
a weekly journal 0f practical information, art, scievce, mechanics, chemistry, and manufactures.


IMPROVED FIRE-EXTINGUISHING APPARATUS FOR vESSELS.
It is not two months since a fine steamer with a cargo of merchandise left Savannah for Nassau. The vessel had but fairly got to sea, when a cask of spirits, which had been improperly stored, broke adrift and leaked; and in some way the fluid caught fire. Although the ship had approved. fire pumps, water was found useless against the intensely hot flame which almost instantly communicated itself to the timbers. Of the crew and passengers, who took to the boats, but few were saved. The vessel was entirely consumed. Here was a case where water as a means of extinguishing fire proved wholly inadequate; and we can recall no better illustration of one class of instances where such an invention as that which we are about to describe would have proved perhaps the only efficient means of protection. Arain, year or two ago, an oil ship in a French harbor caught fire. Every effort to put out the flames was futile; and the conflagration, extending to other craft, bid fair to burn all the shipping in the vicinity. A United States man-of-wor in the port sent out her boats and towed the burning vessel into the roads, where she finally sank. This is an example of still another class of cases where a fire afloat, unless promptly overcome, is almost certain to result in large loss of property. We have repeatedly in these columns dwelt on the inefficiency of modern appliances in preventing disasters of this description. In a heavily laden vessel at sea, it is even dangerous to pour in water in sufficient quantities to extinguish fire, for the reason that the ship herself may thereby be sunk; and in a harbor there is always the peril of the flames extending to the light inflammable rigging of other ships, even if the difficulty of obtaining a full supply of water under pressure, at any given locality, does not exist. water under pressure, at any given locality, does not exist.
Suggestions have not been wanting for the use of carl onic
acid gas as a fire extinguisher on shipboard, based on the successful utilization of the same in chemical engines and other patent devices ashore; but the problem has been how to establish apparatus, in the narrow confines of a ship's hold which will be perfectly safe, and always ready to afford an in tant and full supply of the gas. This is claimed to be solved by the invention herepresented; and if we may judge from the uccessful issue of the trials to which the same has been sub jected, the claim must be considered as well as substantiated.
The general principle on which the apparatus is based is the direct use of the dry gaseous carbonic acid in smoth cring volume, in contradistinction to the ordinary employ ment of limited quantities of the gas dissolved in water under pressure. The means for carrying out the invention ar epresented in our large illustration, Fig. 1. The generators, A, are copper cylinders, capable of withstanding some 300 lbs. pressure, lined with tin to resist the acid, and suspended by straps under the deck beams. These vary in number, ccording to the requirements of the size of the ship, and preferably are about 26 inches in diameter by 9 feet in length, so that each holds about 448 lbs . bicarbonate of soda mixed with water to a paste. Domes, B, extend upward from the generators to a height of 36 inches, and through these the chemicals are admitted. In each generator (as shown by the broken-away portion of one) is a horizontal shaft on which gitating vanes are spirally disposed. When these shafts are rotated, by means of the bevel gearing, C , and cranks, , a slowly moving current of acid is carried through the soda, and thorough mixing insured. Each dome has a hinged removable cover, Fig. 2. When these covers are closed, hey are turned beneath lugs on the dome, and the cap proper is tightly adjusted by lever and screw. Opening outboard a water supply pipe, E, which communicates with two
enerators. The pipe, $F$, serves to conduct water to the latter. The pipe, G, may be used as a waste pipe, as it leads outboard on the other side of the vessel; or when the valve, II, is opened, and the valve, I, closed, it conducts water from E, into the cylinders from below to break up the caked reiduum before discharging the sume overboard. The acid iduum before dise reservoir, $J$, is firmly secured on the bottom of the vessel. It
is thus situated apart from the other machinery, so that the corrosive action thereon of its contents is avoided; while, if it should leak, no harm would be done, as the acid would simply run into the bilge. The cylinder which has a capacity of 213 gallons is made of one quarter inch lead reinforced by an iron shell, which, while strongly backing and holding the weaker metal, may be easily removed when the inner case needs repairs. The reservoir is charged from the deck above through the pipe, K. The vessels, $L$, are intermediate and distributing receptacles, to hold the acid in small amounts until nceded, and also to apportion the charges to the respective generators. They are of copper, lead-lined; they possess gauges for showing the level of their contents, and are directly connected with the domes, B, by pipes, M. To fill these vessels, a pipe is provided which extends into and near the bottom of the acid reservoir. From this, branch pipes lead to the separate chargers. An air pump, $\mathbf{N}$, the lever of which is shown in the hands of the figure, forces air by a small pipe into the acid cylinder; and the pressure enerated drives the acid up through the conduits and into the chargers, L , in quantities as desired. Valves are pro vided, so that one or all of the chargers may be filled. The alkali generators have like valves in the water pipes, so that water may be admitted to as many as needed.
The carbonic acid gas may itself be used for forcing up the acid by causing the pressure generated in a portion of [Cィntinued on page 388.]


# Srientifir Gmexiran. 

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prominent members.
V. ELECTRICITY. TIGHT, HEAT, sound ETC.-FIJectricty in the

in Parres.



## blue glass blindness.

It is curious to notice in what strange ways a popula mania affects different people. The believers in the blue glass absurdity have hitherto had a monopoly of wild theo ries on that subject, of which they have invented no lack, skeptic gravely molkjing iussertions fully here is a blue glass keptic gravely making assertions fully as baseless as the question is none other than our staid contemporary the Ecening Post, of this city: which, in its anxiety to warn its readers against an apparent danger inherent in blue glass, perpetrates the following
"That blue glass has any curative properties remains ye the pays of the sun, in a lesser degrece, as the common burn ing glass does, was kuown before General Pleasonton's book was printed and made so much of by the newspapers. $\Lambda$ gentleman of Brooklyn suffering from weakness of sight was recently led by the advice of well meaning friends to use spectacles of lilue glase, such as certain opticians ar
selling just now. The result was that his eyes alreuly to weak to be used much in ordinary circumstances, were tex posed to a terrible glare and heat, which in less than a week entirely destroyed the eyesight of the sufferer. He is now totally blind. This is a fact, and the gentleman would doubt less be glad to have other sufferers from weak eyes know of his case and draw a moral therefrom. Auother similar instince has come under our observation, a young lady being worth bearing in mind that the only property of blue glas that has been proved is its power to concentrate the rays of the sun and produce extraordinary heat.
Neither glass stained blue nor glass of any other colo concentrates the rays of the sun as the common burning glass docs." $\Lambda$ lens, from the curvature of its surface or surfaces, has the property of causing the luminous rays which traverse it either to converge or to diverge. By a burning glass or double convex lens, parallel rays are conveyed to a focus. If blue glass is made in similar form, it will act similarly; otherwise it will not
But, as we have repeatedly pointed out, blue glass cuts off a very large proportion of the luminous rays, and the light it transmits is nothing but modified sunlight, or rather sun light shaded and reduced in intensity: so that, so far from blue glass producing a terrible "glare," it transmits an ex ceedingly mild light. This property was utilized by pho tographers long ago in order to relieve the cyes of their sitters; while blue spectacles have been worn by weak-eved people almost ever since spectacles were contrived.
It is not necessary to discuss the question of whether blue glass becomes hotter through absorption than clear glass, in the absence of any authentic experiments on the subject. It is well settled that, as color teaches us nothing regarding the radiation and absorption of non-luminous heat, any con clusions as to its influence may well be wholly delusive The absorption depends on the particular alsorptive powe of the coloring substance, and not on its hue. Clear glas is opaque to a considerable degree to heat rass, and therefore through absorbing them becomes warmed. The only ques tion, then, is whether the coloring matter introduced is capa ble of producing increased absorption sufficient to render the glass hot, and so to cause it to injure the delicate outer portion of the eye through its proximity thereto. In the ab sence of any data determining this point, no positive opinion can be formed; but it seems probable that the resulting in
flammation of the organ would produce suffering sufficiently intense to indicate its cause to the wearer of the glasses and induce him to discard them before the week had elapsed during which the lesion became permanently extended to the optic nerve. It should be understood, however, that, if blue glass spectacles are injurious, it is because of the con consequence of glass, and it does n

## DRUNK OR DISEASED?

The sciences of law and medicine are now in direct con flict on the question of the responsibility of the inebriate. The law holds a drunken person answerable for his acts, and rcfuses to accept intoxication as a plea in extenuation. On the other hand, one of the highest medical authorities, who has made drunkenness the subject of prolonged and carefu study, Dr. D. G. Dodge, late Superintendent of the New York State Incbriate Asylum in Binghamton, says that " in ebriety is a condition of the system exhibiting a class o symptoms resulting from a long contimued and excessive use of alcoholic stimulants, which brings the subject to a con dition he is too weak to overcome; and for which he is no responsible." Society, it would seem, stands in a dilemm from which it is difficult to perceive any present way of escape.

The question is one, however, which demands speedy settle ment, for laws are indeed anomalous under which fine-draw pleas of "emotional insanity" have secured immunity for wilful murder, while the wretch who deals a fatal blow while crazed and diseased with drink is subjected to the full meed of punishment. Much has been written and said to prove that, when a man becomes a drunkard, it is a voluntary proceeding on his part. This is the legal view-or rather, the legal fiction-relative to the subject. There is no doubt that many do become confirmed inebriates through finding pleasure in their carly use of stimulants; but this is by no means true of all. Dr. Dodge tells us that, like all hereditary diseases, intemperance is transmitted from parent to child as much as scrofula, gout, or consumption; that i
observes all the laws of transmitted disease; that it may even
skip a gencration, and appear in a succeeding one with al its former activity: that the habit seldom culminates until the subject is thirty years of age, and that the disease is often est found among people between the ages of thirty and forty: that certain individuals possess an alcoholic idiosyn crasy, a natural latent desire for stimulants which leads, if indulged, to morbid appetite and a diseased condition of the system, which the patient is powerless to relieve, because the cakness of will that led to the discease obstructs its removal These are all well demonstrated facts. Dr. Joseph Parrish says that he has known hereditary drunkenness developed after sixty years of sobriety. Dr. Forbes Winslow, before British Parliamentary Committee, stated that he had ob served a list of criminalss in which a father was a drunkard gramdfather a drunkard, grandmother an idiot; and in the whole line the family showed drunkards, criminals, and idiots. All the forms of vice were hereditarily trans itted
The difficulty at once suggests itself of how to distinguish tween the man who rets drunk because he cannot help it and then sins, and him who deliberately becomes intoxicated If we place the drunkard on the same level as the lunatic regard to irresponsibility for crime, we find ourselves brought face to face with a host of perplexing questions a man camnot sham lunacy without being reasonably sure detection; but he can get genumely drunk, and still have faculties clear enough to execute a purpose of revenge, fo example. Neither law nor medicine can positively say how drunk a man must be to be irresponsible. Neither can we nearth every one's genealogy to find out whether his grand ather was an inebriate in order to predicate the hereditary lypothesis. It is evident, therefore that the drunkard-no matter how he became a vietim-must be placed in a differ ent category from the lunatic and the criminal who commits crime automatically. $A$ lunatic is never responsible, societ must regard a criminal as always so; but the responsilility of the incbriate depends on a host of circumstances, whic may differ in countless instances. It is obviously as much an crror to regard every drunkard as an automaton impelled by irresistible impulse as it is to consider him-as we nor practically do-a fully reflecting being. The problem is to find the just me:an which will cover all cases, or to discove mode of prevention which will simplify the general con ditions.
The preventive remedies which have suggested themselve are two: First, the inelriate asyium; second, the repression of the liquor traffic. The inebriate asylum, though really curative institution, is in the end the means of preventing the spread of inebriation by hereditary transmission. Intemperance is curable, just as insanity is, in most cases; and, to certain extent, similar means are used to effect the desired result. The treatment, however, involves skill and thorougl cquaintance with the disease in all its forms; and it i herefore of a nature which is best practised in special institutions. The increase in number of the latter may therefor considered advantageous. As regards the checking of he liquor traffic, there is ground for much argument $p r$ nd con. 1 step in advance which might be taken, and it csults tested before resorting to prohibition, is the stringen nforcement of enactments against adulterated liquors Whiskey-or rather a vile decoction of fusel oil-is sold in the slums of this city, at retail, at prices less than the gov crnment tariff alone amounts to. Repression of adulteration would break up the sale, and place liquor out of the pecuary reach of thousands of people who are now easily able gratify their desires. Pure liquors, say authorities, ar orse as a source of inebriation than the adulterated ones wing to the greater proportion of alcohol present. This is doubtless true; but at the present time the immense preponderance of liquor sold is adulterated. Enforce the laws t prevent the sale of that, and maintain a high tariff on pure liquors, and it will become an expensive proceeding to ge irresponsibly drunk.

