refers to of using potter's clay, water, sand and calf's hair for protecting glass and porcelain can be entirely overcome by mixing up the mass with a little glycerine. This cheaply and easily prepared mass is thus rendered very easy to apply, always retains its desired soft ness, and never cracks nor checks.

## Covering Tables and Writing Desks

The Neueste Enfindungen gives the following practical di rections for covering tables etc., with cloth orleather: Thick rye paste is boiled with thick turpentine (not the oil) slightly warmed. Thin strips of wood are then prepared not over $13 / 8$ inches wide and $1 / 4$ inch thick, and the sharp edges trimmed off. The best thing is a shade roller cut lengtbwise, and the round side put downward. The cloth is stretched at one end and one side, to such a lath and basted fast to it, but the lath must lie two inches from the edge of the veneering (inside), and the cloth must extend half an inch beyond the edge of the veneer, because it will be shorter in spite of the stretching. The lath may be tacked at intervals of six inches apart. After one end and one side are fastened the cloth may be stretched and basted around laths on the other two sides so as to form an inner border or frame two inches from the edges. The paste is then applied to the top of the table close to the veneer but not too near the lath, perbaps $11 / 2$ inches from it, and the cloth that projects beyond the laths is pressed down on the paste and rubbed against the edge of the veneer with the finger nail. There will be little folds in the cloth where it is basted, and these must be stretched out in pasting it down. It is then left to dry and the excess of cloth trimmed off with a sharp knife. Care must be taken in trimming it off, especially when the veneer is thin. If the cloth is cut back too far, a narrow strip should be pasted in between. The laths are then carefully removed and the cloth brushed off.
The cloth should be put on so that the nap runs toward the front of the table if its length permit of doing so.
In covering a table with morocco, of course these strips of wood cannot be employed.
To preserve its luster the leather is evenly but not too strongly moistened on the wrong side with pure water to which a little vinegar is added. The whole top of the table is covered with paste and the leather laid on and moothed out by scraping from the middle toward the sides.
If one skin is too small they should not be joined in the middle, but a seam may be made near each end. The edges are cut with a rule and sharp knife and placed close together. A modeling iron, to be had of any book-binder, is un over these joints and along the edges. It is not necessary to heat the iron, but it is well to do this if the leather is not dry yet.

THe experiment of electrically lighting the dining room and libraries of the House of Commons has, it is stated, cost more than $£ 2,000$, but the Commissioner of Works contracted to pay a sum not exceeding $£ 900$.

## ATMOSPHERIC DUST AND GERMS

Atmospheric dust and germs have been the subject of a profound study for the last few years at the Observatory of Montsouris, and the results obtained have recently been communicated to the Faculty of Medicine, of Paris, by Mr. P. Miquel, chief of the micrographic service of the former institution.
Mr. Miquel did his collecting with $\varepsilon . \mathrm{a}$ aeroscope (Fig. 1) invented by Mr. F. A. Pouchet. This apparatus consists of a cylinder of small diameter connected with an aspirator, and provided with a plate of glass covered with glycerine for receiving and retaining the minute bodies carried along by the current of air.
The number and variety of the spores that are disseminated by the air is found to be immense (Figs. 2, 3, and 4). The spores of Penicillium and the cells of Protococcus and Chlorococcus are almost always present in great abundance. Mr. Miquel applied himself at the outset to the counting of these organisms, and to estimating the number that existed in each cubic meter of air, and thus succeeded in determining what influence the seasons, temperature, dryness, and moisture had upon their development. The results are as follows: The number of spores belonging to moulds is
or chicken broth, and Liebig's extract of beef. The diffi culty consists in having these solutions absolutely free from all living organisms. Recourse has been had, without success, to ebullition at $100^{\circ}$-a temperature sufficient to coagulate protoplasm, the physical basis of life, aceording to Prof. Huxley. Certain spores, however, resist the action of boiling water for several hours.
Mr. Koch extols the method of discontinuous heating for sterilizing liquors. He raises the latter to a temperature lower than $70^{\circ}$ in order to kill the adult bacteria, and then allows them to cool so as to give the spores time to germinate, and finally raises the temperature again in order to kill them. Mr. Miquel, however, formally attacks this method, as he considers it inefficacious owing to the uncertainty that exists in regard to the exact period of evolution of certain germs. He also recommends operators not to rely upon the limpidity of the liquors as a test of their sterilization; for there are liquors, Cohn's for example, which are not deprived of active germs after an ebullition of four hours at a emperature of $100^{\circ}$.
It results from experiments that have been made that beef broth, neutralized by potassa and kept for two hours at a
cold process succeeds better than any other tending to the same end.
The sowing of atmospheric germs in nutritive liquids is done by means of special matrasses resembling in form those used by Mr. Pasteur. The culture liquid is introduced into these through suction, then the slender extremity is closed by melting it in a lamp, and finally the liquid is sterilized by heat. In order to make sure that no atmospheric germ has got into the bulbs while being filled, the latter are tested by allowing them to remain for a month in a stove at a temperature of $30^{\circ}-35^{\circ}$. If they do not become turbid, they are considered as adapted for the sowing. This latter is effected in different ways. If it concerns rain water, the atter is collected in the collector, $\mathrm{P}^{\prime}$, of a rain gauge (Fig. 8). This collector is carried by a movable arm, so that the ope ator placed at a distance can take it and put it very gently under the funnel, E , of the apparatus.
Mr. Miquel has applied this arrangement to the estimation of the number of bacteria contained in rain-water, and has thus ascertained that at the beginning of storms such water contains fifty of these organisms to the cubic centimeter, and that this number soon begins to diminish, although it increases again at times at the end of a few days of damp


Fig. 1.


Fig. 4.


Fig. 9. ATMOSPHERIC DUST AND GERMS.


Fig. 3.


Fig. 6 and 7.
\%.
and rainy weather. It seems, then, that bacteria are capable of multiplying in the clouds, or that the latter become charged with them mechanically during their travel through space. At Montsouris, out of 100 bacteria contained in a space. At Montsouris, out of 100 bacteria contained in a
drop of rain-water, there were, on an average, 28 Micrococci, 63 Bacilli, and 9 Bacteria. In the air the proportion was 66 Micrococci, 13 Bacilli, and 21 Bacteria.
The development of these little organisms in sown liquors is followed under the microscope by means of the moist chamber, an invention of Messrs.Van Tieghem \& Lemonnier. This apparatus (Fig. 9) consists of a hollow glass cylinder, H , at the bottom of which there is placed a little water, H , at the bottom of which there is placed a little water,
which is afterward covered with a thin piece of glass, LL, To the under surface of this latter is attached the culture liquid containing the spore that is to germinate therein, both being introduced by means of the rod, T. The moist chamber is placed on the stage, PP , of the microscope, under the objective, O. Mr. Miquel has in this way studied the evolutions of a bacillus, which aftérward became transformed into a micrococcus (Fig. 10). He has also shown the phenomenon of the devulcanization of India-rub ber, through a bacterium which is very frequent in sewage waters. This schizophyte furnishes nascent hydrogen, and, his ${ }^{\text {and }}$ in the presence of sulphur, gives hydro-sulphuric acid. In-
troduced with the ferment of urea into a solution of urea, into which dip sulphureted papers, it gives hydro-sulphate of ammonia.
The methods that we have just described have given very interesting results, and have shown that there exist, on an average, 80 bacteria to the cubic meter of air. The maximum occurs in autumn, and the minimum in winter. The average numbers are as follows:

| Dece | 50 bacteria. |  |
| :---: | :---: | :---: |
| February. |  |  |
| May |  | " |
| June | 50 | " |
| Octob | 170 | . |

Contrary to what occurs in moulds, the number of schizophytes, which is small during rainy weather, rises when all the dampness has disappeared from the surface of the soil.


Fig. 10.

The action of dryness is greater than that of the temperature. . It seems, in fact, as a result of numerous experiments, that the water evaporated from the surface of the soil never carries schizophytes with it. Dry dust, on the contrary, that from hospitals principally, is charged with microbes. As a result of comparative experiments made in Rue Rivoli, and at Montsouris, it appears that the air contains nine times as many bacteria in the interior of Paris as in the vicinity of the fortifications. The influence of the dominant winds is notable. That from the northwest reaches Mont-


Fig. 11.
souris laden with a considerable number of bacteria. This is the wind that blows from the hills of La Villette and Belleville. Then come the winds from the east, north, and northwest. The south wind is less charged with these organisms. The distribution of microbes in a vertical direction indicates that they are derived from the mud and dirt of the streets and dwellings. A cubic meter of air, which contains but 28 of them at the summit of the Pantheon, contains 45 at the Park Montsouris and 462 at the Mayoralty of the fourth ward.
The determination, among these myriads of schizophytes of the air and water, as to which are the ones that intervene in contagious diseases is the final problem proposed to science, and the solution of which will be greatly aided by the work that is being done at the observatory under con-sideration.-Le Genie Civil.

A Correspondent of the British Medical Journal states that he has found the application of a strong solution of chromic acid three or four times, by means of a camel's hair pencil, to be the most efficient and easy method of removing warts. They become black and soon fall off.

## FIRE AND BURGLAR PROOF SAFES.

The series of nine engravings on the first page are illustrations from sketches of the fire proof and burglar proof safe manufactory of Hollar's Safe and Lock Company, York, Pa.- One of the views represents their factory, which was recently built and equipped with machinery and appliances specially designed for their business, and is not excelled by any other establishment for completeness of tools, fittings, and means of producing good work with facility and dispatch. The company have a frontage of 350 feet on the N. C. R. R., from which sidings run to the shops, enabling them to receive supplies direct and to ship finished work with the least possible delay.
The largest of the interior views represents the burglar proof department, so called, because that in it burglar proof safes and vaults are made. Many who are not fully informed on the subject believe that there is no possibility of constructing a burglar proof safe or vault, the belief being induced by published accounts of successful "crackings" of safes by professional burglars. It is probable, however, that investigation would show that the fault lies with those purchasers of safes who regard the price of the safe as of more consequence than its quality, and. so encourage the manufacture of inferior and unreliable articles. These ideas would be modified and corrected by a visit to this factory and an inspection of the processes there employed to construct absolutely burglar proof safes and vaults.
These processes are the forming of solid welded angles and frames out of welded plates of chrome and carbon steel and iron; the thorough fitting of all joints by planing and grinding; the exactness of the preparation of the parts for the recention of the company's patented compound key wedges and conical and stub bolts for securing all the parts together as one body; the protection against the introduction of all explosives by the use of their patent ribbed tongues and grooves; the security of the door against the force of the most skillfully driven wedge; the means employed by the company for resisting screw power by their patented method of 9 locking the bolt frames to the door, making it a part of the complete construction; the making, grinding, and building-in their patent lock arbor, that strengthens instead of weakens the door, which has beretofore been the weakest part of the construction. These methods, and in telligent effort in their application, have made it possible to construct a safe with no weak point, the door, always heretofore a point of weakness, being made equally invulnerable with all other portions of the safe or vault.
The facilities for heating, working, hardening, and tempering of steel are excellent. These processes may be seen in the view of the smiths' department, in which large furnaces, bending clamps, and cooling tanks are provided. The tanks are kept constantly supplied with cold, soft water procured from an artesian well, drilled for the purpose ; and after all the various parts of the steel safe, vault, or section are completed, they are here treated to the tempering process that reuders them proof against the drill or any known cutting device. Then follows the rebuilding of the safe, vault, or section, as the case may be, not again to be taken apart.
In another view is seen the department for the construc tion of the iron work essential in the production of thehighest grade of fire-proof safes. In this department nothing is left undone that will aid to the desired end-that of absolute protection of records, books, papers, plate, jewelry, etc., from fire; for without a strong iron exterior and interior case to contain it and hold it securely, the best non-conducting material is useless. This has been demonstrated by many fires, in which strap or hoop front and back safes have been broken open by falling from a considerable height, or crushed by the weight of falling walls. In order to remedy this fatal weakness this company have introduced, in the construction of their fire-proof safes, solid welded augle fronts and backs, the doors being protected by a wrought iron tongue, which is made to fit neatly into a correspouding groove in the door jamb on all sides.
In the center view is seen the final process of grinding the surfaces of the safes, with traversing emery wheels, as they progress to the filling room, shown in the view to the right. In this room the important process of preparing and mixing the fire-resisting materials is performed. Filled with this substance the hottest fire can never force its heat through the walls of the safe to the injury of the contents. This material is mixed with fifty per cent of water, and thus mixed has the quality of rapidly attaining the solidity of stone with its burden of water sealed within it, ready, in case of fire, to be liberated in the form of vapor, which pervading the whole interior, prevents the destruction of the contents of the safe.
During the process of fire-proofing an expert examines every part of the work and all the materials used, before the safe is approved and declared ready for the reception of the cabinet work, which is prepared in another department shown in a view on the right. The safe is then ready for the paintroom, seen in another view. Here it receives treatment at the hands of a competent artist, and when finished may be justly pronounced a thing of security and beauty.
The company have a capacity of twenty complete safes a day besides jail and other work. Only the best of materials and the best of workmanship are used and employed-the company make no claim to cheap, second-class work. The most skillful workmen are employed, having been gathered from those localities where the best grade of safe work has been hitherto produced.