## about gravestones.

We have just received a volume containing seventy-fou lithographed designs for gravestones, accompanied by a note from the publishers to the effect that the book is regarded as the best modern work on the subject." It is a small volume, and the price is cight dollars, for which sum on might reasonably expect to obtain something new and valu able. The work is no doubt modern, but we fail to discove anything new or especially attractive in the designs. It seems to us-and the idea is one we have long held-that it is about time that a reform in our churchyard architecture was set afoot. We have got into a rut, so to speak, of de signs which have been the same from the period "whereo the memory of man runneth not to the contrary." The visitor to the country churchyard, or our magnificent Green ood, finds them at every turn; and he may depart wit he fixed impression that, when gravestone makers emanci pated themselves from slabs and tables, the sole decoratio which was the occasional hourglass or impossible cheru bic head, they proceeded as far as the funereal urn and broken pillar and there stopped, a few bolder spirits only advancing to the further point of crouching lambs and neeling angels. Now, these ideas are well enough in their way, or rather they were so, say fifty years ago, when we built our houses like Grecian temples and indulsed in othe rchitectural atrocities; but at the present time, we ma truthfully assert that our graveyards possess a full supply of them, and that something new would be a gratifying change.

It is necdless to state that we opened the book above re ferred to with these feelings. We need not picture our dismay when nincteen monuments with funcreal urns and five with broken pillars met our gaze; and there was the inevita ble lamb. and the in variable angel in the usual uncomfortable position which it makes our bones ache to contemplate There was not a design which seemed to us to offer any striking originality, save one, and that was a most incomprehensible c smbiation of a ewer and basin perched on a slab. What connection existed in the designer's mind between those indispensable toilet utensils and the grave, we should much like to have explained. Some of the gravestoncs de picted are above average merit; but the stigma of conven tionality is upon every one of them. The designers doubtless think they know the public demand, and aim to supply it in the best possible way; and the public taste and judg. ment perpetuates these trite conceptions, to the exclusion of the new and beautiful designs which an art knowledge, far more advanced than that which originally evolved the former, is capable of producing. We do not refer to lofty and magnificent monuments crected without regard to out lay, because such always are the work of the artist-sculptor and not of the gravestone maker, but to the humbler memo rials which mark the thousands of graves in our cities of the dead. There is as abundant opportunity for the application of the principles of true tiste and art feeling to these as to the more pretentious piles; and while we are making Nature transform our great cemeteries into beautiful parks and gardens, it would be well if we allowed art to produce forms which would harmonize, and not disagrecably contrast, with Nature's handiwork. Ancient mythology and the tombs and relics of the Old World abound in appropriate emblems which might find more place on the modern gravestones than they now do. What architect or artist will strike out in a new and original line of thought, and give us something better than the upright slab, pillar, or obelisk for marking the graves of the dead?

## HELPING INVENTORS

A co-operative movement, based on the English system first started at Rochdale, has been begun in Indiana and other western States. The organization is on the masonic plan, there being a "Grand Guild" and subordinate 'Guilds," the latter of which have for their object apparently the promotion of co-ope:ative enterprises of any legitimate character. A mong other schemes, that of an inventors union has been projected, whereby inventors are assisted ia preparing their devices, a workshop is provided, and other encouragement afforded.
We are of course heartily in favor of any plan which tends to develop invention; but the $i=v e n t o r s '$ union scheme is a very bad one, and it has been many times unsuccessfully tried. There never was and never cin be a community of interest am>ng inventors, except so far as all are interested, more than the average run of people, in general progress. The very nature of the inventor's work impels him to kee; it out of public notice until it is complete 1 , and his right in it secured to him. There are abundant circumstances under which it might be highly disadvantageous to an inventor's' interest for his neighbor to gain a knowledge of his invention; and there are not many inventors who would risk making their models in a co-operative workshop, no matter to what pledges of secrecy other occupants of the room had been committed. Besides, this is not the kind of help our inventors want. In meny cases of invention, not only is something ariginated but the implements for its production must also be contrived. It is impossible to foresce what particular means inventors will use to put their ideas in practical form; and it is useless to attempt to fit up a special shop for that purpose. The needs of inventors are, first, suggestions of devices required, and information of what others are doing or have done in the way of origination or improvement: in brief, ideas which will keep their minds in a channel which is likely to end in their conceiving some object on which to exercise their genius. Afterwards, after the patent is secured, and the inventor has perfected his device, then he sometimes needs assistance to aid in its introduction. Now the "Guilds" can furnish either class of help we have indicated, and do good; but we do not believe that they will ever earn much gratitude from inventors by fitting up a shop and requesting people to come in there and invent. They would fi id that good reading rooms-such as we have frequently advocated, and which have been success fully established in many places in accordance with our sug-gestions-will attract thinking people; and if an abundance of mechanical books and pape:s are provided, and discussion on new mechanical and industrial subjects encouraged, in ventions will speedily follow. As regards assisting inventors in introducing their devices, there is no lack of opportunity; but the guild's part in securing the aid could hardly extend beyond bringing investors and inventors into communication. It is useless to attempt to organize an association which undertakes to push any or all the inventions of its members. Discrimination will be found necessary; and as a rule, it is about as easy to convince an inventor that his device is not of superior meris as it is to convince a mothe that her baby is not handsome.
We are glad to hear of the existence of the guilds, and can commend their motive in endeavoring to help inventors. But we think that, after a little experience, they will agree with us that it is better for them to furnish means for obtain ing ideas, and to leave the inventors to work out the pro
jects based thereon after their own fashion.

## LIGHTNING RODS

A correspondent of the Country Gentleman writes to the editor of that paper as follows:
"Having read the recent article in your journal rela ing inquiries: Given a large building say a the follow ing inquiries: Given a large building, say a church with
spire, the spire covered with tin and painted, the church roofed with slate, valleys of copper and conductors of tin, a rod with points soldered to the tin roof, the lat-
ter connected by strips of copper soldered to the copper ter connected by strips of copper soldered to the copper
valleys, the tin conductor connected by strips or rods of copper from the bottom with permanent moisture under ground-is the building protected against lightning ? (1
Would the building be better protected if the above conduct ors were attached in the building to the gas pipes? (2) Doc the paint on one side of the tin materially reduce its power of conduction? (3) Is it not an accepted theory that the
closer the rods are attached to a building the better ? (4) closer the rods are attached to a building the better ? (4)
Do you approve of the method used for protection of the Centennial buildings, as explained in the Scientific Amieri CAN of about a month since? (5).

## To which the editor of the Country Gentleman replies:

1. We do not perceive why this would not make a good ferent connections mirht be more liable to become detache in the lapse of years than a firm rod, and would need looking to. In case the points above should prove insufficient to carry off silently the fluid from a heavily charged cloud immediately above, and there should be an explosion (a rare
occurrence in such a case), there would be more liability to occurrence in such a case), there would be more liability to from the building. 2. Gas pipes, well connected would from the building. 2. Gas pipes, well connected, would
make good conductors, with the same liability as that just mentioned. 3. Paint does not reduce the conducting power.
2. It is better that the rod be a short distance off from the buiding, for the reason already explained. 5. We do no know the mode adopted on the Centennial buildings, and Revarial the paper referred
Remarks upon the above Answers.-(1) We coincide substantially with the Country Gentleman in respect to the general sufficiency of the above example of protection. The proposed connections above ground are correct; but if there is any deficiency, it is in the underground connections. The terminal metal of the rod, placed underground, in contact with moist earth, should be as extensive in area as possible.
We think it erroneous to suppose that lightning rods are a means of silently discharging the electricity of thunder clouds. The latter are generally more than half a mile dis tant above the earth when the discharge takes place; and
while a properly arranged rod, if struck, will conduct the electricity safely to ground, the sudden leap of the lightning through this air space to the rod sets the air intstremendous vibration, producing sounds like the roaring of artillery. Only the atmospheric electricity, close to the surface of the earth, is conducted to the ground silently by rods, buildings, recs, stc.
The object of the rod being to conduct off electricity from the building to earth, the rod should consequently be placed in close contact with the building, so that the clectricity may easily reach it; the rod should not be separated a font or two as our contemporary suggests; the explosion he refers to is the crashing noise, which the rod can neither cause nor prevent.
$(2)$ The protection of the building would be improved ( 2 ) The protection of the building would be improved pipes. But the attachment of the foot of the rod to the gas pipes, outside of the building, would be more convenientthese connections to be additional to the large metallic ter minals in moist carth, before mentioned.
As to inside gas pipes, they are good conductors, and all that is necessary is to bridge over the space between the strect pipe and house pipe, occupied by the meter and it lead pipe, with copper wires. The lead pipe is a poor con-
ductor. By using the copper bridge, if the gas pipes in the house are struck, the electricity will pass off into the carth (3) We agree with our contemporary.
(4) It is an accepted theory that the closer the rods are at tached to the building the better. The reply of our contem orary is incorrect, for the reason explained under (1).
(5) The mode adopted on the Centennial buildings was to connect the metallic roofs with the carth, by means of nu merous rods soldered at different points to the roof, and car ried directly down into the ground, and there soldered to the extensive system of eight inch underground water pipes Thus the rods had the closest possible connection with the roof : while the earth terminals of the rods were provided with a very large area of conducting material placed under-ground-which latter is the essential thing necessary to ren der any rod a protection; but is the very thing that the majority of people neglect in rodding their buildings.

## Fulton's Account of th, First Steamboat Trip

In the Suffolk Guzette, printed at Sag Harbor, on the eas and of Long Island, October 12, 1807, is a letter from Robert Fulton to Jocl Barlow, giving an account of the first trip of the first steamboat on the Hudson River. It is as follows: To Joel Barlow, Philadelpifa.

New York, 22d Aug., 1807.
My Dear Friend: My stcamboat voyage to Albany and back has turned out rather more favorable than I had calcuI ran . The distance from New York to Albany is 150 miles just 5 miles an hour. I had a light breeze against me the whole way going and coming, so that no use was made of my sails; and the voyage has been performed wholly by the power of the steam engine. I overtook many sloops and
schooners bearing to windward, and passed them as if they schooners bearing to
had been at anchor.

The power of propelling boats by steam is now fully
proved. The morning I left New York there were not per haps thirty persons in the city who believed that the boa would ever move one mile an hour or be of the least utility And while we were putting off from the wharf, which was crowded with spectators, I heard a number of sarcastic remarks; this is the way you know in which igncrant men compliment what they call philosophers and projectors.
Having employed much time and money and zeal in ac omplishing this work, it gives me, as it will you, great pleasure to see it so fully answer my expectations. It will ive a quick and cheap conveyance to merchandise on the Mississippi, Missouri, and other great rivers which are now laying open thicir treasures to the enterprise of our country men. And although the prospect of persona? emolument has been some inducement to me, yet I feel infinitely more pleas ure in reflecting with you on the immense advantage that my country will derive from the invention.
However, I will not admit that it is half so important as the Torpedo system of defence and attack; for out of this will grow the liberty of the seas; an object of infinite impor ance to the welfare of America and every civilized country But thousands of witnesses have now seen the steamboat in rapid movement, and they believe-but they have not seen ship of war destroyed by a torpedo, and they do not believe. We cannot expect people in general to have a knowledge of physics, or power of mind sufficient to combine ideas and reason from causes to effects. But in case we have war, and the enemy's ships come into our water, if the government will give me reasonable means of action, I will soon convinc the world that we have surer and cheaper modes of defence han they are aware of

Yours, etc.

Robert Fulton.

## Transparent Gold

In the course of a lecture on gold, delivered before the Franklin Institute, on February 2 rth last, Mr. A. E. Oute: oridge, Jr., of the Assay Department of the Mint in Phila delphia, Pa., gave an account of some experiments he had made, with the view of asccrtaining how thin a film of gold was necessary to produce a fine gold color.
The plan adopted was as follows: From a sheet of copper rolled down to a thickness of ${ }^{5}{ }^{5} \bar{v}_{\overline{0}}$ of an inch he cut a strip $2 \frac{1}{2}$ by 4 inches. This strip, containing 20 square inches of surface, after being carefully cleaned and burnished, was weighed on a delicate assay baiance. Sufficient gold to produce a fine gold color was then deposited on it by means of the battery; the strip was then dried without rubbing, and re-weighed, and found to have gained one tenth of a grain thus showing that one grain of gold can, by this method, be made to cover 2 CO square inches, as compared to 75 squaro inches by beating. By calculation, based on the weight of a cubic inch of pure gold, the thickness of the deposited film was ascertained to be $\overline{880} 0^{1} \pm 00$ of an inch, as against ${ }^{36} \overline{7}^{\frac{1}{7} 650}$ for the beaten film. An examination under the microscope howed the film to be continuous a:d not deposited in spots, he whole surface presenting the appearance of pure gold Not being satisficd, however, with this proof, and desiring to examine the film by transmitted light, Mr. Outerbridge has since tricd several methods for separating the film from the copper, and the following one has proved entirely suc cessful:
The gold plating was removed from one side of the copper strip, and by immersing small pieces in weak nitric acid for everal days, the copper was entircly dissolved, leaving the films of gold intact, floating on the surface of the liquid Three were collected on strips of glass, to which they adher on drying, and the image cf one of them was projected on the screen by means of the gas microscope. It was ob served that it was entirely continuous, of the characteristi bright green color, and very transparent, as was shown by placing a slide of diatoms behind the film. By changing the position of the instrument, and tinrowing the image of the film on the screen by means of reflected light, its true gold color was seen. Mr. Outerbridge has continued his experiments, and, by the same processes, has succeeded in pro ducing continuous films, which he determined to be only the 1 two million seven hundred and ninety-cight thousandth $57 \frac{1}{450} 06$ ) of an inch in thickness, or ten thousand five hun undred and eighty-four $(10,584)$ times thinner than an ordi nary shect of printing paper, or sixty (60) times less than a single undulation of green light. The weight of gold cov ering 20 square inches is, in this case, thirty-five thousandth ${ }^{8} 8_{0}^{50}$ ) of a grain: one grain being sufficient to cover nearly 4 square feet of copper. The film is perfectly transparent and continuous, even in thickness, and presents all the char acteristics of the one shown before. That a portion of the image appears darker is duc to superposed films, the intensity of the green color being proportioned to the thickness through which the light passes.

## Riches and Reason.

The experience of the late Mr. John Daly, of this city, who got riches but lost his reason and committed suicide points a moral for our time. The case of Dr. Ayer, the well kncwn millionaire, who is in an asylum for the insane urnishes a commentary on the failure which some men are making by their appetite for money. There are scores of similar cases of insanity caused by a too intense application to business. Brains are of more account than bank notes, even in this world, truthfully says the Christian at Work
and it is never wise to risk onc's head to accumulate a property for other people to quarrel over.

## IMPROVED DIAGONAL PLANING AND POLISHING MACHINE.

The accompanying engraving represents one form of Nor ris' diagonal planing and polishing machine, which is Woodworth planing machine of the raising and lowering bed class, and of improved construction. The cutting cylinder is made to be changed, at will, from its usual position of square across the machine, to a diagonal one of $35^{\circ}$, and vice versa. A polishing device is also provided which, when suitably adjusted, polishes the surface of the material after the latter has passed the planing cylinder. Among the advantages claimed is that, when smoother surfaces than can ordinarily be produced by planing machines are required, the cylin der can be instantly swung into the diagonal position, and the polishing device thrown into gear; rough lumber fed in then emerges with the surface planed and polished, ready fo paint, oil, or varnish. With the cylinde working diagonally, all kinds of framed ar ticles, such as doors, sashes, blinds, ends of bureaus, commodes, desks, cabinet organs, etc., are claimed to be planed, as casily, per fectly, and cheaply as common lumber, and with the polishing device in operation they are polished perfectly at the same time. The manufacturer states that two men are enabled to do the work of twenty skilled men with hand tools, and at the same time make better sur faces. The machine is adapted for the uses of carpenters' and joiners' shops, sash, blind, and door factories, cabinet-makers' shops, cabinet organ, furniture, railroad, and street car factories, whether large or small, using the cylinder square across for ordinary surfacing, and diagonally for smooth planing and where flat frame work is to be smoothed.
Nearly fifty of Mr. Norris' machines are, we are informed, in use in the sash, blind, and doo factories of the United States and Canada from which the annexed en rraving was prep The machine in the largest walnut furniture factory in this city

Further information may be obtained by addressing W. R. Norris, Fort Ann, N. Y. Arrangements for the manufacture of these machines in Canada are desired.

## IMPROVED CALF MUZZLE.

Mr. August Miller, of Salina, Kansas, has patented, January 18, 1876, a muzzle for calves, by which they can be effectively prevented from sucking the cows when in the same inclosure with them, without being hindered from grazing or getting other food. The muzzle may also be used for dogs and other animals with advantage.
In the engraving, A represents a rigid frame, made of a solid or full-top part, of zinc or other material, that is fitted on the nose of the calf or other animal to protect the same against getting chafed or sore. The top plate is fastened thereto by a flexible head strap, $a$, and a lower jaw strap, $b$. A swinging guard plate, B , is hinged to the front edge of the full-top frame, A , and it extends fully across the front of the mouth. The guard plate has at both sides hinged plates or boards, C, with projecting spur-shaped rear and top extensions, $d$, that serve to hurt the cow when the calf attempts to suck, so that it is driven off and prevented from taking hold of the teat. The front and side guard plates close over the mouth on the upward motion of the calf's

head, but do not interfere with the grazing or other feeding when the head is in downward position, as the plates swing away from the nose and admit the free use of the mouth. The side plates, C , are provided at the top spur, $d$, with inwardly projecting catches, $e$, that engage the side flanges, $f$, of the top frame when the calf turns one side up to get the teat into the corner of the mouth. The side plate is thereby locked to the frame and shuts out the teat, securing at the same time the position of the front guard plate, so that the same cannot be swung higher by the jerks of the animal's head when trying to get the teat.

## A Simple Test for Carbonic Oxide.

All previous methods for estimating or detecting carbonic oxide by oxidizing it with chromic acid, absorbing it in subchloride of copper, or reducing palladium solutions, are tedious and difficult. Professor H. W. Vogel has turned
his favorite weapon, the spectroscope, against this, and again brought down his game. The reagent which he employs to absorb the carbonic oxide is simply blood and water. This mixture is so dilute as to have only a faint red tinge, and, when placed in an absorption cell, 1.8 to $2 \frac{8}{10}$ inches thick, shows distinctly the well known absorption bands. In testing the air of a room for carbonic oxide, he takes a bottle that will hold 100 cubic centimeters, fills it with water, and then empties it in the room where the test is with water, and con empties it in the room where the test is
to be made. Of course, as the water flows out, the suspected


NORRIS' PLANING AND POLISHING MACHINE.
( $\frac{1}{8}$ cubic inch) of the diluted blood is poured in, and the bottle shaken for one minute only. The color of the blood changes, it looks more pink, the absorption bands are a
little paler and pressed a little back to the left or spectrum. A skilled spectroscopist would notice this at once; but for the less experienced, Professor Vogel adds 3 o 4 drops of strong sulphide of ammonium. If the blood is free from carbonic acid, the two bands near $D$ and $E$ disappear, and a broad faint band appears between where these were but if carbonic oxide be present, these bands remain un changed, when the sulphide of ammonium is added.

To test the delicacy of this reaction, Dr. Vogel took the usual mixture of carbonic acid and oxide, as obtained by the action of sulphuric acid on oxalic acid, and mixed it with 60 volumes of atmuspheric air. and by shaking two minutes with 2 cubic centimeters of the blood solution, the reaction was very unmistakable. As little as 0.4 per cent of carbonic oxide in the atmosphere can be detected in this way by taking 500 cubic centimeters (about 1 pint) of the air and shaking with 3 cubic centimeters of dilute blood. The quantity of blood required is so small that Dr. Vogel sug gests that the experimenter can draw it from himself, or fresh blood can be kept in the laboratory for a week by the use of salicylic acid. The reaction could be rendered mor delicate if the oxygen were removed. Carbonic acid is readily detected in this way in tobacco smoke and in illumi nating gas.

## New Copying Ink

The best kinds of copying ink are usually prepared by ad ding a few per cent of alum to an extract of logwood of 10 B., or to a decoction of the same; and then, to improve its copying power, some sugar and glycerin, or table salt is added. Such inks have a violet tint, are purple when first written with, and gradually darken on the paper. The copies taken from them are at first very pale, and only slowly darken.
Professor Gintl states that a new kind of Parisian copying ink has been recently introduced into Germany, which dif fers from those previously in use in having, while liquid, a more or less yellowish red color; but on paper it rapidly turns blue, and immediately produces a distinct blue-black copying ink. Moreover, it remains liquid a long time; while ordinarily violet copying ink soon gets thick and has sediment in it; this kind copies easily and perfectly
Experiments and attempts to make this ink lead to the following result, which indicates the method of its manufac ture: A $\log$ wood extract of $10^{\circ} \mathrm{B}$. has added to it 1 per cent of alum, and then enough lime water to form a permanent precipitate. This mass is then treated with a few drops of a dilute solution of chloride of lime (bleaching powder), just enough being added to impart to it a distinct blue-black color, after which dilute muriatic acid is added drop by drop until a distinctly red colored solution is produced. To this solution is added a little gum, and a half of 1 per cent of glycerin. The preparation thus obtained has all the proper ties of the Parisian copying ink. It is evident that the small quantity of chloride of calcium, formed by this process, greatly increases the copying power of the ink; while the exceedingly slight excess of free hydrochloric acid cause the ink to remain liquid by holding in solution the lime and lumina lakes of logwood. When the writing dries, the acid gradually escapes or is neutralized by the trace of alkal in the paper, so that the blue-black lake is left. It is eviden
that any considerable excess of muriatic acid must be voided, as also the use of too much chloride of lime solu tion.-Deutsche Industrie Zeitung.

## Heated Air instead of Oxygen in the Lime Light

Means of producing artificial light of good actinic quality a moderate cost, without risk of explosion or other dan er, must always interest photographers, and many and vari ous experiments made from time to time have been brought under the attention of our readers. The oxyhydrogen ligh
has, of course, satisfied the condition of efficiency; but be sides the cost of oxygen there has been th greater objection of risk in its preparation storage, and use. Mr. Woodbury has recently been good enough to bring under our atten ion the result of some experiments, by whic he hopes to obtain a light, in all respects effl ient for lantern purposes and for enlarge ment, in which, whilst obtaining the brillianc and the purity of incandescent lime, he dis penses entirely with oxygen in obtaining it.
Mr. Woodbury does not claim to have in ented a new thing, but he has made a valuable application of an existing thing. Som of our readers may be familiar with the Fletcher blowpipe, in which a jet of heated air, inside a gas jet, emerges at the same ori fice as the gas, into the flame of which it en ters, producing an intensely hot concentrated flame. This constitutes the Fletcher blow pipe. The air pipe is connected with an ai bag, sending a stream of air through it, finally ntering a spiral tube, which twines round the gasburner, both being heated by a Bunsen burner underneath. The intense jet to whic we have referred is made by Mr. Woodbury to play upon a lime cylinder, by which is pro duced a concentrated flame of very intens brilliancy and pure actinic color, admirably suited alike for the sciopticon or other magic lantern, and or photographic enlarging purposes.-London Photographic Nevos.

## IMPROVED HORSE BOOT.

Mr. JosephFennell, of Cynthiana, Ky., has patented through the Scientific American Patent Agency, March 31, 1876, an improved boot, which is herewith illustrated. It is designed o protect the hoof, pastern joint, and fetlock joint from being cut or injured by the overreaching or interfering of the horse when being driven at high speed, and is so con tructed as not to chafe or stiffen the joints or confine or cord the leg. It allows sand to pass out readily.
A is the lower or oof boot, which is so formed as to cover the oof, to which it is se cured by a strap, B buckled tightly around the heel of the hoof just above the shoe. Upon the strap, B, is placed a rubber tube C, four inches, more or less, in length, which prevents the strap, B from slipping. The orward part, $a$, of the boot, A, is extended upward to cover and protect the corona of he hoof and the pas ern joint, which ex ension, $a^{\prime}$, is padded prevent it from chafing the said joint $D$ is the upper or speedy-cut boot, the ower edge of which is concaved to corre pond with the exten sion, $a^{\prime}$, of the hoof boot, $A$, and is connected with the upper edge of said boot, $A$, by two or more flexible straps, E, so that the boot may not interfere with the proper play the joints. The boot


D, is secured in place
by a small strap, F, buckled around the fetlock, and which is only designed to keep the boot, E , from falling down The strap, F , is padded, and buckled loosely, so that it can not chafe or cord the leg. The boot, E, is padded upon the inner side, and is made flaring both upward and down ward, so that it cannot confine the sand, but will allow it to pass out freely.

Purification of Bismuth.-M. E. Smith adds to 16 parts f bismuth, kept in fusion at the lowest possible temperature part of a mixture of 8 parts of cyanide of potassium and parts flowers of sulphur. After fifteen minutes the metal is allowed to cool.

## practical mechanism.

by jositua rose.