Mr. William H. Hollar, the founder and able president and manager of the company, is a gentleman well qualified for the responsible position he occupies, having had years of experience in the business and fully understandiug all its requirements. He has able assistants in every department, and a number of the directors and principal stockholders represent much of the wealth and enterprise of a progressive and important comm'inity.

## recent decisions relating to patents. <br> <br> By the Supreme Court of the Uuited Stas.

 <br> <br> By the Supreme Court of the Uuited Stas.}Reissue Letters Patent No. 6,673 granted to Mrs. P. Duff, E. A. Kitzmiller, and R. P. Duff, October 5, 1875, for an improvement in washboards, on the surrender of original letters patent No. 111,585, granted to Westly Todd, as in ventor, February 7, 1871, are not infringed by a washboard constructed in accordance with the description contained in etters patent No. 171,568, granted to Aaron J. Hull, Decemver 28, 1875.
In view of prior inventions, the claims of the Todd patent must be limited to the form shown-namely, projections bounded by crossing horizontal and vertical grooves-and do not cover diamond-shaped projections bounded by crossing diagonal grooves.
In the field of washboards made of sheet metal, with the surface broken into protuberances formed of the body of the metal, so as to make a rasping surface and to strengthen the metal by its slape, and to provide channels for the water to run off, Todd was not a pioneer, but merely devised a new form to accomplish those results; and his patent does not cover a form which is a substantial departure from his. Letters patent granted to Edwin L. Brady, December 17, 1867, for an improved dredge boat for excavating rivers, delared to be invalid for want of novelty and invention.
The design of the patent laws is to reward those who make some substantial discovery or invention which adds to our knowledge and makes a step in advance in the useful arts. It was never their object to grant a monopoly for every trifling device, every shadow of a shade of an idea, which would naturally and spontaneously occur to any skilled mechanic or operator in the ordinary progress of manufactures. Although a patent is not set up by way of defense in an answer, yet if the invention patented thereby is afterward put into actual use, the date of the patent will be evidence of the date of the invention on a question of priority between different parties.
One person receiving from another a full and accurate description of a useful improvement cannot appropriate it to himself, and a patent obtained by him therefore will be void.

## By the Court of Claims of the United States.

The language of the Constitution confers upon Congress the power of "securing to inventors the exclusive right to their discoveries." It is not empowered to grant to in ventors a favor, but to secure to them a right; and the term 'to secure a right" by no possible implication carries with it the opposite power of destroying the right, in whole or in part, by appropriating it to the purposes of the Government, without complying with that other condition of the Constitution, the making of " just compensation."
Neither does the term "the exclusive right" admit of an implication that, with regard to such patentable articles as the Government may need, the right shall not be exclusive.
Such right, when properly secured in the manner provided by law, becomes property in the cye of the law, and the Government cannot make use of the improvement any more than a private individual without license of the inventor or making him compensation.
Where, as in this case, there is clearly an implied contract between the Government and the citizen, and the suit is brought entirely upon that agreement, and the claimant is without judicial redress elsewhere, the Court of Claims of the United States has exclusive jurisdiction.
The above decision has been confirmed by the Supreme Court of the United States.

By various Circuit Courts of the United States.
A licensee is at liberty to contest the question whether the articles made by him embody the invention or any material part thereof, and a stipulation to the contrary in the contract is of no effect.
In a suit by a patentee against a licensee for license fees for the use of a patented improvement, something corresponding to an eviction of the licensee must be pleaded and proved if he would defend against an action for royalties.
Where plaintiff's claim must be construed as a "shortened vamp "-that is, a vamp which ends substantially where the box toe begins-as a means of uniting the box-toe and tip to the upper, and defendant's vamp is carried for the full length over the toe and lasted with the sole, Held that there was no use of plaintiff's invention.
A mere license to make and use, without the right to grant to others to make and use, the thing patented, though exclusive, will not authorize the licensee to bring suit in his own name for infringement without joining the patentee. Semble, if the patentee refuses to join, a court of equity can give a remedy to the licensee.
Where a manufacturing company and a firm eutered into a contract by which the former let out to the latter all the power, machinery. etc., of the company, to be used for the manufacture of tools, and for carrying on the business of
the company agreed to be done by the latter parties in cooperation with the directors, the firm agreeing to pay as rent ten per cent of their net sales, the profits of the consolidated company to be shared in certain proportions, Held, that the manufacturing company are not responsible for the manufacture of try-squares complained of, made by the firm for its own use in the rented premises.
May a landlord be enjoined from permitting his tools and machinery to be used for the injury of a third person? Quære.
An improvement in try squares which produces a tool more convenient, with a larger capacity, and more accurate, by adding to such a tool a slot in one of the arms, is a patentable invention.
Whether a reissue is wholly valid or not, it may be valid to the extent that claims in the original and in the reissue are alike; and if those claims are infringed, an injunction may be granted.
The reissued patent of John Lovatt, May 30, 1876, being much broader than the original, declared void.
The right to have corrections made by reissue may be abandoned and lost by unreasonable delay.
A reissued patent which enlarges an original patent-i.e., which makes the invention patented other and more inclusive than the original letters patent-is void as against intervening rights and the public as well.
The object of the law on the subject of patents is to advance the interest of the public by securing certain exclusive rights to patentees, and among those rights is that of changing, by a surrender or reissue, the language when the idea remains the same.
Reissued Letters Patent No. 8,590, granted February 18, 1879, to Charles T. Day, for an improvement in skates, construed and Held not to be anticipated by the invention patented June 22, 1869, by Alpheus S. Hunter.
Reissued Letters Patent No. 6,811,granted to John Parker, December 21, 1875, for an improvement in fly-traps, examined and held to be invalid. Reissued Letters Patent No. 6,493, granted to James M. Harper, June 22, 1875, for an improvement in fly-traps, construed and Held not to be infringed by the defendant's structure.
In the fly-trap whose construction is otherwise old it is not a patentable invention to strengthen the wire-cloth case by the use of upright and horizontal stays, nor to similarly strengthen the wire cone by annular and upright stays. These are suggestions which would occur to any skilled mechạnic in constructing such chambers of wire-cloth, from the very nature of the material, and are mere matters of workmanship involving no invention.
There is no patentable invention in fastening the cone of a fly trap to the base by slipping the horizontal annular stay of the former within that of the latter, so that they shall coincide, nor in nesting such cones for transportation.
The damages recovered in a suit for infringement are merely a satisfaction for prior use, and do not free the parties infringing from the operation of a patent.

The use of part of an in vention covered by a patent may constitute an infringement, and a party so using an invention after injunction granted adjudged guilty of contempt.
Where skates containing an improvement on an earlier patent held by the same inventor were in use or were offered for sale by the same inventor, whether actually sold or not, more than two years before his application for his second or subordinate patent, the latter is void.

The decision of the Patent Office upon an interference proceeding is sufficient to entitle the successful party, as against the defeated party or his privies, to a preliminary injunction upon the question of priority of invention.

The defeated party may, in another action, raise the question of want of novelty in the invention; yet if he had knowledge of the state of the art at the time he made his application, the want of novelty must be made clearly apparent.
Letters Patent No. 259,597, granted to Stephen N. Smith, June 13, 1882, for an improvement in machines for making lacing-hooks for shoes, construed and Held not to be anticipated by Letters Patent No. 102,195, granted April 19, 1870, to S. W. Young, or by Reissued Letters Patent No. 9,837, to Lauriston Towne, August 9, 1881.

Letters Patent No. 177,384, granted to Abner B. Hutchins, May 16, 1876, for an improvement in hydrocarbon-stoves, examined. The court declined to consider whether the invention was sufficiently described in a prior Canadian patent, or whether the invention had been in public use for more than two years prior to filing the application, it appearing that the defendants' structure did not infringe the claim of the patent.
Disclaimers, qualifications, and limitations imposed upon a patentee by the Patent Office are forever binding upon him, if he chooses to accept a patent containing them, and they forbid any subsequent enlargement, whether by reissue or by a broad construction of claims thus intended to be limited.
If an applicant considers a case important enough, he may refuse to take a limited patent, and being then rejected, may apply to the Supreme Court of the District of Columbia, and if still dissatisfied, he has bis remedy in equity by section 4,515 Revised Statutes. Here remedies are ample, and they are exclusive under the decisions.
Construing the patent according to the requirements of the Office acquiesced in by the patentee, Held that the defendant did not infringe, because his frame has not the peculiar construction which the Examiner declared was the only ground for issuing the patent.

## duxtequantate.

## The statue of Liberty.

To the Editor of the Scientific American :
In your last number is a plan that must meet the approval of all concerved to raise the statue of Liberty, by building it on its great plinth stone; and by powerful screws raising it by degrees to îts desired height. But the almost brickwork like pedestal seems out of proportion in its plainness to the statue.