## pattern making.-bevel wheels,

"He who can make a good bevel wheel is a good pattern maker." That was once the saying; but the system that di vides a trade into specialties is now growing to be the gen eral custom, and it has robbed the expression of half its truth, for there are many good pattern makers who have been engaged all their lives in specialties remote from beve wheel making. We give the saying, however, merely to show the importance that has always been attached to work of this kind, not undeservedly. A pair of bevel wheel pat terns, fresh from the workman's hand, especially if of ma hogany and nicely varnished, excite gencral admiration. It is a job easy enough to do; but you must know the way that way is what I shall endeavor to elucidate


Fig. 205 is a sectional elevation and plan of a bevel pinion; the construction of the body does not differ materially from that of a spur. We may commence building up, if the pinion is of such size to require building, from the small side, A B, for the reason that it is desirable and convenient to turn the part, where the teeth are to be, last, when the building is completed; or if it is a solid piece, we begin by turning off to the line, D C, then reverse on the chuck and turn A B, making a slight recess for the core pivot, set a bevel to the angle, A B C, on the drawing, and turn the circumference to it and at the same time to the required diameter, making it perfectly true and straight for the reception of the teeth. Very little, if any, sandpapering is to be done on this part; it destroys the evenness of the surface. With a fine tracing point, and while the lathe is in motion, mark a line near to D C on the circumference, or, properly speaking, the face. Upon this line the pitching or dividing is made to determine the position of the teeth; divide this line into as many parts as it is desired to have tecth. It often happens in performing this division that, having passed the compasses around the piece, we do not fall exactly into the starting point, but yet are so near that we cannot shift the compasses, even if they are furnished with a slow-motion screw, without making the error greater. The usual way of overcoming this difficulty is to give the compass points a few slight rubs upon the oilstone inside or out, according as we wish either to enlarge or diminish the distance between them.
When a pair of bevel gears are geared together, all the teeth on each wheel incline towards a single point; this point is where the axial lines of the shafts would meet if produced. In order to give this direction to the teeth of a bevel wheel or pinion, we must set them square; but to an article of the shape we have produced, an ordinary square cannot be applied in this case, and the workman calls to his aid one of the simplest problems in practical geometry, namely, to erect a perpendicular to a given line. This is illustrated in Fig. 206, where the whole outline is supposed to represent the turned body' of the pinion. A B is the line passing around it, of which we have previously spoken. In it take any point, C; it may be one of the points already made in pitching off. With C as a center, and at any distance convenient, mark $D$ and $E$; with $D$ and $E$ as centers, and at any suitable distance, mark the arcs which intersect at the
point, F. Join F C; it is the perpendicular line required. As bevel wheel or pinion will be too much undercut to leave th it would be too troublesome to go through this operation for mould without damaging it; this method will admit of the teeth being withdrawn in detail, after which the pattern can be lifted without difficulty. To counterbalance these advantages must be mentioned the extra cost inseparable from this method of fixing the teeth. This, however, is really a small matter when dealing with pinions; and therefore bevel pinions usually have their teeth attached by dovetails, ex cepting those of small size. If it is decided to use dovetails, we procced as follows: The body of the pinion has been turned and divided, and the perpendiculars all finely drawnin. Cut out of thin wood a piece of the size which the dovetails are intended to be, which is such that a small margin of tooth may be left on each side; set the piece on the rim, at a distance from a perpendicular equal to the margin allowed; set it by the square shown in Fig. 207, as the dovetail must have such a taper that its sides may both tend towards the point, X , before alluded to, namely, the intersection of the axes of the shafts. This will be the cas if, when one side of the dovetail template has been se square, the other is square also. By this template, lines for all the dovetails are scribed on the face; the depth is laid of on the drawing by lines tending toward X ; and from this the depth of each end of the recess may be gauged on the pat tern. No curvature is given to the bottom of this; it is pared out flat with the chisel; the dovetails are now fitted and left projecting above the face; they are driven moder ately tight; the projecting parts are then turned off leve with the rim.

We have now to go through the same process as before de scribed for making and attaching teeth. When the glue is well set, each should be knocked out, numbered, and the dovetail bradded. Fig. 208 is a section and half plan of a bevel wheel; in the latter the shape of the teeth is no shown, but merely their thickness at the pitch line; in the sectional view, a few teeth are laid out in profile upon arcs struck from the centers, $A$ and $B$, which are the point of intersection of perpendiculars from the ends of the teeth (at the pitch line) and the center line. In the section on one side is shown a serics of rectangles numbercd from 1 to 5 these represent the segments of which the rim is composed It is true that they might be made more nearly to approxi mate to the shape of the rim by sawing them to a bevel, but a machine suitable for this is not in cevery shop; and when it a machine suitable for this is not in every shop; and when it
is considered that the segments themselves are usually not is considered that the segments themselves are usually not
more than $\frac{5}{8}$ inch in thickness, it will be seen that the additional complication counterbalances the saving in lumber and time in turning. If, however, the wheel is very large, or where thick segments are employed, we may advantageously saw the segments to a bevel. The method described for turning the bevel pinion is exactly suitable for the wheel the arms will be checked together, but need not be built into the rim, unless we desire an exceptionally strong pattern; the obliquity of the rim enables us to get a good purchase, by means of screws through the end of each arm into it. Car must be taken to have the ends of the arms each to bear properly on the rim; otherwise the rim will be thrown out of true in screwing.
It will be remembered that, in treating upon the spur whecl, we had, in forming the box for shaping the teeth, sim ply to draw out on each end the natural size of the tooth that is, if we except a slight diminution towards one end for draught; but the conical form of a bevel wheel gives a little extra trouble. In Fig. 208 the tooth proper is of the lengt of the face of the wheel, as seen in section. Now all lines

bounding the teeth must converge to the point, $\mathbf{X}$; so if we take F F to represent the length of the box, we must strike out upon the large end an enlarged, and upon the small end a diminished, tooth; then by planing to these lines we shal have formed such a box that any piece shaped in the gap formed in it will be of the proper size and shape for a tooth It would confuse our engraving too much were we to at tempt to show the enlarged and diminished tooth on the ends of the box; but the principle is casily understood, as we have but to follow out whatever method has been adopted on the drawing for producing the tooth curves. It will be necessary to recur to this subject again when treating specially upon the methods of tracing out the curves suitable for teeth.

Since the first of the year New York has exported ove $70,000,000$ gallons of petroleum against $25,000,000$ by al other ports. Last year the city had only about half the trade.

## [Continued from first page.]

 cimple connections which need not here be explained. Steam may also be conducted to the acid reservoir to serve the same pur pose. A water trap, $O$, is provided in the air pump pipe, which prevents the acid fumes from injuriously affecting the working parts of the pump. The pipes, $P$, connecting the domes with the chargers, serve to equalize the pressure be tween the two, and to permit the free passage of the acid down to the generator, when the chemicals are to be mixed, by preventing a vacuum above the acid. Each dome, by means of a horizontal distributing pipe, $Q$, with suitable vertical branches, communicates with the gas holder or purifier, R , into which the generated gas is thus conducted. The purifier is a cylindrical vessel, which is imperforate at the points where the entering gas strikes it in issuing from the branch pipes; and between these pipes it is perforated to admit the passage of the gas. The object of this partition is to eliminate the solid and liquid particles which are mechanically carricd up on the form of spray, by causing them to impinge against the imperforate portion of the diaphragms. The gas then passes to the hose, S .In order to remove the collected impurities from the puri fler, a pipe, with suitable valve, leads from the bottom thereof to the discharge pipe, G. In this way, water may be led in from the main supply. E, and also discharged through the same pipe. The latter also serves as a drain for any of the liquid contents of the generator which might surge up into


GRANGER'S APPARATLS FOR EXTINGLTSIING FIRE ON SHIPBOARD.-Figs. 2 and 3.
the holder; and thus it operates as an equalizer to restore the said liquid to the gencrators. In order to intro duce the gas into the burning vessel, without causing it to entrain air with it, the nozzle, T, Fig, 3, has a ta pered screw-threaded swiveling sleeve, U, which is provided with handles, and which may be screwed into a hole of any size bored in the deck. An attendant at the nozzle is thus dispensed with, and the latter is firmly held airtight. An extra pipe, V , is connected to the distributing pipe, and leads into the open air so as to prevent the escape of the gas into the room through the safety valves. There is a separate safety valve on each dome, and also one on the purifier, which is arranged to blow off into the atmosphere at a lower pressure than those on the domes, in order to insure that no gas shall escape between decks. Pressure gauges are also arranged on each generator, and one is provided to indicate the pressure applied upon the acid in the reservoir
The apparatus, we learn, is alrearly in use on the Protector, vessel now used to prevent tire among shipping in the harbor of New Orleans. It is equally well adapted for use aboard the ship it is to protect, or upon a small vessel, as above noted, to serve as a floating chemical fire engine in ports. Within two months last year it wasthe means of extinguishing fire on three cotton-loaded vessels in the abovenamed harbor. These ships carried respectively $1,400,900$, and 3,200 bales of cotton, and were valued with their cargoes at an aggregate sum of $\$ 375,000$. We are informed that, with the exception of the bales of cotton which had actually been on fire, in two of the vessels the cotton, after the flames had been subdued, was discharged "in as good order and condition as it would have been at port of destination had there been no disaster." In the third vessel, water was employed by the firemen; but the fire was subdued by the gas. In one instance the flames, which were rising twentyfive feet above the hatches, were brought under control in twelve minutes after the gas had been admitted to the ship. The importance of this invention in such cases as the above is especially great; as cotton, when soaked with water, bccomes much deteriorated in value. The United States Board of Inspectors examined the vessels saved. This body, in an official report, recommends the adoption of the apparatus aboard all steam vessels. We need not point out the advas.
tages of the invention to passenger-carrying ships. Even on
a man-of-war, where rigid discipline prevails and whore fire is provided against by an claborate system of drill, the out break of a fire at sea is apt to produce a panic, as was re cently the case aboard the Egyptian cruiser Latif in the Red Sca. On an ordinary ocean steamer, crowded with people the terrible confusion can be easily imagined. Amid such a state of affairs, it is difficult to collect enough cool-headed people to aid in managing the usual appliances; and every moment of delay in getting the flames under only intensifies the general fear. In such cases the apparatus which we have described, which silently and quickly smothers the conflagration, might well prove invaluable.
Patented through the Scientific American Patent Agency January 2, 1877. For further information, address the in ventor, Mr. A. M. Granger, Exposition Building, New Or leans, La.

## Preserving Metals.

For preserving metal and other substances from decay and fouling, Mr. Charles Weightman Harrison, of South Kensington, London, Eng., proposes to dissolve the crystalline hydrocarbon known as ozokerit in any of its solvents, such as benzole, petroleum, oil of turpentine, or resin oil, and he then mixes the solution in ary desired proportion with otlrer suitable bodies according to the purpose for which it is re quired. He mentions that his experiments have been made with ozokerit as a type of the mineral hydrocarbons, which are built up of molecules containing not less than 20 atoms of carbon, such minerals being capable of resisting the action of all acids at ordinary temperatures, and suffering no deterioration from atmospheric influences. On this account he has found them valuable for mixing with gums, resins, and colors applicable to a great variety of purposes for preserving, as they impart thereto a high degree of permanence. He explains that a simple and ready mode of preserving bright metals from rust is to rub them over occasionally with a wax formed by melting together equal parts, or nearly so, of ozokerit and beeswax. It is easily applied in a thin coat by rubbing the compound on the metal with a cloth. In by rubbing the compound on the metal with a cloth. In
applying this compound wax to iron, he sometimes adds applying this compound wax to iron, he somet me metal
finely powdered plumbago to give it the color of the finely powdered plumbago to give it the color of the metal.
Another compound or solution for preserving metals he forms by dissolving in a sand bath (say) 4 ozs. ozokerit and 4 ozs . marine glue in 2 lbs . benzole, and then adds 4 lbs . linseed oil and $\frac{1}{2} \mathrm{lb}$. essence of turpentine. The mixture is kept gently boiling in the bath for an hour or so, after which it is ready for use, and may be applied to the metal by a soft brush, as in ordinary painting. In some cases he impregnates the surface of the metal deeply by forcing the compound of ozokerit into the pores by exhaustion or pressure, or the two combined. $\Lambda$ convenient apparatus, which he uses for this purpose, consists of a metal cylinder, such as a wrought iron boiler of a suitable size and strength, equal (say) to about 200 lbs . to the square inch, fitted by connec tions with exhaust and pressure pumps in a manner which is well known. This cylinder is provided with an airtight door and a safety valve. When the metal articles have been placed in the cylinder, the air is exhausted to about 27 inches of mercury, and the hydrocarbon fluid is then admitted through a connecting pipe until the articles to be impreg nated are covered. The pressure is then put on, and the fluid forced into the exhausted pores. He also claims paint ing or coating metals with a compound formed by melting together about 5 lbs . of ozekerit, 5 lbs . resin, and stirring the fluid in 2 gallons rectified spirit ( $65^{\circ}$ over proof), in which 2 lbs. gum sandarach and 2 lbs. garnet lac have been dissolved. Add turpentine varnish to them, and boil at a gentle heat for an hour or so. Filter through a fine cloth, and preserve for use. He forms a protecting varnish for suspended or open air telegraph wires ly coating them with a fluid, formed by mixing together and heating at a low boiling point for a short time, $\frac{1}{4} \mathrm{lb}$. ozokerit, $\frac{1}{4} \mathrm{lb}$. gutta percha or india rubber, 1 lb . rectified resin oil, and 2 lbs . linseed oil varnish. As varnish for outdoor ironwork he proposes to dissolve, in . 2 lbs. tar oil, $\frac{1}{2} \mathrm{lb}$. ozokerit and $\frac{1}{2} \mathrm{lb}$. resin, mixed while hot in an open pot. The invention also includes a process of poisoning barnacles with strong tonic bitters-Angostura and the like-or weak strychnine; but these not being of direct interest to manufacturers or miners, they need not be referred to.