It seems to me that a column, not unlike Pompey's pillar, in Egypt, or a minaret tower, might be designed, that would be far more beautiful, or even some square Italian tower. If the design, in the poverty of the people of the United States, is to build this rude, unseemly pedestal, to be inclosed hereafter in cut and ornamental stone, then there is no objection to it; for it will remind our citizens of the great want of money, that built up so many millionaires. Of course other means of giving the statue stability might be adopted than the central metallic tube, as the statue is evidently designed to be fitted with braced work of metal,
and then filled with masonry, with a winding stone staircase to its top. But the mode of its elevation by the plan suggested, it seems to me , is eminently practical.
S. J. Parker,

## Ithaca, N. Y., May 25, 1883.

## "Hydrophobia.'

To the Editor of the Scientific American:
Working as a boy in the office of the American Farmer, Baltimore, Md., I first became familiar with your paper a quarter of a century ago, and it has afforded me boundless pleasure and profit since. In your issue of March 31, article entitled " Treatment for Snake Bites and Hydrophobia," credited to the Lancet, I find the following, and if permitted expect to show another illustration of the old adage, "There is no new thing under the sun:" "At a recent meeting of the Lower Rhenish Philosophical and Medical Association, held at Bonn, Professor Binz described an interesting series of experiments carried on under bis direction, with a view
of testing various antidotes to the poison of serpents. He remarked that numerous specifics are heard of among the natives of India, which as a rule were inoperative. His opinion was that when a poisonous snake has bitten a per son in the usual manner, spirits can only serve to alleviate or prevent the spasms of suffocation which are induced by the action of the poison on the respiratory ner s. Atro-
pine and other specifics against imminent results of an analogous character caused by narcoticinfluences, have been found ineffective against this deadly virus. The most favorable tests made were with chloride of lime, a filtered solutifn of which was injected into the place where the fatal virus had previously been introduced. In seventeen trials madein succession, the poisoned animal survived without the slightest disturbance of its healthy condition. In five succeeding experiments, when a relatively insufficient dose was administered, or when animals suffering from disease tard the fatal effects of the poison. Binz suggested 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 been shown to have much greater power than any of the caustic substances now usually applied to dog bites, which have been proved to be scarcely if at all effective against the consequences of snake

Chloride of sodium, common table salt, chemically a com bination of chlorine and sodium, universally used as a condiment and antiseptic, and highly recommended in malarial fevers, has recently come to the front as a remedy for hydro phobia; and the letter upon the subject in the April issue of the Druggists Circular, by Dr. Dix, of Shelbyville, Ky., merits the attention of the medical profession as well as layI h
I have in possession some curious instances of the use of chloride of sodium as an internal remedy for hydrophobia, in Maryland, extending back full half a century. My collection of cases where it has been given internally, added to Dr. Dix's experiments and experience applied to the
wound externally, would justify further experiment by students of science, particularly, since in addition to the "chlorine" afforded as a decomposer of the animal virus or poison in the circulation are the well known therapeutic effects of salt entering rapidly into the blood and thrown off by the kidneys, acting upon the bowels, tonic and stimulating to the general system. In teaspoonful doses it is widely used as a household remedy to lessen the rapidity of the circulation and stop the flow of blood. Dr. Dix recom-
mends opium for this purpose; the small amount necessary to produce narcotic effects would make its general use, however good, to some extent dangerous, given under cir cumstances of intense excitement.
Prof. Binz's suggestion that chloride of lime would be a valuable remedy for the cure of hydrophobia, applied to the wound, is not quite " as old as the hills," but old neverthe less. Why it did not occur to him to use it bypodermically and by mouth, and to others also, I cannot, understand. It is stimulant and astringent, in the first case helping to raise the of the case lessening the rapidity poison through the economy. If chloride of lime applied to
in contact, it is reasonable to assume, that some of it, will be absorbed by the vessels and decompose the virus in the cir culation. If this is a fair assumption, it is plausible, practicable, and possible to meet the poison within the system and destroy it. To show the antiquity of the remedy, I append the extracts taken from a letter of Dr. Jos. Ennals Muse, of Cambridge, Md., written for the Cambridge Chronicle, February 18,1830 :
'With this view and these sentiments I make the communication of a 'fact' which should be cut out and pasted in every man's parlor. The fact I allude to has been receutly ascertained by a French chemist and surgeon, M Coster, and published in the American Journal of Science, conducted by Professor Silliman. This important fact, that chlorine has the pover to decompose and destroy the deadly poison of the saliva of the mad dog!" has grown out of chemical philosophy and chemical research, and is of more value than vaccination, or any other discovery which the annals of medicine have recorded; because it furnishes man with a certain prophylactic against the most horrible disaster which is incident to his existence.
' Of the truth of this discovery and the accuracy of the experiments on which the statement is predicated, there can be no doubt, 'it is affirmed,' by the most highly valued medical authority ; and M. Gay Lussac bas since reported a case of the successful application of the same substance to poison by prussic acid, one of the most active and virulent known in nature ; and it will probably be extended to many others. It is astonishing that this substance called, 'cblorine" under the new nomenclature, should have remained so rine" under the new nomenclature, should have remained so
long comparatively at rest. It was discovered by Schle in 1774, and was used many years ago by England, and I bejeve France, to purify their ships, jails, and hospitals, under the name of 'oxy-muriatic gas.' The principle, too, on which it operated was then well understood; and the theory now differs in the present case, chiefly in terms. Hydrogen gas is known to constitute, in combination with sulphur, phosphorus, and ammonia, the intolerable smells from putreying substances; deprived of hydrogen this odor disappears ; the analogy was extended to animal effluria; the conclusion was drawn that the abstraction of the hydrogen by means of its affinity for the excess of oxygen in the oxymuriatic gas would destroy the virus by its decomposition; the result has been satisfactory. The Chloridians view this same oxy-muriatic gas as an elementary substance, and call it 'chlorine' from its green color ; this 'chlorine' then performs the part of the oxygen of the 'French theory,' and combining with the hydrogen of the effluvia effects its decomposition, and consequent destruction, in the same manner.

As many poisons (most probably all animal poisons) are known to contain hydrogen, it is a matter of astonishment that analogical induction had not long ago advanced the earned inquiries to the present important discovery, 'that poisons, animal and mineral, constituted in part of hydrogen, as far as experiment has gone, are decomposed and rendered innocent by oxy-muriatic gas, or chlorine, as the respected theorists may please to have it."
"This article (chlorine) is cheap, and should, in conjunction with the mode of using it, be in the possession of every family, because delay will render it abortive. It is prepared and applied in the following manner : Make a strong wash, by dissolving two tablespoonfuls of chloruret of lime in half a pint of water, and instantly and repeatedly bathe the part bitten. The poison will in this way be decomposed. It has proved successful when applied within six hours after the animal has been bitten.

It may be now proper to say that I have made this communication, because the fact stated is one of recent discovery : and I have made it the more full, connecting with it the rationale, thatit may obtain the greater confidence with hose who, though not conversant with chemical science, yet can appreciate the force of reason in any science ; and I have affixed my name, because an anonymous notice of a fact does not necessarily bear with it the verity or responsibility of a name.
' I have the honor to be, sir, Yours, etc.,
" Joseph E. Muse."
Hoping this letter will serve to invite the attention of scientific men to experimental investigations relating to the internal use of chloride of sodium and chloride of lime, in addition to the already higbly extolled external use of these substances, and that they will prove satisfactory substitutes for the present barbarous and unscientific knife and actual cautery-if the poison is on or near the surface of the wound, these substances will destroy it ; if it is absorbed, they may extract it or neutralize it ; the knife and cautery can de no more on the surface, and nothing but injury if the poison is absorbed.
J. M. Worthington, M.D.

109 Church Street, Annapolis, Md.

## Explosion of a Slag Ball.

The Ironmonger relates an account of an accident of an larming character which recently occurred at South Bank, Middlesborough. Near the railway station, says our London contemporary, is the slag heap of the Cargo Fleet Ironworks. A large slag ball had been taken from one of the furnaces and tipped over the slag heap, when it exploded. Three large pieces of the molten slag fell through the roof of the railway station on to the platform, and several passengers awaiting the train to Middlesborough narrowly es. caped being injured.

ELECTRIC LIGHTING ON THE ARIZONA
The progress of electric lighting is well illustrated by the example we herewith illustrate, showing the electrical ma chinery now in use on board of the fast ocean steamer Arizona, plying between New York and Liverpool. Our engraving and particulars are from Engineering.
The Arizona is fitted with two of Siemens' compound shunt wound dynamos, each capable of maintaining 300 high-resistance Swan lamps, driven by a pair of Shanks ${ }^{\text {' }}$ "Caledonian" engines, with cylinders $91 / 2$ inches by 14 inches. Each dynamo is fixed upon an independent base plate, sliding upon round rods in a foundation plate. The side of the base that takes the strain of the driving rope is lengthened into a long slide, and the two machines are slightly displaced laterally, so that their bases interlock. By means of screws both dynamos may be drawn backward to tighten the belts. There are ten grooves in each fly wheel, but there is only one rope to each machine, and con sequently but one splice. This necessitates the use of a guide pulley to lead the rope from the last groove of the driven to the first groove of the driving pulley. Only one of the pulleys can be seen in the engraving, the other being hidden by the mast. The axis of one machine is elongated, and is provided with a pulley for driving a tachometer mounted upon the top of the frame. The commutator brushes are set on a bracket, which can be rotated mutator brushes are set on a bracket, which can be rotated
chief purposes of the Mutual Fire, viz., the prevention of fires, it is appropriate to call the attention of our policyholders to this hazard in its many headed forms, and to adopt such stringent rules and inspections as practically to abolish spontaneous combustion within the risks carried on our books.
Closer attention should be given to the spontaneous origin of fires, although it saves painstaking investigation to ascribe them to incendiarism, and the owner prefers to call the cause " unknown" than to admit his carelessness In the official reports from the whole State of Massachusetts for 1881, as given by city and town authorities, in the summary of causes of fires, 365 are reported as "unknown," 310 are claimed to be "incendiary," and after ' heating," and " lighting apparatus," "spontaneous com bustion" leads the list, having created 56 fires. Intelligent observation will in coming years decrease the number of fires called "incendiary" and " unknown," and show that bad management and carelessness are the principal causes of such fires.
The great incendiary to be dreaded is Oily Waste, whether n cotton waste, animal fiber, as wool and silk, or vegetable fiber, such as raw cotton, jute, and "Excelsior." In some form it is found everywhere, in private houses and in stores; in shops and factories; at sea and on land; and the higher the mechanical skill and the more costly the pro duct, the more frequent is its existence. Most men hro
thinkingly, men say iron will not burn, and the proprieto of works which have turned out immense quantities of valuable product for the U. S. Government seemed surprised at the hazard in a pile of damp iron filings, into which had fallen drops of oil and a little cotton waste. In that case only the low temperature of the room or the excess of water bad prevented a spontaneous fire.
Common Causes.-The more usual cause of these fires are "oily waste," "rubbing rags," " Excelsior" used for rubbing and finisbing, "oiled rags" for cleaning sewing machines, oiled paper used for lining packing cases, iron grindings, piles of coal, etc. The present object is to suggest practical methods for overcoming the danger of spontaneous fires from those principal causes with which we come in daily contact.
Oily waste is the most common cause of spontaneous combustion, since it is found in every factory, store, hotel, office building, etc., baving even an elevator in it. The usual custom prevails among the better houses to remove the "oily waste" daily, yet it is quite common to find it lying upon the floors, upon and under workbenches, and ften with the clean waste
"Oily waste" which is permitted to lie around during the day is not likely to be cleaned up carefully at night, and even in the best establishments fragments will fall under machinery, benches, tables, and heating apparatus, besides the surplus carried into rat holes. Then again it is fre-


ELECTRIC LIGHT MACHINERY OF STEAMER ARIZONA.
favorable line, and the conductor, which is of large cross section, is jointed, so as not to impede the motion.
By this machinery all parts of the great ship are brilliantly lighted with electric lamps. Looking back for only twelve months, immense advances are to be seen in this department of electric lighting. It is no longer a question with the Liverpool companies in what parts of the ship the light shall be used, for it is now applied everywhere, and both cabin passengers and emigrants share in its benefits. At the present time there are more than a dozen American liners fitted with Siemens generators and Swan lamps, and the number is increasing every month. Besides these there are vessels of the Orient, the Castle, the British India, and other lines, which probably bring the total up to three times that number.

## Spontaneous Combustion.

Secretary P. B. Armstrong, of the Mutual Fire, of New York, has sent the following circular to the members of his company, which merits consideration by all who are interested in reducing the number of fires:
Oily Waste.-The frequency of fires from spontaneous combustion is constantly increasing. Only a few years ago this was a debated point between underwriters and business men, but, especially since the introduction of novel products of petroleum and the formation of new chemical compounds, now all observing men admit the power of spontaneity. Chemistry and science are only seemingly arrayed against good underwriting in introducing new agencies of combustion. Pursuant to one of the
the ready excuse that only a small quantity is used, and therefore it is not dangerous. A handful of cotton waste immersed in a pan of linseed oil is harmless; the same waste with a few drops of oil makes the effort to carry the tiny globules along its fibers by capillary attraction, until it is arrested by the microscopic kinky structures, and especially when under the joint mechanical and chemical action of the sun, combustion spontaneously arises, and another fire is reported as "incendiary."
Rats and mice have great affection for the soft, slightly oily fragments, which they incorporate in their nests, as heedless of the danger of spontaneous combustion as are the more intellectual tenants of the same premises; and in their august assemblies and nightly clubs, they doubtless declaim against incendiarism and the mysterious origin of fres.

In this brief paper it is impracticable to enumerate the particular cases of spontaneous combustion which occur in almost every branch of trade from numerous causes. Two years ago "cordonnet silk" attracted particular attention here, though in England it had been recognized as a special hazard for fifteen years. Phosphorus has recently educated some men concerning its well known powers, and the danger from leaking acids, as used in the electrical batteries stowed away in dusty corners, has been often emphasized by fire-loss.
As even water can be changed into its constituent elements, and transmuted into combustible gases, nothing seems to escape this insidious power of combustion. Un-
quently swept up with other rubbish, placed in barrels, and kept over night, to the hazard of property valued at hundreds of thousands of dollars.
Rags used in cleaning sewing machines are commonly placed with the "cuttings," or with the floor sweepings, and repeatedly our inspectors have urged discontinuance of such conduct. Hereafter where such carelessness is discovered and not immediately remedied, our policies will be discontinued without delay.

## Novel Railway Propulsion.

A railroad is being constructed from Territet to Glyon, in Switzerland, to be completed next September. The steep mountain side is climbed in a manner similar to the railway up the Riga. The motive power of the Territet and Glyon road is to be water, derived from a reservoir in the hills above Glyon. The use of water in place of coal will not only be a great saving of cost for fuel, but the carriage of fuel up the mountain will be another saving in the running expenses.

## Imitation Walnut

We have it on good authority that an excellent stain for giving light-colored wood the appearance of black walnut may be made and applied as follows: Take Brunswick black, thin it down with turpentine until it is about the right tone and color, and then add about one-twentieth its bulk of varnish. This mixture, it is said, will dry hard and take varnish well.

## THE HELMET CASSOWARY.

The cassowary (Casuarius), of which not less than nine distinct species bave been discovered, differs from the emu in having a somewhat more slender body and hair-like feathers. The helmet is quite remarkable, and is composed of a cellular bony substance. It is barely perceptible in the young bird, not reaching its full development until the bird arrives at adult age. The plumage of the body is hair-like, with a tuft of down at the root of each shaft. The short, with a tuft of down at the root of each shaft. The short,
thick foot has three toes. The height of the bird is about five feet. These birds are found in the Malaccas.
The helmet cassowary (Casuarius galeatus, Struthio casuarius), shown in the engraving, has been the longest known of this family. The plumage is black, the back part of the head green, the neck is colored with blue, violet, and red, the bill is black, and the foot a yellowish gray. The young birds are brown.
All travelers who tell us of the wild life of this bird agree that it inhabits the thickest forests, and leads a very retired life, and at the least appearance of danger it hastens away, and seeks to with draw itself from the sight of men. How difficult it is to observe them may be seen from the fact that Miller never had the opportunity of seeing a cassowary, although he found their tracks and beard the noise of the bird fleeing through the thicket, and Wallace in Ceram could not make a single capture, , although he sought for the bird in all its accustomed haunts; He says: "These birds wander through the great mountain forests of Ceram, and subsist chiefly on fallen fruits and herbage. The femaje lays from three to five large beautifully granulated green
through doors left ajar, follow the servants step by step, rummage in all the corners of the kitchen, spring upon the table and chairs, to the great disquiet of the cook. If any one attempted to catch them, they would run quickly around or creep under the furniture, defending themselves vigorously with bill and feet. If left free, they would go back of their own accord to their accustomed dwelling place. Sometimes, when the maid attempted to drive them away, they would strike out at her and tear her clothes. Tbey would run into the stall between the horses and eat with them from the manger. Often they would push open the door of Dr. Bennett's study, run quietly around, look at everything, and go their way. Dr. Bennett says: "It was dangerous to leave any object around which was capa ble of being swallowed. The servant was starching some muslin cuffs, and hearing the bell ring she squeezed up the cuff, threw it into the starch, and attended to the summons On her return the cuff was gone, and she discovered that the mooruk was the thief, its beak and head being covered with the starch. This occurred at eleven A. M., and at balf past five P. M. the cuff was passed quite undigested and uninjured." The height of this bird is about five feet when standing erect.-From Brehm's Animal Life.

## Are Trichinæ Killed by Salt?

The prohibition of the importation of American pork by the German Government, on account of the alleged presence of the microscopic worm known as trichinæ, has awakened a large degree of interest among pork raisers and shippers in this country. That trichinæ are sometimes iound $n$ n
the most positive proof. The law governing parasitic existence in living tissue usually involves the speedy death of the parasite after the pabulum upon which it feeds has passed from under the domain of vital force; hence, unless this tiny worm constitutes an exception to this law, its life must be short after the organic structure upon which it feeds has ceased to live."
Consul Wilson very pertinently adds that "if salt really kills trichinæ, and of it I have scarcely a doubt, it is evidently an injustice on the part of foreign governments to lay an embargo on our pork product, which, of all others, in order to secure it against decomposition on a long journey to foreign markets, is better salted than that of any other country."

## The Medicinal Value of Vegetables.

On the autbority of the Medical Record, asparagus is a trong diuretic, and forms part of the cure for rheumatic patients at such health resorts as Aix-les-Bains. Sorrel is cooling, and forms the staple of that soupe aux herbes which a French lady will order for herself atter a long and tiring journey. Carrots, as containing a quantity of sugar, are avoided by some people, while others complain of them as indigestible. With regard to the latter accusation, it may be remarked, in passing, that it is the yellow core of the car ot that is difficult of digestion-the outer, a red layer, is ender enough.
In Savoy the peasants have recourse to an infusion of carrots as a specific for jaundice. The large sweet onion is very rich in those alkaline elements which counteract the


## THE HELMET CASSOWARY.

eggs, and male and female sit alternately upon them for the space of a month.
All the cassowaries which have been taken to Europe were captured when y young by the nalives and brought up by them. This is perhaps the reason that many of them are tamed and appear to be gentle and confiding, although their original disposition is the reverse of this. They are naturally fierce, and take offense without any provocation. They are greatly excited by the sight of a scarlet cloth, and have a great antipathy toward ragged or unclean persons, sometimes attacking them.
They sometimes become ungovernable in captivity, and the keepers of zoological gardens say that one cannot be too cautious with the cassowary. "When irritated, they are formidable antagonists, turning rapidly about and launching a shower of kicks, which may do no small damage, their effect being heightened by the sharp claws with which the toes are armed." In confinement they often swallow whole apples and oranges. In the gardens they are given a mixture of bread, grain, cut up apples, etc., but it has been observed that young fowls or owls which come accidentally in their way are destroyed.
They often lay eggs in captivity, but it is very seldom that any young are raised. It is not often that a pair can be obtained that will live together in peace.

Another species of cassowary was discovered in the island of New Britain. Its native title is mooruk. A pair of these birds were purchased by Dr. Bennett in 1857 from Captain Devlin, and were sent to England. They were very tame, and ran around everywhere in the house and yard without fear. In time they became so obtrusive that they disturbed the servants in their work, for they would crowd
pork (and in some other food flesb) is not to be doubted. That proper cooking of meats for food destroys them is un questionable. That all authenticated cases of injury to health arising from the presence of this microscopic worm were traced to the eating of uncooked or half raw meat is fact. But that the salting of meat destroyed the parasite is still a matter of doubt, or, at least, it is a subject of dispute On this point United States Consul John Wilson, stationed at Brussels, makes some statements, based on his own observations. He says:
'I have myself been present when officially appointed microscopists at some of the abattoirs of this country have been engaged in examining American pork for trichinæ, and bave been invited by these gentlemen to see for myself, through their microscopes, the peculiar cell and spiral coil of the animal; but on carefully examining them I haveonly observed, blended with the tissue and minute salt crystals, the entombed animal, evidently as destitute of life as the structure in which it was embedded.
" It is claimed by most trichinic observers that the process of generation and birth of this little animal invariably takes place in the stomach and intestinal canal, and that within a few days from its birth it has so matured as to penetrate the walls of the intestines and rapidly makeits way through the various intervening structures to the remote muscular tissue of the animal it infects, there to be speedily encysted and endowed with a subsequent dormant existence of several years, during which time its presence occasions little or no inconvenience. Of this theory of the life and movements of this little worm I can only say that it involves an almost unparalleled exception to the law generally regarded as determining animal life, and ought not to be accepted but upon
poison of rheumatic gout. If slowly stewed in weak broth, and eaten with a little Nepaul pepper, it will be found to be an admirable article of diet for patients of studious and sedentary habits. The stalks of cauliflower have the same ort of value, only too often the stalk of a cauliflower is so ill-boiled and unpalatable that few persons would thank you for proposing to them to make part of their meal consist of so uninviting an article.
Turnips, in the same way, are of ten thought to be indigestible, and better suited for cows and sheep than for delicate people; but here the fault lies with the cook quite as much as with the root. The cook boils the turnips badly, and then pours some butter over it, aud the eater of such a dish is sure to be the worst for it. Try a better way. What shall be said about our lettuces? The plant has a slight narcotic action, of which a French old woman, like a French doctor, well knows the value, and when properly cooked is really very easy of digestion.

## A Picture in the Heart of an Oak.

A correspondent of the Waterbury (Conn.) American writing from Watertown, says that Mr. Benjamin Marvin, of that town, in splitting a log of black oak, observed a picture on the smooth grain in the heart of the tree. It is a landscape, or rather a clump of trees, with trunk and branches and twigs as clearly defined as though drawn with ink or photographed by the sun's rays. The trees form a picture about four inches square, showing like the open leaf f a book and the same on the opposite page. M. Marvin says it is a pretty good portraiture of the clump of trees which he felled, the picture appearing in the heart of the largest one.

## RECENT INVENTIONS

## Bagasse Furnace.

The engraving sbows a furnace in which green bagasse may be burned as fuel in the manufacture of sugar and molasses in localities where fuel is scarce and expensive. The invention consists of a chute or chutes contrived, in connection with the furnace, for feeding the fuel along where it is exposed to the - heat of the furnace or the fue leading there from to the chimney a suitable distance, and
for a length of time enabling the fuel to dry and heat, so that it will burn with good results when it finally discharges into the fur nace. In evaporating and other furnaces the inventor proposes to arrange the chute to enter the furnace from the back, where the fuel will bave the benefit of the whole length of the run of the flame under the evaporating pans from the furnace to the chimney. This invention has been patented by Mr. John Hill, of Independence, Kan. (Box 224).

## Fruit Picker

We give an engraving of a very simple and effective fruit
 picker recently patented by Mr. Lebbeus Simkins, of Marshfield, Oregon. The invention consists of a tube having at its upper end two hollow hemispherical cups, one fixed to an arm projecting from the tube, the other secured to a lever pivoted to the tube and having its shorter arm pivoted to a rod ex tending down the tube and connected with hand lever, by which the movable hemi spheres are brought together upon the fruit to be picked. A spring attached to the upper end of the rod separates the movable hemisphere from the fixed one when the hand lever is released. With this implement fruit may be picked from the outer and top limbs of a tree, where it could not be reached from a ladder or from the tree, and lowered to the ground or into a basket without being injured.