## American Fruit in Europe.

Europe is now taking a surprising quantity of American fruit. 'The purchases have amounted, according to the New York Tribune, to over $\$ 2,500,000$ worth since .June, 1876, compared with $\$ 600,000$ in the same period the year before. Dried apples figure largely in this movement. This country has exported over $12,000,000 \mathrm{lbs}$. of them since last June, as compared with $522,000 \mathrm{lbs}$. the previous year. This new addition to the trade of the United States is due to inven tion, which has occupied itself of late with improved methods for drying and preserving for transporting fruit. The greatest progress has been made in the way of dryers.
Within a year some notable inventions in this line have been perfected which are a great acquisition to the resources of the country. The fruitdryer bids fair hereafter to be as much of a necessity to every farming community as the cider mill and the cheese factory.

According to the Philadelphia Trade Journal, Mr. Pea body, the inventor of the Peabody rifle, receives about $\$ 300$ day in royalty.

## (Cummisatioms.

## Our Washington Correspondence

To the Editor of the Scientific American
In my letter published in No. 22, I mentioned that S. D Locke had applied to Secretary Schurz for an order directing the Commissioner of Patents to re-hear acase decided arainst he applicant by Assistant Commissioner Doolittle, which pplication the Secretary denied. Mr. Locke has since ap plied to Judge Humphreys of the District Supreme Cour or a mandamus directing the Commissioner of Patents to re-hear the case. The hearing was set for May 22, but wa postponed until a later day; and on the second day set, the Judge again postponed the case until thiz fall term
Under a recent examination of third assistant examiners, in which seventcen competed, Messrs. C. J. Hedrick, F. S Williams, and R. J. Fisher were appointed second assistan examiners. To fill the vacancies thus made in the ranks of the third assistants, another examination has just been held in which sixty-five competitors took part, the result of which as not yet been announced, but probably will be before this is published.
The managers of the French Exposition of 1878 have in formed our government that, if the United States is to tak part in the Exhibition, it will be necessary that immediate steps be taken for representation in the American section The Secretary of State, by direction of the President, has ow under consideration the proper measures to be recom mended to th:e Cabinet to form a basis of a plan of repre entation of the United States GJvernment and people a he Exposition. Both the President and Secretary express their regret that no action was taken by Congress at the tim the notification of the proposed Exhibition, submitted to the Secretary of State by M. Bartholdi, was transmitted to tha body. The letter of the late Secretary of State transmitting the notification was accompanied by no recommendation of a plan of representation, on account, it is said, of the dissatisfaction entertained by the late Administration with the action of some of the French Commissioners during our own xhibition. President Hayes and Secretary Evarts, on the contrary, are extremely anxious that some representation should be had, particularly in view of the fact that the French Commissioner Sommerard's conduct was satisfac orily explained. It is thought probable that the best plan will be to appoint a Provisional Commission, with the under standing that the Commission will not be paid uuless Con ress, when it meets, makes suitable appropriations, and that by this means arrangements may be made for the shipment of articles by American exhibitors. There is no constitu ional impediment to this course, and the Secretary thinks there will be no doult about Congress making the necessary propriation when it meets in October. The minimum amount wanted for this purpose is said to be about $\$ 300,000$. Several prominent gentlemen associated in the administra ive branch of the Centennial Exhibition and now counected with the Permanent Exhibition, in a recent informal inter view with Secretary Evarts, said, as they had the machinery for such work now in efficient organization, they would be appy to co-operate in any way that he might fecl disposed to tilize their services. Another plan suggested by a numbe of prominent American manufacturers of machincry is that some person now in Paris connected with the State Depart ment may be temporarily detailed to take charge of such shipments as may be made until Congress can meet and ake the necessary appropriation
Our Consul at Berlin has submitted to the Secretary of tate a prospectus of the Leather Exposition, which is to be held in that city from the 8th to the 24th of September, and recommends that the American manufacturers of that ne cssary article send exhibits of their wares, which he thinks will turn out very beneficial to the leather trade.
From the Spanish Minister, Secretary Evarts has received notification that an International Exhibition of Fine Art will take place in Madrid in January of next year, under the uspices of his government
Our Consul at Odessa in a late report to the State Depart ment, has the following: "Agricuitural implements might be sent in great quantities to this country if our manufac turers would make an effort in that direction and adap their implements for the use of the peasantry here. Th principal thing to be done is to make them exceedingly firm and strong. American reapers and mowers are now the fa vorites above all others, and have a large sale. In other machinery the English manufacturers have the field, and I have scen no article of their manufacture that excels the American, unless expensiveness be deemed an excellence. I am persuaded that there is a fine field hire for the American threshing machines. During the year an American firm has supplied a railroad here with fifty-five locomotive engines. They were remarkable in strength, power, and workman ship; and I am told that they draw a train easily through heavy snows that, with the engines formerly in use, would have been impassable.
Some three or four years ago, Congress appropriated $\$ 100,000$ to be expended in experimenting on steam boiler explosions, to discover if possible the cause of some of the mystery that is believed by many to be connected with these accidents, which mystery, however, is generally believed by the best informed engineers to consist in low water. During the then ensuing season, a Commission, of which the Super vising Inspector of Steam Vessels was the chairman, made a series of experiments at Sandy Hook, and about one half of
the appropriation was spent without results of any value training knowledge becomes power. But knowledge, as worth mentioning. The next season the Secretary of the given by the mere teacher into the memory, is not power; it Treasury placed a gentleman of scientific attainments at the head of the Commission, but with no more satisfactory re sults. It has now been determined to change the location of the experiments to Pittsburgh, but only about $\$ 8,000$ of the appropriation remains unexpended, and it is feared that little or nothing will be gained by the expenditure of the $\$ 100,000$, although great expectations were formed by many of the amount of knowledge that would be obtained from the expenditure of so large a sum.
There are encouraging indications that the spawn of the Californian salmon, deposited at or near the head waters of the Atlantic coast rivers by the United States Fish Commission, has produced large numbers of the young fish. Reports state that young salmon nine inches in length have recently been caught at the mouth of the Connecticut river. They were probably making their way to the ocean, as the young fish are said to remain in fresh water some twelve or eigh teen months before going seaward, returning in two or three years weighing from ten to fifteen pounds each. A Richmond paper reports that salmon of the same size as those found in the Connecticut were caught in Hampton Roads going to the ocean, and thinks they were, no doubt, some of the young ones deposited in the James river by the Fish Commission in the winter of 1875-6.
The Director of the Mint estimates that the coinage at San Francisco for the present fiscal year will reach $\$ 45,000,000$ including $\$ 13,000,000$ of silver coins.
From a statement furnished by Dr. Young, Chief of Bureau of Statistics, it appears that the aggregate imports and exports for April were: Total exports, $\$ 44,515,439$; total im ports, $\$ 42,662,696$; for the past ten months of the current fiscal year the exports of merchandise were valued at $\$ 514$,799,053 , the imports for the same time being only $\$ 357,584$,817, showing a balance in favor of over $\$ 157,000,000$.
Mr. H. C. Fisher, the general manager of the English postal telegraph, and Mr. W. H. Precce, the engineer, are here for the purpose of making an examination of the working of the American telegraph systems, particularly the use of the sound system, which has not yet been introduced in London, and will visit the principal cities and examine all the operations connected with transmitting and receiving messages.
The Postmaster-General is constantly in receipt of letters from parties who claim to have discovered an indelible ink for cancelling postage stamps. Impressed with the value of such an ink, which would effectually prevent the use of washed stamps, the department made arrangements with experts to test all inks presented, and public notice wasgiven that any ink that was claimed to be indelible would be so tested, and, if the result proved satisfactory, the ink would be adopted. The result was that a large number of samples of ink were presented, and for nearly two years the depart ment experts were engaged in testing these so-called indelible inks; but these tests proved the inks to be so far from indelible that they were discontinued by order of the Post-master-General; and as there are now no longer any tests made, it is useless for inventors to forward any more samples.
Wathingon, D. C.
Occasional.

## Knowledge is Power."

Every year an oration is delivered before the Hunterian Society of London, in eulogy of Join Hunter, the celebrated physician, from whom the society takes its name. The address of Dr. W. Moxon for the present year is remarkably vigorous. The following is an extract:
The great fallacy of the age is the vulgar fallacy that knowledge is power. But not all knowledge is power. Only the knowledge you have faith and aim to use is power; and the instinct of each mind is, I believe, a far better judge of how much knowledge it has faith and aim to use than we commonly suppose. Knowledge is not power. Any fourth year's student knows much that Hunter did not, and could not, know. But where is the power of Hunter? Power arises by training in the use of knowledge. Consider the difference between training and teaching. The teacher carries over the things he knows, and fixes them in the learner's memory; the trainer takes what is in the memory, and converts it into an organ for the pupil's own use. The store of memory of things taught is totally distinct and separate from the traincd mechanism for use of knowledge. And these two different things-the store and the mechanism-are in separate places in the brain. It is only of late years we can be sure of this. We have it proved obviously in the case of language in what is called aphasia. In aphasia, a person paralyzed on the right side of his body has lost the power of using language, and yet understands all you say. Obviously, then, the understanding of speech is in one place, and the power of framing language is in another place, in the brain. The same is true throughout all human acquirements. The power of knowing is the fruit of knowing, and the power of acting is the fruit of acting. There is knowledge stored in one place, and the power of using it stored in another place. Teaching is the storing of knowledge; it may be done quickly. Training is the creation of an organ for use of knowledge; it needs much time; it is a slow process. The trainer has to convert the pupil's knowledge into motive, his desire into patience, his will into skill. Every good trainer aims to raise up in the pupil's mind a self-training faculty, which shall itself continue to train more and more knowledge into motive. By such
is so much weight, which by training may become the in strument of power. Now, the self-training spirit is natural to some men-to all great men. On the other hand, the self-training spirit is almost absent in some men. These are the fools, and they trouble every one as to what is to be done with them. But the vast majority of men have some self training faculty; and the proper aim of education is to sup port this, which I may call the vital spark of character, b help from the training faculties of others."

## Birds, Nests.

" The best way to find nests is to watch a bird while building; in that way, moreover, you are sure to see them in their best condition, and to know when the eggs are fresh. It requires patience; but you see the workers return again and again to the same spot, and a little closer inspec tion usually completes your knowledge, though you may sometimes be deceived or nonplussed by the caution an cunning of the architects. You will facilitate your work by scattering cotton wool, horsehairs, straws, string, worsted and cloth where they will attract the attention of the birds about you. Put them on your lawn or on the piazza vines, and watch them. A robin comes to carry off the string, and, having used up what you have provided, and liking the material, attacks a long piece wound round a stake, and of it; but the harder that he pulls the rest, the tighter he of it; but the harder that he pulls the rest, the tighter he
ties the knot around the stake, and the string is becoming entangled with his legs; he fights twenty minutes and then gives it up. Sparrows pick up hairs and straws from the lawn, and warblers come to the vines for cotton wool, pass ing fearlessly within three feet of your chair; then they
come back to break off little twigs and to peel off shreds of dry bark from the honeysuckle. $\Lambda$ pair of golden robins the male with black and orange, the female with yellow and duller black, come for string, worsted, and thread; but be ware of them, for they are thieves. Leave your knitting under the tree there for five minutes, and it is gone; you will find it a week later, a part irrevocably woven into the hanging nest, and a part dangling with the needle in it. The weaving is so cleverly done that you wonder whether the orioles haven't used your needles. Not at all, madam; I
defy you to produce with your implements such a piece of work as these birds have produced with their bills. Suc cessful experiments have been made by supplying the orioles, in the tree where they are occupied, with brigh silks and worsteds, which they employ altogether, if liberally provided, so that a very gay and party-colored nest may swing in your orchard where you can see it from the house. Wilson says that an old lady, to whom he showed an oriole's nest in which a piece of dry grass, thirteen inches long, was passed through thirty-four times, asked him, half in earnest, f the birds couldn't be taught to darn stockings."一H. D Minot, in Harper's Monthly for June.