## New Cartridge Implement.

The engraving shows a new instrument for capping, loading, and extracting shells, also for removing the caps from the shells. The instrument is composed mainly of three parts, an arm, a haudle jointed to the rear end of the arm, and an auxiliary arm, jointed to the handle near its pivot. The main arm is apertured near the pivot of the handle for receiving the body of the cartridge shell, and the handle has an anvil above the center of the apertured portion of the main arm, so that when a shell is passed through the aperture with its flange resting upou the upper side of the arm, the primer or cap can be forced into the shell by means of the handle and its anvil as shown in Fig. 1. Upon the end of the auxiliary arm is a perforated or semicircular flange, made with a groove for receiving the flange of the shell for the purpose of extracting the shell from the gun. Upon the end of the main arm is a pin, and the arm is also screw threaded for receiving a hollow block which is used as a rammer for loading the shell, and also as a guide for decapping. This invention has been patented by Mr. Edmund R. Darling, of Woonsocket, R. I.

## Improved Bag Holder.

The engraving shows an improved device for holding bags while being filled. A cast iron frame is secured in a vertical position to the wall or other support by means of screws, nails, or other convenient fastening. This frame is formed upon its front face and upper edge with the notches, and is formed with the inwardly projecting flanges with which the T-stud of the sliding head is adapted to engage for locking the head and frame together, and at the upper end of the frame these flangés are cut away, so that the head may be attached to and detached from the frame. The siiding head, besides being formed with the T-stud at the back, is formed also with the lip near its lower end, that
is adapted to rest
in the notches of the
frame. Upon the upper end of the sliding head there is a stud which is squared at its lower end as shown, and round at the upper end. Upon the squared portion of the stud is fitted one of the curved arms, and upon the round portion is placed the other curved arm; this arm is normally held back away or open from the other arm by a coiled spring. In use the movable arm will be drawnforward to ward the fixed arm and held while the open end of the bag to be filled is placed over or upon the arms.

The movable arm will-then be released, when the spring will draw it back, and thus hold the bag upon the arms and hold the upper end of the bag open. The sliding head will then be raised in the frame to suit the length of the bag. The edges of the arms are notched or serrated to insure firm hold on the bag. The device constructed in this manner is very cheap, durable, easily handled, and may be adjusted to bags of various sizes and lengths, so that it is perfectly practical for its purpose. This invention has been patented by Mr. E. E. Alderman, of Portville, N. Y.

## Benson's Culinary Heater.

This invention is a combination of a cylindrical vessel and an inverted funnel. It is intended for boiling and keeping hot, water and other fluids by means of a gas or oil lamp, the flame of which is introduced into the funnel, and thus utilizing nearly all the heat. This device will be found very useful to restaurant-keepers, barkeepers, barbers, and others who wish to keep hot water constantly on hand. A

small article made in this way is useful for shaving and other toilet purposes. It will be a very great convenience in the sick room and nursery.
This device may either be used as a cup or as a funne To dealers in liquids this combination will be valuable
The engraving shows the heater applied to a gas burner also to a kerosene lamp.
For further particulars, address the patentee, Dr. W. H Benson, Staunton, Va.

## Man's Invisible Foes.

The most indifferent and self-confident man, to whom sickuess and disease are merely matters of speculation or curious inquiry, would feel his courage, like Bob Acre's, "ooze out at the end of his fingers" should he meet Dr . Burrill's summary of the bacteria, those minute organisms, one twenty-five thousandth of an inch in diameter, which swarm through the air, infest decomposing materials, and which might, under the most favorable conditions, multiply at the rate of three hundred billions in forty-eight hours from one individual. Dr. Burrill's discussion of the bacteria is interesting, though not especially striking in any new information it imparts, but the synopsis of genera and catalogue of species with which it concludes is quite valuable to workers in protistic life. Thirteen well defined genera and two doubtful genera are enumerated, and their characters briefly stated are as follows:
Micrococcus. Cells globular or oval elliptical, motionless, isolated or united in chains. These embrace pigment form ing micrococci, 7 species; ferments, 4 species; disease germs, 11 species; doubtful species, 10.
Ascococcus. Cells globular in irregular groups, of ten lobed and enveloped by a capsule of firm jelly; this genus contains one species.
Cohnia. Cells globular, inclosed in a jelly-like sac more or less spherical, the walls at last breaking up in net-like openings. It includes one species found in swamps, on de composing algæ, etc.
Sarcina. Cells globular, dividing in two or three direc tions, secondary cells small, joined in solid or tabular faui lies in fours or multiples of four. The genus embraces five species.
Bacterium. Cells short cylindrical or long elliptical, rapidly moving much as micrococcus; 14 species.
Bacillus. Cells elongated, attached in rod-like rows or hreads, also forming chains; 10 species.
Leptothrix. Very long, slender unbranched threads; 2 pecies.
Beggiatoa. Filaments very long, slightly or obscurely jointed, moving rapidly; 8 species.
Cladothrix. Like Leptothrix, very slender, colorless, ranched, undulating, doubtful; 2 species.
Myconostoc. Filaments slender, colorless, not. jointed, mbedded in jelly; 1 species.
Spirochæta. Filaments long, very slender, closely ound in places, active; 4 species.
Spiromonas. Cells flattened, spirally twisted; 2 species.
Spirillum. Cells cylindrical, a hair at each end curved r wound; 10 species.

The Saccharomycetes, not included in the foregoing ist, are the yeast fungi, and embrace 11 species.
The number of apparently authenticated species is large but perhaps not so large as the fervid imaginations of students in biology may yet make it. It is to be hoped that the burning zeal which evolves these perplexing forms will be tempered if not quenched by the prudent use of some medical conservatism.

## Gas from Iron Cement.

In the construction of a railway bridge over the Forth, a number of cylinders were sunk into the bed of the river. They were built of iron rings 6 feet in diameter and several feet high, and made a total height of 60 feet. The space round the sections was filled up from the inside by a rusting composition of iron turnings mixed with sulphur. and sal ammoniac. When wet, this mixture oxidizes and swells up, so as to fill the spaces into which it is thrust. It was applied to the joints by one man. One day last May, however, when there was a perfectly still, somewhat hazy atmosphere, and considerable heat without direct sunshine, this man was observed to become overpowered by some " mysterious influence," and a companion descended by a windlass to bring him up to the top of the cylinder. He managed to get the man into the bucket of the windlass, and so to get him hauled up inter purer air; but the deliverer himself succumbed to the same influence, and falling into a himself succumbed to the same influence, and falling into a
pool of water at the bottom of the cylinder was unfortupool of water at the bottom of the cylinder was unfortu-
nately drowned. One of the contractors now descended, taking care, however, to fasten a rope to his body, and it was fortunate he did so, as he also succumbed and had to be pulled out by the rope. Dr. Wallace was called in to account for this fatal accident and traced it to the absorption of oxygen by the rusting compound, thus depriving the air in the cylinder of its sustaining power. The oxygen com bined with the iron and sulphur of the mixture, and the state of the atmosphere prevented free circulation of fresh air into the cylinder. The result was that the gas breathed by the man was nitrogen, or air robbed of its oxygen. The normal proportion of that gas in the air is $20: 9$ or 21 per cent, and Dr. Angus Smith has shown that this proportion cannot be altered, even by one-quarter per cent, without producing appreciable effects, while a loss of one-half per cent gives rise to serious inconvenience, and air containing only 20 per cent of oxygen may produce grave consequences if breathed for a considerable time. When the deficiency of oxygen exceeds this to a sensible extent, a candle refuses to burn:

## Brilliant Colors for Glass and Porcelain.

by dr. r. Kayser.
The pigments commonly employed for decorating glass and porcelain have hitherto been prepared either by melting the metallic salt, which is generally the nitrate, in resin (colophonium), or by decomposing soluble resin soaps with the solutions of these salts, whereby an insoluble resinate is formed, which is first dried and then dissolved, just as that formed by fusion is; in oil of turpentine, or lavender, or in nitrobenzol or some similar solvent.
Both of these methods of preparation have their disadvantages, the principal one being that a considerable quantity of the metallic salt remains undissolved, and when the resinous mass is dissolved it is precipitated, and lost, or, at best, is only recovered by a tedious operation.
With the help of carbolic acid these pigments can be prepared without difficulty and without any insoluble metallic compounds separating worth mentioning
Bismuth.-Ten grains of metallic bismuth are dissolved in aqua regia and evaporated in a porcelain dish to a thin sirup. When cold 50 grammes of carbolic acid liquefied by gently warming in hot water are added. It is left standing a few hours, for if warmed and stirred at once an energetic reaction takes place with .violent foaming. At the end of this time it is well stirred with a glass rod and heated awhile in a steam bath, when there will be an evolution of hydrochloric acid vapors. It is taken off the steam bath as soon as a drop taken out on a glass rod will dissolve clear in itrobenzol. When this point is reached, the mass is dissolved in nitrobenzol or a mixture of nitrobenzol and oil of spike, when the preparation will be ready to use.
lin.-Ten grammes of pure tin are dissolved in aqua regia and the solution evaporated to a thin sirup, then mixed with 50 grammes of carbolic acid in the manner above described. The remainder of the operation is the same as for bismuth. Uranium.-Fifteen grammes of nitrate of uranium are mixed'with 40 grammes of pure hydrochloric acid and dis solved. This solution is also mixed with 50 grammes of car bolic acid, as before, and treated as already described.
Iron.-Fifteen grammes of perchloride of iron are dissolved in pure hydrochloric acid and any excess removed by evaporation, so the solution when cold will have the consistence of a thin sirup. To this are added 50 grammes of carbolic acid; and it is then treated as described under bismuth
A manganese pigment can be made from the chloride of manganese; and nickel and cobalt pigments from their chlorides in precisely the same manner as that of iron wa made from its chloride.
Of course the finished preparation can be diluted to any desired extent, as the concentration of the original prepara tion leaves plenty of play for dilution.
The different pigments above described may be mixed with each other to form all kinds of combinations.-Deut Ind. Zeitung.

## ENGINEERING INVENTIONS.

An improved balanced slide valve is the subject of a patent granted to Mr. Jeremiah Murphy, of
Brooklyn, N. Y. This invention provides a valve which Brooklyn, N. Y. This invention provides a valve which
is balanced by the steam, thus relieving the valve of undue friction and requiring less power for operating the valve.
An improved journal box for car wheels and loose pulleys has been patented by Messrs. Georg
Sargood and F. L. Hemmer, of East Arlington, Vt Shis boo is air tight, and is so constructed that the
Thearing may beadjusted as the axle wears away, the
beat bearings may be adjusted as the axle wears away, the
air being excluded from the box to prevent the gumair being exclude
ming of the oil.
A novel switch lock has been patented by Mr. David H. Speer, of Pittsburg. Pa. This invention relates to locks for securing the lever by which a railroad switch is operated; and consists in a spring-actu-
ated bolt, combined with devices for setting the same in such a manner that it will be tripped by the disengagement of the lever ard thrown into position for automatically locking the lever
A very simple, and we should think effective car coapling has been patented by Messrs. B. W. W.
Harry and J. C. Kieffer, of Milton Center, $\mathbf{O}$. A slidHarry and J. Co Kieffer, of Milton Center, o. A s.in-
ing block is projected by a spring within the aperture in the head block, through which the coupling pin passes. .n coupling the cars the connecting link passes
into the drawhead, depresses the sliding block, which libera
ally.
A relief valve for steam fire gines to pre vent the occurrence of the water hammer and reaction
ary force of the water when the jet from the bose is ary force of the water when the jet from the hose is
suddenly stopped, has been patented by Mr. Richard H. Atwell, of Baltimore, Ma. This valve is ocated in hose, doing away with an extra valve chamber, and it is so arranged as to be opened automatically by the dynamic force of the water
Mr. Edward Ebi, of Cedar Rapids, Iowa, las patented a novel coupling for brake rods, which is
an improvement upon a patent granted to the same inventor October, 1882. The present invention consists provided at the outer ends with heveled pronss Thes gride blocks guide the clutch disks at the ends of the brake rods together, so that they can engage. The and may
Mr. Clarence C. Delano, of Musson, La., is the inventor of an improved car conpliig, which is so
constructed that when the cars are to be coupled the pin of the one into which the link is to enter is made to rest on a lever. The link raiser of the car containing
the link is then turned so as to raise up the projecting link high enough to enter the socket of the drawbar to which it is to be coupied, and so held until the link encurely coupled.