## Waste in Machine Shops.

A workshop, however small, however few the number of hands, is never too small to have a system; want of system is the cause of great waste of time and material, besides con worry and discontent.
Step inside this building of fair dimensions, whose front s covered with big lettered signs, showing that it is devoted the production of all kinds of machinery
What do we find? The floor covered with litter, heaps outtings under every lathe or machine, under every bench on the floor new and old material of all kinds have been thrown in almost inextricable confusion; the machinery is encrusted with oil and dirt, except just those parts that meet the hand in working; and the speed cones and pulleys are polished by the running belts, showing what might be and is not.
The cutting tools, the bolts and plates, and other gea used in these machines, lie around their bases; a new stratum seems to be fast closing over some of them. Overhead is heard the harsh grating of some loose pulley; the belts have been thrown off others by some sensitive workman, who cannot bear the unpleasant noise in such cases; the belts dangle from the shafts, the running shaft keeping a stretch on them and wearing them all the time. About thirty men are employed in these works, yet there is no one whose special duty it is to look after the tools, to replace or repair them when lost or broken.
A man has to drill a $\frac{3}{4}$ inch hole in a piece of plate; the time actually required would be about five or ten minutes if good order were kept in this case. The man commences by making a tour of the shop, for there are some drills lying around this machine, and some around that, and there is no
one place where every drill not in use is sure to be found. His search is not crowned with immediate success; a $\frac{3}{4}$ clear ing drill ( $\frac{1}{1} \frac{3}{6}$ ) is the nearest he can procure; he has set hicallipers and taken the size of it; he proceeds to grind it to , having reduced it to the size, he finds it will not clea itself so high as he wishes; however, at last, by more grind ing, he is satisfied with it, and is ready to commence-time lost, twenty minutes. He is hardly through drilling, when up comes a man looking for the $\frac{3}{4}$ clearing drill he was using twenty-five minutes ago; he, finding it has been altered takes it to the smith, and waits to have it flattened out,
which, with the re-grinding, makes a further loss of twenty minutes-total loss, forty minutes on the drilling of a $\frac{3}{4}$ hole,
for which the boss could scarcely charge more than ten cents.

Another has a brass to plane; no tool for brass seems to ande; he has probably trodden it down too deep in th e sod dust of the flooring to be distinguishable. He it iro hat is easy enourh; but when that tool is wanted again to work in the material it was made for, a $\frac{1}{18}$ of an inch must be ground off its facets to restore the original angle-waste time and steel.
If a workman should happen to drop a small pin, washer or key, he makes another, because among the debris around he knows it is as much lost as though when it fell the earth had gaped to receive it.
Here is a man who has been half an hour filing out the hammer marks he has made in fitting two finished pieces toether; another, the same time traing up an arbor damaged y blows on its center with a steel hammer. There was copper hammer once, but it laid around and now no one knows where it is. A few of the old hands have lock-up boxes, chock full of all kinds of tools and contrivances, and re laughing in their sleeves at the frantic efforts others ar making to produce a good job without those proper instru ments, kept so securely under lock and key.
The grindstone-that much abused necessity of the work-hop-is all out of true, has no water can, and sometime not even a rest; it is nobody's special duty to keep the grindstone in order, and hence nolody docs so, while everybody grumbles at its dilapidated condition. As to its speed, the pulley now driving it was put on when the stone was of hrge diameter, and there it has remained ever since, so that the velocity of the stone is about half what it should be; the lower the speed, the worse condition the stone can get into without wrenching the tool from the hands when grinding with the stone running towards you; hence the speed of the tone is admirably suited to its condition, and both are ex ceilent levers to hoist the proprietor into bankruptcy, which under the above circumstances would just serve him right. J. R., in the Polytechnic Reviero.

## Employers and Working Men.

Difficulties between employers and working men would he less frequent, says the American Manufacturer, wer their intercourse more conciliatory, and were each to realiz that seeming inequalities are but surface appearances; and that the best interests of the one can only be secured in the rotection and welfare of the other. Governed by such dis positions and opinions, irreconcilable differences could carcely arise, because each would take a fair view of the rights and obligations of the other, and willingly make the concessions required by justice and kindness. A reasonable amount of information, derived from observation and read ing, is a pre-requisite qualification, and is always found wanting, on one side or the other, where jars and conten tions disturb the harmony essential to these relations. Ad mitting this qualification to be possessed by employers, further duty devolves upon them, of insisting that thei workmen shall possess it also. Men utterly illiterate, who can neither read nor write, cannot possess the self-respect and ambition needed to form skilled mechanics, neither can they be sufficiently enlightened to comprehend their right and duties, to know when they are well treated, or to understand the fluctuations in business which justify the rise and fall of wages. It is therefore a duty of employers to employ none but persons sober, moral, diligent, and accustomed to reflect-men with whom they can sit down and reason-who can understand just conclusions, and feel the overruling propriety of abiding by them. Where large establishment are organized on these principles, the business moves on
with contentment on both sides-each respects the rights of with contentment on both sides-each respects the rights of the other-misunderstandings are quietly settled withou strikes, and peace and mutual goodwill reign as in well regulated families. Where the instrumentalities of labor are organized, with intelligence and integrity of employers, and with workmen suitably cultivated for respectable American citizenship, the most desirable consequences may be reasonably hoped for: 1. Superior safety of capital in nlightened hands. 2. Economy of time and labor whe conscientiously employed. 3. Economy in the use of stock nd materials manipulated by instructed men of good princi ples. 4. For the same reason, the best results may be looked or as to quality and quantity of products. 5. Interests of customers and consumers are better subserved with fabrics made upon honor. 6. Ignorance is the generator of crime and vice, producing the worst consequences where it pre vails. 7. The safety of society can only be conservated by enlightened citizens, and are jeopardized by the malig nancy growing out of general ignorance. 8. It is impossile to over-estimate the social value of making workme good and useful citizens. 9. So to elevate a large class ives stability to schools and institutions for moral and in ellectual culture. 10. Working men constitute a large ma jority of our people, and whatever lifts them up in the social scale is important to the whole community. 11. In numer ous eastern cilies and towns, the benign efforts of cultivatin the industrial class are visible in good order and the general moral tone of society. 12. It is, manifestly, a primary duty of employers, to themselves and to society, to give prefer ence to workmen of intelligence and morality; where such qualities are uniformly preferred, those who possess them not will strive to attain them, and they will form an essen tial qualification in preparing youths for employment.

The Providence Tool Company are making 600 guns a day for the Turkish Government.

THE NEW GRAIN ELEVATOR IN NEW YORK CITY. measures 154 feet in height to the peak of the roof. It is is taken upmuch more rapidly than other kinds. The lower As it is now manifest that the war in Europe is destined erected on made ground, some 7,000 piles having been driven portion of the elevator legs-there are eleven in the building to render this country the principal source of grain supply into the river bed at intervals of 2 feet 9 inches between cen- -is made of plate iron from the foot to the bottom of the to foreign markets, it also is apparent that increased facili- ters. These are cut off below low water level, filled in with bins; through the bins, 2 inch pine planking is used. Each ties for handling grain will become needed at all points of sand, and transversely capped with heavy timbers. Two elevator has a 22 inch six-ply gum belt, on which the buck shipment. Inventions, therefore, tending to improve upon diagonal cappings follow above, and a series of granite piers, ets are attached at intervals of a foot.
present methods of loading and unloading cereals are, or pyramidal in shape, finally support the ponderous timbers As the grain reaches the bottom of the receiving pit, it is

soon will be, the subject of especial demand. As there is an which sustain the bins. Of the latter there are 7 rows, 33 in $\mid$ scooped up by the buckets and carried to the uppermost garexcellent field for inventive work in the present form of each row, making 231 in all; and there are shipping bins in ret of the building. Here we have followed it in Fig. 2, grain elevator, we have prepared the annexed series of en- addition. There are 182 large bins, measuring 9 feet by 13 which represents the long perspective of lofty elevator gravings from the fine building of this class, recently com- feet 3 inches by 72 feet deep; others are variously subdipleted by the New York Central and Hudson River Railroad vided to make smaller receptacles. The walls of the bins Company, at the foot of 60th Street and North River, this are of 2 inch planks laid flat, and strongly spiked together, city, which conveys a good general idea of probably the most the width of the boards making the wall thickness. The improved machinery, etc., now employed for grain tranship- total capacity of the bins is $1,500,000$ bushels. ment and storage. There are other elevators in the country We shall now trace the progress of the grain from the time


Fig. 3.-THE wEIGHING HOPPER.
much larger than the one here referred to; but the latter, constructed under the engineering direction of Mr. Charles Hilton, is practically a combination of the best results of experience as exhibited in the principal older structures in Boston, Chicago, Baltimore, and elsewhere
The building is of wood, with an exterior envelope of brick. It is 354 feet in length by 100 feet in width, and

enters the building on the cars until the final delivery into the ves sels. Four tracks enter the building at the north end; and between the outside pairs twenty-two receiving pits are arranged, the disposition of one of which is shown in Fig. 1. Each receptacle is a huge wrought iron tank, sunk in masonry and lined with boards. Each has two hatches with happers, abreast of which the doors of the freight of whe brout. The grain is car are brought. The grain is then re moved from the cars by steam shovels operated by simple overhead mechanism. By this means the un loading is very rapidly accom plished; and the grain slides down the inclined side of the pit until it meets the lofting elevator leg, the foot of which descends to the lowest point of the pit. Here is a valve adjusted by a wheel above (shown in the hands of the workman), which checks the supply of grain to the buckets in accordance with the na ture of the material, as some grain
heads. The elevator belt here passes over a 6 foot pulley, the journal of which has a hinged bearing, so that the pulley may be raised and lowered by means of a lever and cord. In this way it is brought into or out of contact with a friction pulley on the main driving shaft. A part of the heavy bevel gearing by which power is transmitted from shaft to shaft is shown in the foreground of the engraving. The friction pulley referred to is made of brown paper pressed in between iron disks, 2 feet in diameter; its face also measures 2 feet. The grain in the buckets is carried over the large pulley and is at once discharged into a weighing hopper, Fig. 3, on a floor below. This hopper stands on an 18 ton scale; and as fast as the grain within it is weighed, a valve is opened by which the grain escapes through the swinging spout on the next floor below, shown in Fig. 4. This spout may be turned by hand, so as to eject the material into any one of the open conduits, the mouths of which are placed around the cir


Fig. 5.-LOADING THE VESSELS.
cumference described by its lower extremity. As all the bins are numbered, and as each conduit bears a similar number to the bin to which it leads, it is merely necessary to adjust the spout to any desired opening to divert the grain to the proper bin. A blackboard, painted on a partition, is di vided into numbered squares corresponding again with the bin numbers; and in each square a record is kept of the contents of the bin, so that the person in charge can see at a glance just where the incoming grain may be stored.
The grain, now being in the bins, is there left until it becomes necessary to load it aboard vessels or otherwise prepare it for transportation. If the vessels are to take it in bulk, the grain is allowed to escape from the bins through spouts

Rlowpipe Apparatus.
A prize of $\$ 50$, which has been placed at the disposition of the Council by Colonel A. A. Croll, is offered by the Society of Arts, with the Society's silver medal, for the best set of blowpipe apparatus which shall be sold retail for $\$ 5$. The apparatus must, at least, contain blowpipe, blowpipe lamp or candle, spirit lamp, charcoal or charcoal pastilles and holder, platinum wire, glass tubes closed at one end (mattresses), open glass tubes, platinum-tipped forceps, magnet, hammer and anvil, and four reagents, namely, borax, microcosmic salt, carbonate of soda. and nitrate of cobalt. These instruments and reagents, together with any other which may be thought desirable, must be packed in a box. It must be

Milk and Butter.
There are no farmer's productions, says the Maryland milk and so subject to injuries from many slight causes as f every kind; none that is so much and as readily deterior ed in value the . Hence, allkinds of unclealior ted in value as these are. Hence, all kinds of uncleanliness should be avoided, and the utmost neatness should be ob-
served in every step of their production and marketing, from the very feeding, handling, and milking of the cows, as well as treatment and handling of the milk, with the churning working, and putting up of the butter. All of the imple ments used, the water and salt used, and the rooms occupied in keeping the milk and making the butter, should be kept


Fig. 6.-THE BAGGING FLOOR.