A railway signal in which a vane, a gong, of ble distance from the signal, is the subject of a patent air pumps are located at each end of a section of the rail track, and connected together by an air tube. An
engine passing over the section in either direction will operate the pump and display the signal, and then conceal it, and the pump first actuated
normal position by the air pressure.
Another novelty in car co patented by Mr . C . patented by Mr. J. C. Look, of Yuba City, Cal. The
drawhead of the coupling in this instance consists in drwo horizontal parallel plates counected with one an. other by studs, each plate being provided with a hook ling the cars. The cars may be nncoupled by a chain which is connected dat one end with the grid and at the
other with a capstan which is rigged on the top of the
${ }^{\text {car. }}$ An improved rock drilling machine is the subject of a patent granted to Mr. Henry Dunham, of
Glen Aubrey, N. Y. The drills are held in position for work by clamps arranged in a row in the lower part of the an oscillating beam above in such a way that they may be raised und brought forcibly against the ends of the drils for producing the holes in the rock. A pawl and ratchet is provided for rotating the drill at each blow of the sledge. The frame of the machine is mounted upon
wheels which move on a track, and it is also provided with cog wheels which mesh with a rack for setting feeding up, and removing the drills.
An improvement in feed water regulators has been patented by Mr. J. S. Clarke, of East China, Mich. The feed water pipe which connects the pump
with the boiler is provided with a waste pipe and a with the boiler is provided with a waste pipe and a
valve, to open the waste pipe when the boiler is fall, and to close itanc cause the water to enter the boiler
when the water begins to fall in the latter. This valve is controlled by a float in the boiler, which float operates a whistle of alarm in case the pump fails to act and
the water falls too low in the boiler. The same inventor has more recently obtained another patent for some improvements upon the above invention. These relate,
in the first place, to a device for obtaining a uniform pressure bothe externally and internally upon the float, ther, of a device for relieving the pressure when the ther, of a device ored, by means of a relief valve which
main valve is closed is operated automatically by the main valve. An improved method of working
boiler is likewise provided.

## mechanical inventions.

Messrs. Geo. B. McCracken and Samuel Hamer, of Willimantic, Conn., have received a patent
for improvements in spindle bearrings for spinning frames for insuring proper support and lubrication of
the spinde without a loss of oil.
A tension device for
A tension device for sewing machines has recently been patented by Mr. Hiram Holden, Jr., of
Spencer, Mass, which is intended for use for either
wax or dry thread sewing machines, and insures the
thhtening of the thread in the work and prevents reaking or cutting of the read.
An improved gear cutter for cutting beveled, straight, spur, and worm gearing bas been patented by Messrs. John Brooks and wiliam scully, of Detroit,
Mich. This machine is designed to provide a gear cuter that can be used upon any lathe or upon any ma-


Mr. D. H. Lord, of Northfield, Minn., has patented a mill stuff recovering macbine, by which any arplus meal or dust accumulating in different parts of passing to the dressing machinery in a much more satisactory manner than by the common method of feeding
Mr. Hugh O. Ames, of New Orleans, L has patented a pan for evaporating cane juice which is an improvement upon a patent granted to Mr. Ames in
December, 1880. The object of this improvement is to December, 1880. The object of this improvement is to
give the liguid a uniform heat and a steady circulation or the purpose of expediting the process of evaporation by methods formerly employed.
An improved ice cream freezer has been panted by Mr. Ferdinand Espel, of San Francisco, Cal. The salt is kept from settling at the bottom by changing the horizontal position of the freezer from time to time, so that what was at first the lower part of the
freezer will be at the top, and thus canse continual circulation of the salt, greatly expediting the freezing pro-
An improved ear corn cutter has been patented by Mr. J. N. Howser, of Sidney, Ill. The object of this unvention is to provide a cutter having a yielding gauge to permit the slice to recede as the thickness
the blade parts the corn from the ear. The gauge is made adjustable as to the thickness of the slice to be cut. Means are provided whereby the cut corn shale.
turned away from the lower gearing of the machine.
A removable valve cover is the subject of n invention of which Mr. E. E. Carter, of Waynesburg Pa., is the patentee. The object of this improvement
is to provide a valve cover which can be readily taken off and replaced, so as to afford easy access to the valve and its seat, and to the interior parts of the adjacent cleansing of the valves and pipes.
A cotton gin of improved construction has een patented by Mr. 'Thomas Camp, of Covington, Ga The lower edge of the gin breast is provided with a eries of slots adapted to register with the spaces be
ween the ribs, so that the cotlon shall be ginned hrough the slots instead of between the ribs, thus separating the cotton fiber from the seed without matting and napping the fibers.
A very simple but effective device for level ing pendulum clocks has been patented by Mr. R. B.
Freeman, of Blossburg, Pa. The clock is provided with n adjustable back to which the works are attached his supplementary back is changed to any necessary as to insure accuracy of beat without disturbing the都ion of the clock case
An improved curd mill has been patented by Messrs. Goswin Castle and George D. Pohl, of Ava, N. Y. This invention consists of an apparatus for grinding
curd in cheese factories before it is taken ont of the vat nd preparatory to putting it in the hoons, and consists of a pair of toothed rollers working together, the teeth being contrived for tearing or breaking up the curd ather than cutting or squeezing it. An attachment is provided for salting the curd while grinding it.
An ejector for the purpose of raising water or other liquids from wells by the means of compressed
ir has recently been pans air has recently been patented by Mr. W. O. Robbins,
of New York city. As compressed air is very apt to bubble through liquids without raising them, the invent or provides a series of check valves, so arranged tha
they cannot pass through the discharge pipe without orcing the airs to act on the column of liquid and to raise it.
An improved lifting jack is the subject of a patent granted to Mr. Marcus Eaton, of Circleville, 0 . may be elevated, so that both wheels will be raised from the ground at the same time. This jack is espe cially recommended to the attention of carriage build-
ers, where it is necessary, in painting and varnishing the gearing, that all the wheels of the vehicle should be An impror
An improved vehicle wheel which the inentor terms a "steel suspension wheel," and designed patented by Mr. E. G. Ferguson, of Macon, Ga. The at the hub. A spiral spring around the pairs of disk two sets of disks apart with a yielding strain, to compensate for the expansion and contraction due to varia ion in temperature.
An ingenious combination lock has been patented by Mr. William B. Atkinson, of Franklin, Ky. The invention consists of a combination lock having a
ward wheel in engagement with each side of the bolt and means for controlling the operation of the tumbler in rotating the ward wheels and moving the belt, and
in certain means for converting the bolt into a spring in certain means for converting the bolt into a spring
bolt aterey a very simple lock is provided

Mr. W. H. Davis, of Verona, Miss., who specially adapted for cotton gins, mills, etc., has pa ented recently some improvements on the same. The counter shaft pulley, the guide pulley, and the sliding rame which carries the guide pulley in such a manner that the driving band will pass squarely upon the coun-
ter shaft pulley, economizing space, and avoiding
An improved hoisting device to be em ployed in elevators tor coal, ore, etc., in which a wind-
ing drum is used to elevate coal from a vertical shaft by
hand by means of bucket and rope, bas been patented
by Mr. C. W. Baldwin, of Denver, Colo. A reciprocating lever is provided by means of which intermitten motion is communicated to the winding drum in one direction. Devices are also provided for lowering the
bucket rapidly into the shaft, and for regulating the de sucket rapidly into the shaft,

A flexible fire escape ladder of improved construction has been patented by Mr. Wesley C. Bush of Brooklyn, N. Y. This improvement consists of tw der, and are united by rungs. These links are of metal and are pivoted one to the other in such a manner tha the ladder may be wound on a drum in one direction,
while it is entirely stiff and inflexible in the other direc tion. In this way the ladder may be rapidly unrolled and in position in case of fire
Mr. G. W. Pittman, of Keokuk, Iowa, is he patentee of an improved bench vise which the in ventor claims may be operated more quickly and more
easily than those commonly in use. In this vise of Mr. Pittman both large and small objects may be held b the jaws with equal facility and without the necessity
of unscrewing and screwing up the jaws, as is the cas of unscrewing and screwing up the jaws, as is the case
with vises of the ordinary construction. It is likewise a simply and cheaply constructed implement, and is equally adapted for heavy and light work.
An improved coke furnace and apparatus for the delivery of the coke into cars has been patented
by Mr. Richard Thomas, of Carbondale, Ill. The object of the improvement is to provide for the withdrawal of coke from the furnaces in which it is made, and for the loading of the coke into railroad cars, without the use of rakes, forks, or other devices, thereby reducing the labor heretofore required in handling the coke, and saving the waste resulting from such handling. This
is an improvement upon a patent granted to the same ventor in November, 1881
An improved davit and chair for life boats has been patented by Mr. J. H. F. Meyer, of Yhiladel phia, Pa. The chairs upon which the boat rests, in-
stead of being stationary as is ordinarily the case, are hinged and connected with one another in such a wa that when the boat is to be swung out for use, thes chairs ate lowered out of the way which obviates th Further, the davits are hinged at their lower ends that when the boat is to be lowered, the davits are swung forward, thus bringing the boat into position for clearing the side of the ship. At the same moment the pin which retains the boar in its elevated position is liberated by the swinging of the davit, and the boat be-
ing lowered into the water will be automatically released from the ropes by the action of the connecting ear. This so far simplifies the operation of lowern the purpose.

## agricultural inventions.

Mr. David Wise, of Paradise, Texas, is the opera of an improved seed planter, so constructed as to operate automatically by the action of the wheels. A
lever is provided by means of which the opening plow may be adjusted to work at any desired depth in the ground, and can be raised from the ground when de sired. A foot lever is provided for throwing the gea An improved hay stacker which greatl economizes time and labor has been patented by $\mathbf{M r}$
J. C. Testman, of Wisner, Neb. The machine of an inclined way upon which is arranged on wheels a movable frame provided with a series of hook teeth, for grasping the hay at the bottom of the inclined way. The truck with its load is then hauled by a rope and
pulleys to the top of the frame, where the hay is discharged, the forks being raised automatically.