## Fig. 7.-THE STEAM ENGINE.

back into the receiving pits. Hence it is re-elevated to the top of the building, and passes first into a weighing hopper and then into a shipping hopper immediately below. By thus using two hoppers, the delivery of the grain is rendered continuous, as, while the weighing hopper is being filled, the shipping hopper may be emptying into the spout which leads down outside the building and thence directly into the vessels, as shown in Fig. 5. If, however, the grain is to be bagged, then, instead of going down into the receiving pits, it is drawn off by a simple valve to the bottoms of the bins directly into the sacks. The floor directly beneath the bins is thus known as the bagging floor, Fig. 6. As soon as a workman fills a bag, he closes the valve and places another bag in position. Another operative ties the first bag, and places it on the conveyer, which is a large rubber belt running in an opening and level with the floor. This transports the filled sack to the side of the building, and throws it off upon an inclined trough, down which it slides and emerges through an opening in the wall upon a wagon placed to receive it.
Figs. 7 and 8 represent the engines and the immense main driving belt. The engines are two direct-acting, vertical, inverted, with cylinders 34 by 34 inches. The average pressure is about 60 lbs . of steam. The belt, Fig. 8, is the largest in the country, measuring 4 feet in width and 331 feet in length, and weighing 2 tons.

## Electricity in the Production of Galvanic Deposits

 and of Chemical Decomposition.All who are acquainted with electro-magnetic machines know that the maximum of effect produced corresponds with the moment when the current is best closed, and the minimum with that when it is most open. The author was led to think that electrolysis might derive advantage from this principle. Hitherto, when desirous of effecting a metallic deposition or a chemical decomposition, a single bath has been used, into which were plunged two anodes more or less closely approximating. That is to say, we have placed ourselves in conditions approaching those of the least electric resistance and the maximum of effort. The author has therefore multiplied the baths, taking care to connect their anodes, as is done with the elements of a battery arranged for tension. The result was that the totality of metal deposited increased with the number of baths.-M. Arn. Thenard.

## Adulteration of Bread and Flour with Gypsum,

A Rotterdam firm has been recently offering finely ground gypsum to various millers in the province of Hanover. To detect such frauds Vohl mixes 10 grains of the flour with 20 grains of potash saltpetre, places the mixture in a platinum vessel, and ignites with a redhot platinum wire. If the flour is pure the pale green melted mass dissolves almost entirely in water, and the solution, scarcely turbid, gives no precipitate with hydrochloric acid, which, if it appears, indicates the presence of silicates. The acidulated solution should give with barium chloride merely a slight turbidity'. A decided precipitate indicates the presence of sulphate of lime or of
baryta. baryta.
understood that the above list of apparatus, etc., is only in tended to include such as are absolutely indispensable, and it is expected that the set will contain additional instruments and reagents, the selection of which is left to the competi tors. Special attention should be paid to the following points: 1. Solidity of construction. 2. Compactness and portability. 3. Facilities for packing and unpacking. 4 Number of useful instruments and reagents in addition to hose mentioned. The Society does not engage to give th


## ig. 8.-THE DRIVING BELT

prize unless some apparatus appears to show sufficient merit and some advance in merit on what is now obtainable for $\$$. All apparatus for competition must be sent to the Society's House, London, on or before the 1st of August, 1877. The successful competitor must guarantee that a proper supply of the apparatus shall always be kept on hand, for sale in
England. of the app
England.
perfectly clean and sweet, in order to produce the best quality to secure high and fancy prices. No article that the farmer produces for the market has such a wide range or difference in price as butter, not even cheese or choice fruit. We see by quotations in all the great butter markets that the prices of eating butter range all the way from $\$ 1$ to 10 cents per lb., while greasy, cooking butter is even lower than that; even the packages in which it is put up, whether firkins, pails, tubs, or rolls, affect the prices for which it sells. Grains and meats have but a small range compared to butter; the difference in the prices of butter is much greater than th difference in the cost; hence, it is much more profitable to difference in the cost; hence, it is much more pro
make and sell a first-class article than a poor one.

## Greasing Axles.

On the authority of the Carriage Monthly, more injury is done to carriages and wagons by greasing too much than the reverse. Tallow is the best lubricant for wood axles and castor oil for iron. Lard and common grease are ap to penetrate the hub, and work their way out around the tenons of the spokes and spoil the wheel. For common wood axles, just enough grease should be applied to the spindle to give it a light coating. To oil an iron axle, first wipe clean with a cloth wet with turpentine, and then apply a few drops of castor oil near the shoulder and end. One teaspoonful is enough for the four wheels. Carriages ar sometimes oiled so much that their appearance is spoiled by having the grease spattered upon their varnished surfaces When they are washed in that condition, the grease is sur to be transferred to the chamois from the wheel, and from thence on to the panels.

## The Cockroach Utilized.

In Russia the common cockroach (blatta orientalis) is a favorite popular remedy for dropsy. Dr. P. Bogomolow, of St. Petersburg, has lately examined its effects in nine cases of Bright's disease, heart disease, and other affections ac companied with severe dropsy, and in all the result was the same. There was an increase in the secretion of the urine and perspiration, with rapid disappearance of œdema, and also almost complete disappearance from the urine of albu men and renal derivatives. The dose was five to ten grains of the powdered cockroaches in the twenty-four hours, but they were also administered as a tincture and as an infusion. These insects do not, like cantharides, says the Boston Jour nal of Chemistry, produce any irritant action on the kidneys. Dr. Bogomolow has succeeded in extracting from them a Dr. Bogomolow has succeeded in extracting from them a
crystalline body which he calls antihydropin, and which is their active principle.

## Detection of Oleomargarin in Butter

Professor G. Lechartier says that fresh genuine butter which has not been melted appears under the microscope composed of ovoid granules, and contains no crystals. The artificial product obtained from tallow contains crystals. Artificial butter does not melt at once, like genuine butter to a clear oil, but fuses gradually, a whitish "sauce" being first formed.

## THE HELLGRAMMITE.

## y Professor c. v. riley.

Few insects excite more curiosity than the gigantic fly (corydalus cornutus, Linn.), to which I desire to introduce the readers of the Scientific American. It is our largest neuropteron, or nerve-winged insect, belonging to the family sialidke. Of not unfrequent occurrence over the Atlantic Middle, and Western States, it is most often met with along water courses, and is vulgarly called the "hellgrammite" in the Mississippi Valley ; and this cognomen, the origin of which is somewhat obscure, has been generally adopted by entomologists. There is a certain formidable look about the creature; and though it is absolutely harmless, a oreat many people have a superstitious dread of it.
The supposed eggs of this fly were first found by the late Benjamin D. Walsh, of Rock Island, Ill., and were figured and described in the American Entomologist (Vol. I.), and in the fifth "Entomological Report" of the writer, as " oval, about the size of a radish seed, of a pale color with some dark marks," and " deposited in the summer months in closely set patches of fifty and upward, upon reeds and other aquatic plants growing along running streams." How it was that Mr. Walsh referred these eggs so confidently, and without qualification, to this particular species, it is impossible now to say. Walsh was a most carcful observer and writer, and the accuracy of his conclusions in this instance was never questioned either by myself or others. Yet the eggs of our hellgrammite are, in reality, totally different. In passing up the Mississippi last July, between Bushberg and St. Louis, my attention was attracted to a number of white splashes on the leaves of vines and trees overhanging the water, which splashes looked at a short distance very much like the excrement of some large bird. But upon closer inspection each splash had a more or less regular, circular or oval bulging about the middle; and upon procuring some of the leaves thus laden, a glance sufficed to show that each swelling was in reality an egg mass. Within the distance of a mile I obtained over thirty of these egg masses, there usually being one to a leaf, and that made was destroyed with the Walsh cabinet in the Chicago on the upper side, but sometimes three or four, and in one instance eight-five on the upper and three on the lower surface. They were found alike on cottonwood, sycamore, elm, and grape vine, but in every instance on leaves over-hanging the water, thus indicating that they belonged to some aquatic animal, and that the leaf was but a temporary place of attachment. The mass is either broadly oval or circular in circumference, flat on the attached side, and plano-convex on the exposed side. It averages 21 millimeters ( $\frac{4}{5}$ inch) in length, and is covered with a white or cream-colored albuminou secretion, which is generally splashed around it on the leaf or other object of attach ment.
Each mass contains from two to three thousand eggs, the outer layer forming a compact arch, the eggs placed side by side with the anterior ends inside, and the hind ends showing like so many faint dots through the white covering. Those of the peripheral row lie flat upon the pheral row he flat upon the object of aradually diverge others gradually diverge at their outer or hind ends, so hat those in the center of th arch are at right angles to said object. Beneath this vaulted layer the others are packed on a plane with the object, those in contact with it arranged in concentric rows, the rest packed in ir regularly. Each egg is $\frac{1}{20}$ inch long, about one third as wide, ellipsoidal, translucent wordid white in cor ordid white in and with a very delicate shell and each is surrounded and separated from its neighbors by a thin lining of the same white albuminous substance which covers the whole. Before hatching, the color of the eggs deepens into fuliginous, and contrasts more strongly with the intervening white. Now the nature of these eggs not only puzzled myself but every prominent entomologist in the country to whom I referred them. The eggs of all the larger water beetles are known and described, and those of our hellgrammite were also supposed to be. There is a large water bug (belostoma grandis), but these eggs were evidently not heteropterous. No dipterous insect was large enough to produce them, and the hymenoptera, lepidoptera, and orthop-
era were out of the question. In fact, Walsh's blunde opment. Presently to my great joy the young began to hatch; and being perfectly familiar with the full grown larv f corydalus in all its details, I at once recognized this species in my young curiosities. For the first time it struck me that Walsh had made a mistake. An examination of th contents of the abdomen of a gravid hellgrammite in my cabinct at once settled the question, and made it manifest that the eggs that had just hatched belonged, without any uestion, to this gigantic fly
As to the nature of the eggs that have hitherto been mis taken for them, and which are represented in Fig. 3, we can