## MISCELLANEOUS INVEHTIONS.

Mr. Henry Hirsh, of New York city, has patented an improved frame or cap for holding pictures
The subject of a patent recently granted to Mr. E. W. Free, of Baltimore, Md., is an attachment
for drills for facilitating the spreading of either grain $r$ fertilizers. The attachment is simple and is intended supply a long felt want.
Mr. Leonard Tilton, of Brooklyn, N. Y., has patented a blind stop which is a cheap, efficient, and easily operated device for holding the slats of win-
dow blinds open or closed, or at any desired intermedidow blinds o

An improved compound for preserving belts, keeping them soft and pliable, so that they wil
lie close to the pulleys, and prevent the sllpping of the same, has been patented by Mr. W. H. Durkee, of Cin cinnati, O . This mIxture consists of tallow, light res
and castor oil compounded in certain proportions and castor oil compounded in certain proportions.
Mr. William S. Appleget, of Cranbur Mr. William S. Appleget, of Cranbury, N. J., has obtained a patent for an improved platform gear for wagons which consists in so constructing and
combining the several parts, the elliptic springs, the braces, the bars, and the pole with the axle of the wago A combined refrigurability is secured.
A combined refrigerator, filter, and water cooler is the subject of a patent granted to Mr. T. C. Nativel, of Brooklyn, Cal., whereby in one apparatus
the water may be filtered and kept cool for drinking purposes, and at the same time a sufficient amount of

Mr. James H. Russ, of Providence, R I e, R. I. or window shades, which is so constructed that the cient for raising it again when necessary. The inven tion is simple in construction, and provides a shade An i
An improved awning to be attached to the of the sun has been patented by Mr. Jacob Engle, Jr., of Sharon Center, N. Y. This consists in a folding sun-
shade supported on an extension staff, provided with a
niversal joint, so that the shade may be shifted to any Mr. D. W. Wilkins, of Boston, Mass., has patented a device to be applied to shirt bosoms for preventing the screws of spiral studs from irritating the
skin and cutting holes in the underwear. This shield skin and cutting holes in the underwear. This shield one of which is provided with an aperture through hich the screw of the stud is passed
An improved nut lock has been patented by Mr. G.
which P. Mlinarich, of Del Rio, 'Tex. 'The bolt to which a key slides, and connects with the nut which is so constructed as to prevent it from unscrewing. The inventor intends to have the
which is not liable to rust
A brake block which acts by friction on the ire of a wheel is the subject of a patent granted to $\mathbf{M r}$. . J. Siq ueira, of Brooklyn. Cal. This brake block is wear from the wheel. The friction leather is secured y hooks and pins, so that when it is worn out a new Mr. Cbarles H Bennett of
Mr. Cbarles H. Bennett, of Halifax, Nova tencil has recently obtained as assignee a patent on a ame place. The bject of the . Wennett, of the mit stencil, name, or number plates to be inserted and removed readily, and for holding them firmly while in
se, whatever may be the shape of the plate.
Mr. William Standing, of St. Louis, Mo., has vatented an improved safety trace holder which is o constructed, that by simply inserting the trace in the he pull on the frace the more firmly will it be retained but should the horse or horses become unmanageable by pulling a cord the trace will
A pocket button hook has been patented by Mr. George Clark, of Brooklyn, N. Y. The hook shank hollow flatiened metal case. When the hook is not re quired for use, it is pushed into the handle, and thus will occupy but little space. The implement is intend will found quite a convenien rticle.
An improved hood for electric lamps has been patented by Mr. Samuel H. Tacy, of New York city. This hood consists of a conical upper part having n inverted cone and hinged suitably to the upper part The object of the hood is to protect the operating me chanlsm of the lamp and increase its effectiveness by n ward
A molasses evaporator for concentrating cane juice or other kinds of saccharine juices to form sugar and molasses, has been patented by Mr. J. S.
Boren, of Booneville, Miss. The improvement consists in the construction of the box, which is made up of sev eral independent troughs of copper or othermetal con being round, so tbat they may be more readily cleaned. An improved truck designed to facilitate the andling and transporting of bricks has been patented by Mr. J. S. Armstrong, of Republic, O. The platform o the frich the bricke are loaded is suspended by rods the frame of a barrow-like vehicle by means of which hey may be deposited without removing them from he platform by detaching the rods from the frame o the truck.
An improved fastener for gloves, shoes, etc., is the subject of a patent granted to Mr. D. T. Chambers, of Washington, D. C. The slit of the gloves in to one of its edges through which a strap passes fo holding down the flap, this strap being attached at the ree end to a button located on the back of the glove making it fit the wrist snugly, and giving the glove an Mr. S. B. Bartine, of Tottenville, N. Y., as obtained a patent for an improved sun shade ha which consists in a hat having a crown, that in hot
weather may be raised, furnishing an umbrella-like sunshade protecting the head of the wearer from the ays of the sun, and permitting at the same time a fre circulation of air. In cool weather the shade may be

Mr
Mr. John Lutz, of Xenia, O., bas patented n improved end gate for wagon boxes. The upper board, so that the former will rest in an inclined posi tion between side wings which retain the contents of the box. The special advantage of this improvement is
that it greatly facilitates the use of a shovel in the rethat it greatly facilitates the use of a shovel in the re apples, etc enables the shovel to be inserted under th the produce without damage to them
Mr. J. Harris Rogers, of Washington, D. ©. is the patentee of an improved antonatic telegraph, dented metal foil or shet in an automatic tom ior the purpose of transmitting electrical impulse by hreaking connection over the iudentations 'in the strip or sheet and making contact with the intervening paces lying in the normal plane of the strip or sheet, ossments may be transmitted without removing the strip from the Mr, and also for avoiding static charges Mr. F. M. White, of Winigan, Mo., is the hess makers for forming and pressing the leather into he proper shape, preparatory to the pad stuffing provided with a form or mould over which the leather is stretched. The leather is confined to the form by a metallic hoop, which fits closely around the outer edge of the form, holding the leather securely on all sides,
but leaving the central portion free to conform to the mould. The frame may be constructed to hold two or more formers, and thus the manufacture of harness pads is greatly facilitated.

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We renew our request that correspondents, in referring
o former answers or articles, will be kind enough to
name the date of the paper and the page, or the number of the question
Correspondents whose inquiries do not appear after lished, they may conclude that, for good reasons, the Editordeclines them.
Persons desiring special information which is purely of a personal character, and not of general interest,
hould remit from $\$ 1$ to $\$ 5$, according to the subject, should remit from $\$ 1$ to $\$ 5$, according to the subject,
we cannol be expected to spend time and labor to we cannol, be expected to spend time and Any numbers of the Scientific American. Supplie ENT referred to in these columns may be had at Correspondents sents each.
Correspondents sending samples of minerals, etc., label their specimens so as to avoid error in their identification.
(1) E. A. B.-The impurities commonly found in rock salt are generally of an earthy, sandy, or ferruginous-ocherous nature. These it is impossible to
separate from the dry salt by known mechanical means, but if the substance is liquefied the separation becomes a comparatively easy matter. As commonly practiced the operation of refining is as follows: The native salt is shoveled into a series of large cisterns or wooden
vats arranged so that water entering the first will gradually overflow into the next and so on to the last (five vats are the usual number). Water (pure) is allowed to enter slowly into the first reservoir at or near its bottom and percolate upward through the broken salt rock. he resulting salt solution to thenext cistern or vat. If hese cisterns or vats are kept well filled with the broken rock salt, the liquid flowing from the last of the series will be a saturated solution of salt. This is drawn off into large tubs or cisterns and allowed to
stand for three hours to deposit the impurities. The stand for three hours to deposit the impurities. The
clear liquid is then run into shallow pans and allowed cear liquid is then run into shallow pans and and air, or is first concentrated by boiling down in large caldrons seated on a furnace. In another plan of concentration downward over a series of pipes heated by circulation
steam under pressure within them.
(2) M. M. H.-One of the simplest methods of recovering silver from waste solutions is the follow-
ng: First dilute the liquid about one-third with water (double this quantity if much gum is present), heat the solution to about $180^{\circ}$ Fah., and gradually add solution of pure sulphate of iron (iron sulphate 5 ounces, water 1 pint) until no further precipitate forms. Decant the
liquid portion, throw the precipitate on a filter, and liquid portion, throw the precipitate on a filer, and
wash it thoroughly with hot water. To the washed precipitate-consisting of finely divided metallic silver-add strong pure nitric acid and heat over a
water bath until the silver has all been dissolved. Evaporate to dryness over the water bath (in a porce-
lain dish, capsule) and dissolve the residue in hot water (distilled or rain). Filter this solution and concentrate it over a water bath, then set it aside to crystallize. Remove the crystals, concentrate in a similar
manner the mother liquid, and obtain another crop of crystals. These crystals (of nitrate of silver) are pure
for photographic purposes they should be redissolved in water and recrystallized. Where the liquid containing
the silver contains also much insoluble it is sometimes preferable insoluble organic matter, evaporating the liquid to dryness and fusing the residu with an equal quantity of borax glass in a black lead
crucible.
(3) F. A. C. asks: What will be the powe of an engine $11 / 8$ inch bore and $21 / 4$ inch stroke, making
200 revolations per minute with 40 pounds of steam, 200 revolations per minute with 40 pounds of steam,
common slide valve engine? A. About one-twelfth of common slide val.
one horse power.
(4) E. G. A. writes: I am building a small portable engine, boiler twenty by ten inches and three-
sixteenths thick boiler plate. What pressure of steam sisteenths thick boiler plate. What pressure of steam
would be safe, and how may 1 convenjently test it by would be safe, and how may 1 convenjently test it by
hydrostatic pressure? A. If well made, 150 pounds per square inch. 2. What pressure would raise a valve one fourth inch in diameter, and lever pivoted three-fourths inches from valve stem? Also please give me a rule for calculating safety valves, if there be such a rule. You can prove by a force pump, and having a proper
gauge to show the pressure. Rule for safety valves: gauge to show the pressure. Rule for safety valves:
Multiplying the area of the valve in inches by the press Multiplying the area of the valve in inches by the press-
ure per square inch, gives the total pressure, and that ure per square inch, gives the total pressure, and that
sum divided by thenumber of "leverages" will give the necessary weight, not taking into account the weight
valve and lever. Do not make your valve less the

## half inch diameter.

(5) M. E. S. inquires for information as to tractive force upon macadamized roads. A. Some in
teresting experiments have recently been made to ascer tain the tractive force requisite to move street cars and vehicles on a macadamized road. The apparatus use consisted of an inclined plane, at the upper end of which was an iron wheel, over which passed a rope. loaded box car weighing, with its contents, 12,820 pounds was drawn up the grade by a weight of 970
pounds, suspended at the other end of the rope. The pounds, suspended at the other end of the rope. The
empty car, weighing 4,820 pounds, was drawn up the same grade by a weight of 283 pounds. A smaller box
car, weighing when empty car, weighing when empty 2,730 pounds, was occupied
by fourteen persons, and drawn up by 339 pounds, and when unoccupied by 176 pounds. An ordinary load of
sand on a macadamized road was started by 514 pounds, sand on a macadamzed reighing 1,550 pounds, by 19 pounds. The same hack, with four passengers inside, required 23 G pounds to move it. On a level road the
load of sand was started by 240 pounds, while the large box car yielded to 56 pounds. These experiments were made by a horse railroad company to prove that their work was not unusually severe for the horses.
(6) P. G. H. asks for a cement for gas retorts. A. For cementing earthenware gas retorts, which have to withstand very high temperatures, the
following cement can be used: Powdered glass, 5 parts; chamotte meal, 5; powdered boraz, 1. Chamotte meal is obtained by pulverizing broken pieces of gas
retorts. Thls cement is a hard glass, which only melts retorts. This cement is a hard glass, which only melts
at the highest temperatures, then closes the leaks in the retort. To render the iron retort cover which closes the retort air tight, a cement is used consisting of
schwerspath powder, to which as $\cdot$ much soluble glass has been mixed as to obtain a paste of sufficient
(7) S. B. P. asks: Will you give the formula for making a good paste stove polish? A. The following liquid stove polish is recommended:

Pulverized black lead................. 2 pounds.
Spirits of turpentine................ 2 gallons.
Water......................... 2 ounces.
Sugar.
Mix.
(8) J. L. B. and J. J. ask for a receipt for taking printing ink out of paper. A. This is not an
asy matter. It is said, however, that it can be accomplished to a limited extent by means of ether or a solution of soap in water, naphtha, benzol, hot solutions in water of po
(caustic potash or soda).
(9) J. H. asks how to erase scratches made by amalgam on vulcanized black rubber plate and cyl nder friction electric machines. How are the plates polished to keep fromfouling by amalgam? A. The best
way to prevent the scratches is by making the amalgam very fine and to’apply it with tallow. Scratches made on glass cannot be removed except by grinding the glass, which is more expensive than purchasing ne
(10) J. S. D. asks (1) how to mote liquid lass or as it is sometimes called water glass. Will solidify when in bulk, and if so in what is it sçuble
A. The alkaline silicates are prepared by pressing dic with the hydrates, carbonates, nitrates, or other salts ing flint, sand, etc. in with strong solutions of the caustic alkalies under pressure. For full details se Scientific American Supplement, page 5061, No. 317
2. How can I make a night light with sweet oil and 2. How can I make a night light with sweet oil and
phosphorus? Is anything necessary, and should the vesphosphorus? Is anything necessary, and should the ves
sel containing them be kept air tight? A. See answer o query No. 54, carrent volume, issue for Jan. 13, 1883.
(11) W. A. F.-Chloride of gold is prepared by dissolving gold in nitro muriatic acid, evapo-
rating to dryness, and dissolving the resulting crystals in water. We would recommend you to purchase the chloride of gold. Iis manufacture is attended with
dangers which in the hands of an inexpert may lead to dangers which in the hands of an inexpert may lead to
(12) W. T. V. asks: 1 . What is the best British Journal of Photogram? A. According to the ted ether and petroleum spirit is said to be the best solvent. 2. How is rubber cement made? A. See formulas for cements in Scientific American Supplempnt, No.
158. 3. Will pure Para gum answer in place of guttapercha where the latter is given in a formula for ce however, the Para rubber is more expensive.
(13) J. W. S. writes: I have a cambric malloon which is too porous to retain heated air in order
make it ascend. What can I coat it with to make it air tight, flexible, and at the same time add but little weight to it? A. Apply a varnish made as follows: Melt India-rubber in small pieces with its weight of inseed oil, and thin with spirits of turpentine.
(14) A. D. F. asks: 1. What is the best illing for mahogany, and how made and used? A. Take equal parts by weight of whiting, plaster of Paris, litle French yellow, asphaltum, Vandyke brown, and erra di Sienna. Mix with 1 part japan, 2 of boiled oil, nd 3 of turpentine; grind fine in a mill. Lay the filling in with a brush, rub it in well, let it set 20 minutes, and hen rab it clean. What is used to stain or colormahogBoil half a pound madder and 2 ounces in a gallon of water and bruch well logwood chips in a gallon of water and brush well over while hot;
when dry go over the whole with pearl ash solution, 2 drs. to the quart. 3. What is the process used to photoraph on wood for making wood cuts A. Consult graph on wood for making wood cuts $\%$ A. Consult
Scientific American Supplement, No. 53. 4. What imple cement or compound will fasten a paper label to lass and not be affected by moisture or be easily removed? A. Starch paste with which a little Venice turpentine has been incorporated while it is warm. 5. Is
hyposulphite sodium made in this country? A. It is.
(15) F. J. F. asks: What ingredients are ecessary for making ten pounds of roller composition for a printing press? A. Cooper's best glue 81/2 pounds,
extra sirup 2 gations, glycerine 1 pint, Venice turpenextra sirup 2 gatons, glycerine 1 pint, Venice turpen-
tine 2 ounces. Steep the glue in rain water until pliant, and drain it well. Then melt it over a moderate fire, Next put in the sirup and boil three-quarters of an ext put in the sirup and boil three-quarters of an
our, stirring it occasionally and skimming off impurities rising to the surface. Add the glycerine and turrenine a few minutes before removing from the fire, and our slowly. Slightly reduce or increase the glue as he weather becomes colder or warmer.
(16) C. D. E. asks what preparation awning and tent makers use to prevent their canvas from mil-
dewing. A. Use the following: Alum, 2 pounds disdewing. A. Use the following: Alum, 2 pounds disolved in 8 pounds water; to which is added gelatine, 1 pound dissolved in 30 pounds water; lead acetate, half a pound dissolved in 30 pounds water. The solu-
ions are all hot, and separately mixed, with the exceptions are all hot, and separately mixed, with the excep-
tion of the vitriol, which is added. See also receipts for aterproofing cloth. See Scientific American Suplement, No. 317.
(17) W. O. C. asks: 1 . How can I clean hells? A. To clean shells: Make a lye by boiling trong ashes, allow it to settle, pour the lye over the heils, and boil them six or seven hours, or longer if water. 2 . How to glaze pipes without heating. A. As glaze for pipes, see Scientific American SuppleENT, No. 226, for varnishes to protect iron.
(18) J. H. writes: Please give me, in your column of Notes and Queries, a good paste or glue for
taching paper labels to stone, Indian relics, geologi-

## cal specimens, etc. <br> Starch........ White sugar. 2 drachms. 1 ounce. Gum arabic 1 ounce.

Water ............................... s.
(19) E. P. asks for a receipt for bleaching ivory. A. See article on Hydrogen Peroxide for this
purpose, page 5572, ScIentific American Supplement, purpose,
No. 349 .
(20) E. P. W. asks: What mixture can be put into paint or on to canvas, before it is painted, to
prevent it from absorbing so much paint? A. Size your nvas with rather thin glue size.
(21) B. B. asks: Will you inform me what etal or substance is the most sensitive to heat or cold -that will expand or contract the most? I wish to get
something that one or two degrees will affect. A. After mething that one or two degrees will affect. A. After
mercury, zinc is the metal most sensitive to heat and old.
(22) K. N. asks: 1 . What is the composition of water glass and what its properties? A. Read
Scientific American Supplement, No. 317, page 5061. What authorities can I read on the subject? A. Silicates, also "Spons' Encyclopedia of the Industrial Arts," and like technological dictionaries. 3. Is there any combination with which color can be given to glass (stain glass) so as to withstand heat and water without danger? A. Aniline colors dissolved in alcohol can be mixed with water glass. Ordinary glass if treated by
(23) F. A. B. asks how the aniline ink for ruher stamps is made. A. Dissolve crystallized aniine black, half an onnce, in pure alcohol, 15 ounces, and add concentrated glycerine, 15 ounces, to the solu-
ton. This liquid is poured upon the cushion and abbed with a brush.
(24) J. R. M. writes: I am greatly annoyed by a continuous output of soot from my chimney
fues, especially the kitchen flue, where I have a portale range attached. My chimneys are all considerably higher than the roof of the house, they have terra cotta throw out soot almost continualiy, which falls like rain over my new paints. Can you suggest a remedy? A. Probably your best plan is to clean your chimney and burn anthracite coal. You do not mention what kind of coal you burn; take itfor granted that you burn bituminous. With this coal, perfect combustion is the only combustion can only be had by applying some smoke consuming device or by feeding the fresh coal beneath he fire so that the smoke will have to traverse the hot ranges in the Western market. in. stoves and
(25) E. C. R. Writes: I have a Cleveland
study lamp, the principle of which is similar to the study lamp, the principle of which is similar to the
German student lamp, and I am troubled with having the flame, after burning a sbort time, gradually go lower and lower, and then, if I raise and lower the tank or oil receptacle several times in quick succession,
which I imagine forces the oil through the apparently which I imagine forces the oil through the apparently
partly impeded passage leading from the tank to the partly impeded passage leading from the tank to the
wick, the flame will again assume its regularheight and periaps not grow smaller again for the remainder of the evening. Now I suppose that the pipe leading from
the tank to the wick is lined with grease or something simliar, thus preventing the oil from readily fiowing to the wick, and what I wish to know is what can I clean this channel or pipe with (some liquid) that will not ea the metal,and yet destroy the grease sufficiently to clear the pipe? A. If the feed tube of your lamp is ob-
structed, put a solution of potash and water into the structed, put a solution of potash and water into the tank holder afterwashing out the lamp with hot water Let itstand for a day, then clean out with hot water.
See that it runs a free stream when the tank holder Sce that it runs a free stream when the tank holder bot be below the top of the tube that feeds the lamp.
(26) T. M. asks: 1. What size leather belt would you advise to transmit 125 horse power; shafts 50 ter? Belt speed 2200 feet per minute. A. Your pulley is too small to transmit 125 horse power. It will re quire a belt or a number of belts equal to 60 inches in width upon 42 inch pulleys. Better use 4 foot pulleys
and 2 belts 24 inches wide running a give. 2. What size shaft would you recommend for
main shaft in mill? A. The size of the shaft depends main shaft in mill? A. The size of the shaft depends
upon whether you distribute the power upon both sides of the receiving pulleys. A $41 / 2$ inch shaft if for one way, a 4 inch shaft if both ways. 3 . Give me the best foundation with granite cap stones with anchor bolts from the bottom is the best.
(27) H. M. W. writes: I have a large saw mill run by steam. We run the engine by burning of it in this way. Now, is there no way in which the sawdust can be utilized without a great outlay for machinery? A. Sawdust can be used in the manufacture of pyroligneous acid and methylic spirit. It also
makes good manure, but is slow in rotting. It should makes good manure, but is slow in rotting. It should
bethickly spread and plowed in; two years will be rebethickly spread
(28) G. M. S. asks: 1. What can I use to waterproof coat a large canvas used as shed for portaSee Supplement, No. 159. 2. Can I run a 1 inch by 40 nch steel shaft and disk 100,000 revolutions per minute Boxes are very long, hollow, and a cold stream of ressure. At is improbable a 1 inch shaft can pressure. A. It is improbable a 1 inch shaft can be Could not water, powder, or dynamite be made red hot without burning, if so powerfully confined that it could not explode? Would it not be impossible to freez water under the same condition? A. If powder or dynamite is confined in a chamber that is strong enough to prevent bursting, it will not prevent the chemical combination, when brought to the proper condition for
explosion, whether by heat or otherwise. The pressexplosion, whether by heat or otherwise. The pressor waste. These experiments have been made by firing a confined charge and allowing it to waste through a small vent. Water will f̈reeze if confined, and put the vessel holding it under immense pressure. We think 4. Could not steam be heated to such a degree that it would not return to a fluid state? A. Yes. Could be heated under pressure, until its chemical constituents
are dissociated. 5. If it was possible to so powerfully compress wood or other substance as to make it as dense as iron, would it not be as heavy, as hard, and as rong as iron? Has extreme pressure of such sub tances ever been experimented upon? A. Wood com constituents considered as solid bodies. Wood has been put under great pressures, but we do not know f any proftable results.
(29) A. R. H. writes: I am attempting to make a Newtonian telescope, described in SuppleMENT, No. 179, but there are some points I don't under-
stand, and I have concluded to write and ask a few questions, hoping that you could enlighten me. Is the irror glass or metal, and what is its size? The writer does not give the number or kind of lenses used in
the eyepiece. How are the rays thrown through the eyepiece? What is meant by the flat which is mounted on the sliding piece? Is it necessary to have copper bars or ny bars at all. and why is the mirror supporting base composed of layers of wood glued together? Are the reflected rays of the mirror thrown up through the cener of the tube, and how are the lenses arranged? A.


For your Newtonian telescope a mirror of speculum metal is to be preferred, although fine glass specula
are now made with a silvered surface. The size of are now made with a silvered surface. The size of
the mirror should be about one-twelfth the focal length of the telescope that you wish to make focal length the tmall oval plane you wish to make. The flat is reflect the image forming rays through the side of the tubeor frame, so that in viewing an object your head will not interrupt the incident light. The details of the construction need not be followed strictly, as the mirror support may be made of a solid piece. The above sketch may answer some of the other questions.
A, speculum; $\mathbf{B}$, flat; C, field lens; D, diaphragm; E, A, speculum; $\mathbf{B}$, flat; $\mathbf{C}$, feld lens; $\mathbf{D}$, diaphragm; E,
eye lens. The eye piece is Huyghenian.

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\begin{aligned}
& \text { ing case. watch case. } \\
& \text { Cash carrier, automatic, } \\
& \text { Caster, o. Pederson (r)... }
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