Fig. 1.-HELLGRAMMTTE:- $a$, full grown larva; $\boldsymbol{b}$, pupa; $c$, male fly; $d$, head of female fly the opinion that they belong to the large water bum of he opinion that they belong to the large water bug lostoma grandis), the eggs of which are still undescribed.
The full grown larva of our hellgrammite is well known to fishermen, who, in this part of the country, call it a " crawler," and esteem it as bait. It measures from three and a half to four inches in length, is of a dark brown color variegated with light brown, the abdominal joints being tough and leathery, and the head and thoracic joints horny and
 crawls slowly about, feeding upon other aquatic insects. Mr. J. H. Comstock, of Cornell University, who has been making some interesting anatomical studies on this insect, generally finds it in the most rapid portions of the streams about Ithaca, where it dwells mostly under stones. He has captured numbers by turning over large stones, and allow ing the current to wash the larvæ into a dip net; and he is of the opinion, which my own observations support, that
the species live three years in this larval ondition. Most aquatic larvæ transform o the pupa state within the water, but this arva quits the water when full fed, as do the others of the same family, and crawls bout for days seeking a place wherein to ransform. We find, therefore, that Nature as abundantly fitted it for living in both elements, by giving it, first, two rows of nine breathing holes or spiracles, placed in the usual way along the sides of the body, which enable it to breathe out of the water;* and, secondly, two sets of nine gills or branchice, in the shape of lateral slightly hairy filaments which enable it to which enable it to
breathe in the water. These gills or respiratory filaments are placed just below the spiracles, one on each side of each abdominal joint, except the ninth, and one on the terminal sub joint. Besides these lateral filament here is, ventrally, a pair of rust-brown spongy masses of short fibers, one on each side of joints 4-10, and a somewhat simiar central patch on the terminal joint and sub-joint. These have been regarded a accessory gills, but they probably assist the creature in adhering to the surface of tones at the bottom of swift-flowing waters. T'he lateral filaments assist in swimming, and the tip of the body is pro vided with a pair of curved double hooks, which assist in climbing, or in moving backward. The newly hatched larva is almost colorless, and has the structural characters of the full-grown individuals, except that the legs and the branchial fila ments are relatively longer, and the body of more uniform diameter. The sponge like ventral masses of fiber are, however obsolete, and the lateral filaments are smooth and not hairy. In hatching, th young do not gnaw through the vaulted covering, but creep from beneath the side of the mass, which is somewhat loosened and raised by their pressure. They at once drop from the leaf, and crawl actively, nce drop from the leaf, and crawl actively, with tails hoisted in the air, over whatever surface they may fall upon. It is doubtless their habit to drop at once to the water and sink to the bottom, where they can anchor by means of the anal hooks, or find lodgment under some stone or rock. In an aquarium, in which I endeavored to rear and study them, they would float readily, with the body curved in the water and the head bent so as to rest at the surface They also swam readily by sudden jerks of the body, es pecially by striking the abdomen beneath, very much re sembling the actions of the common mosquito wriggler in lescending, but ascending head foremost, more like the pupa of that species. They did not seem to need to rise for air, and would congre rate most at the bottom of the aquarium, and under such stones as were placed there in.
They none of them could be made to survive more than three days in such standing water, and the necessity of fresh running water to their well-being will always rende difficult the study of the in sect in its infancy.
After leaving the water about the beginning of June, this larva travels, in the night ime, sometimes to compara tively great distances, hav ing been found nearly a hundred feet from its former habitat.
Mr. Walsh mentions a most curious incident in connec ion with its larval wande ing, which I quote in full:
"A most respectable man who keeps the toll bridge over Rock River, where this polished. Though this larva can live for some time out of $\left\lvert\, \begin{aligned} & \text { insect is very abundant, informed me that on several occa }\end{aligned}\right.$ water, even when young, yet until it attains its growth it is $\begin{aligned} & \text { sions its larvæ had fallen down one of his chimneys. His } \\ & \text { idea was that theymust have bred there, but that, of course }\end{aligned}$ strictly aquatic, abounding most in rapid-flowing streams, $\begin{aligned} & \text { idea was that theymust have bred there, but that, of course, } \\ & \text { is out of the question. The statement was confirmed by }\end{aligned}$ and especially such as have a rocky bottom, upon which it his wife, and I have no doubt of its truth. In 1863, I threw
a larva of this insect into the Mississippi to examine into its customary mode of progressing in the water, which, a I found, was by crawling along the bottom, not by swim ming. As it emerged from the water, it climbed with ease
up the stump of a large white elm, which was stripped of up the stump of a large white elm, which was stripped of
its bark, and as smooth as any carpenter could have planed its bark, and as smooth as any carpenter could have planed
it. The stump was three feet high and upright, and when
*Mr. Comstock has found an additional pair of rudimentary spiracles on
it had reached the top it commenced descending on the op-
posite side; but, after a while, lost its foothold and fell into posite side; but, after a while, lost its foothold and fell into
the water a acain. The pair of two-clawed appendages at the tail are used with much effect to assist it in climbing. The building which it must have climbed to reach the chimney story wooden one.
This larva can pinch with its formidable-looking jaws, but not forcibly enough to draw blood. In preparing for the pupa state, it burrows into the earth, where it forms an
oval cell; or it hides under some large stone, piece of wood, oval cell; or it hides under some large stone, piece of wood, or other substance. Here, in about two weeks, it casts its tough larval integument and assumes the pupa form, lying in a curved position in its cell, with the head, wing-pads, and legs deflexed on the breast. The color is yellow, with traces of the brown mottlings of the larva and of the latera filaments. The spiracles are more conspicuous, and the upper jaws stronger than in the larva, and olive green. The pupa state lasts but a few days, and the perfect insect issues during the month of July. It is nocturnal in habit, and hides, for the most part, in obscure places during the day It is sluggish at this time, and, if approached, will drop sooner than fly, or raise its head and abdomen and open its jaws menacingly.
The sexes differ greatly in this perfect state. The male is remarkable for having his upper jaws-which in the female are normal and fitted for biting-prolonged into incurved, prehensile appendages of the form of a grain cradle finger, and smooth and cylindrical, except at the tips, which are pointed, and minutely notched. As I have shown in my 5th report, there is no perceptible sexual difference in larva or pupa, unless it is, as stated by Haldeman, in the rather larger size of the jaws of the male. This feature cannot however, be relied on. This similarity of the sexes, especially in the pupa, is the more remarkable that in the imago state they differ so greatly. The subsequent modification of the male jaws is assumed at the last molt; and if the jaws of a male pupa be dissected, the future finger-like jaws will be found crowded within them, like the " wrinkled finger of a glove pushed into a thimble," as Mr. Comstock expresses it This modification in the male is evidently to enable him to embrace the soft body of the female, as it cannot well have any other use. The body of the hellgrammite is soft, and were the jaws of the male horny, and armed with teeth, in securing the female they would injure her, and thus defeat rather than aid procreation. In the large stag beetle or " buck-bug" (lucanus elaphus, Linn.), on the contrary where both sexes have very hard, horny bodies, the upper jaws in the male are greatly prolonged, but very stout, and armed with sharp prongs, the better to enable him to seize the female.
In these two cases we see how wonderfully the homologous organs have been modified in opposite directions to ac complish the same end. We find in Nature innumerable such curious contrivances and modifications, which at once excite our wonder and admiration. To quote Mr. Walsh's own eloquent words: "In so elaborate and diversified manner does Nature adapt her plans and patterns to the ever varying conditions of animated existence; and with such consummate care has she provided that the great fundamental law shall everywhere be carried out: 'Increase and multiply and replenish the earth.'
It is worthy of remark that in both these large insects, in which the male upper jaws are so modified, this sex is far more common than the other. It is probably owing to the fact that the female seldom wanders away from her breeding place, and is, therefore, less often seen than her more restless and adventurous mate.

## The Allen Governor.

The Allen governor, an extended illustrated description of which we published some time ago, is mecting, we are gratified to learn, with the substantial success to which through its many merits, it is justly entitled. Over 2,000 of these governors are now in operation in this country and abroad, and the demand is constantly increasing. The manufacturers exhibit a series of testimonials, from those who have the machine in use, on all sorts of engines and under a great variety of conditions; and there seems to be but one opinion as to its great sensitiveness and gencral efficacy. We see from an advertisement in another column that agents are desired for the sale of the governor.

## On the Estimation of Alum in Bread.

For a long time past the old Normandy or soda process for the estimation of alum in bread, has been condemned on account of the great difficulty experienced in re-dissolving the aluminic hydrate or phosphate, after its precipitation, together with tri-calcic phosphate, etc. This has led to the production of several processes, most of which are very complicated. By a slight modification in the usual method of procedure, the Normandy method can be rendered as ac curate in its results as any of those which have replaced it This consists in adding the boiling acid solution of the charred bread to a boiling solution of sodic hydrate, contain ing a large excess. I proceed as follows: 1,000 grains of bread are burnt down to a small bulk, powdered with about 100 grain measures of hydric chloride, and warmed for a few minutes; about two ounces of water are then added, boiled for five minutes, filtered, etc. A solution containing abou 250 grains of pure sodic hydrate is made in a very little water; and to this solution, when borling, is very cautiously added the boiling acid solution of the charred bread, the
whole borled for a few minutes, filtered, and washed. Th
filtrate, after the addition of a few drops of a concentrated
solution of disodic phosphate, is slightly acidified with hydric chloride, and subsequently rendered just alkalin with ammonic hydrate and boiled. The precipitate
" To test the accuracy of this method, I had four loaves of read made in my kitchen, one with no alum, the other with varying quantities. Care was taken to leave as little a possible of the dough adhering to the sides of the vesse in which it was made, so that each loaf contained, practi cally, all the alum that was dissolved in the water with which it was made. The loaves were weighed when one day old, and 1,000 grains taken of each:

## 

It will be seen that the method leaves nothing to be de"d in point of accuracy, and
" Since devising the above process, I have been informed by Mr. Heisch that he, and he thinks others, have for many years applied the same principle (namely, the addition of the acid solution to an excess of boiling alkali) to the separation of aluminic hydrate from other gelatinous precipitates, hav ing found it impossible completely to re-dissolve the alu minic hydrate by any amount of sodic hydrate if it wer once precipitatcd."-W. C. Young, F.C.S., in The Analyst.

## Mount Carmel, Ill, Destroyed by a Tornado

The town of Mount Carmel, Ill., was visited on the 4th stant by a terrible tornado, which laid nearly the entir place in ruins. About 20 business houses and 100 residence were either destroyed or badly damaged by the fury of the gale, and by the fires which broke out at variou points. The storm came from the southwest, and, from its track, seems to have been a cyclone traveling at an estimated velocity of 150 miles per hour. During its prevalence, the air was filled with flying roofs, lumber, clothing, etc., some of the débris being carried miles away. Thirteen persons ar reported as killed, many others injured, and some seventy families were rendered homeless. The loss of property is aid to amount to nearly $\$ 500,000$. No warning whateve as afforded of the approach of the storm. It seems to hav truck the town and to have passed over it within two min tes, preceding a heavy rainfall.
Mount Carmel has about 3,000 residents, and her industries were largely mechanical. The Scientific American ha ll of whom we have the heartiest sympathy

## The Meeting of the American Association for the

 vancement of ScienceThe twenty-sixth meeting of the American Association fo the Advancement of Science is to be held at Nashville, Tenn. n August 29. Sessions will take place in the Capitol. pecial arrangements are being made for decreased railroa fares, etc., and for the accommodation of members in the city. The permanent subsections of chemistry, microscopy, and anthropology are to be continued, and the co-operation of students of these sciences is requested. The Entomolog ical Club will meet on the day preceding the meeting of the Association.

## Inventions Patented in England by Americans.

From May 15 to May 24,1877 , inclusive.
bath Overflow, etc.-Valve and Faucet Company, New York city Book.-J. Clemens, Hartford, Conn.
Bottier Stopper.-N. Thompson (of Brooklyn, N. Y.), London, England Car Coupling.-E. Miller, New York city.
LAMP -Lamp.-J. H. Lewars, Philadelphia, Pa.
Lamp.-N. L. Rigby et al., Winfield, Kan.
Metal caytridge shells.-J. H. Bullard, Springfield, Mass. Motor For Rock Drinls, etc.- E. S. Winchester et al., Boston, Mass Priamenting Glass, etc.-S. M. Adams, New York cit Paring Fruti, Etc.- W. H. Goodchild et al., New York city. Portable boat.-C. A. Fenner, Mystic River, Conn. Postage Stamp, ETC.-A. B. Foster, Providence, R. I
Postage STAMP, ETC.-J. Sangster etal., Buffalo, N. Y.
REINING STEL, Scissons.-C. M. Meserole, New York city SCREW MACHINERY.-E. Nugent, Brooklyn, N. Screw Wrench, etc.-B. L. Walker, Sing Sing, N. Y.
Sewer Gas Trap.-B. P. Bower $t$ al., Cleveland, Ohio Sewing Machine.-L. Dryfoos, New York city SPLINT.-D. Ahl, Newville, Pa.
TORPEDO APPARATUS.-H.
orpedo apparatus.-H. S. Ross (of Chicago, ill.), London, England. oy Horse.--J. H. Nolan, Boston, Mass.

## DECISIONS OF THE COURTS.

## 

ppeals from the. Circuit Court of the United States for the
trict of New York.-Decided October term, 1876 .
The patent granted to Eli W. Blake for a stone breaker, June 15, 1858 , he earlier patent to Hobbs and Brown for " "mprovements in the applice
tion of well known mechanical means for the purpose of crushing ice, and to Ha Hilton for "crushing and grinding quartz or other substances,
they not containing any of the essential element of Blakes invention.
The substitution of one part of the operating mechanism, of a combin The substitution of one part of the operating mechanism, of a combina-
When equivalent of that omitted, does not avoid an infringement.
When an orginal machine and an improvement upon it are both pat
ented, neither patentee can use what does not belong to him without the
requisite authority from the owner.
The complainant was found entited to nominal damages only, the
burden of proof being upon him; and it appearing that the proof was mea
ger and indefinite, but four machines made, no established license fee, the
profits made being due in part toinventions covered by by other patentent, and
po distinction made eetwen proftta accruing from the use of complin
ant's invention, and that from the other inventions and manufacturers Mrits.
Trestice Swayne delivered the opinion of the court:
Mr. Justice Swayne delivered the opinion of the court:
These are cross-appeals in the same cause. Both involve questions in
mechanics. These being determined, the legal propositions which apply
 States, for a stone breaker. On the 9th of January, 1866, the same authority
reissued the patent to him, with amendcd specications. It was extended
on the 15 th of of June, 1872 . The bill in this case is founded upon the latter atent. It charges infringement.
The answer avers that the machine described is of no practical utility,
denies the novelty of the invention, and also the alleged infringement denies the novelty of the invention, and also the alleged infringement.
The description in the specifiation sets forth three things as the essen (ial characteristics of the machine:
(1.) Two jaws within which the estones are to be broken. Their face (1.) Two jaws within which the stones are to be broken. Their faces
are to be os nearly in an upright tosition that the stones will descend be
tween them automatically interspace at the top will be sufficient to receive the stones, and that at the
bottom only such as will allow the fragments to escape when broken of w
 advance and crush it, then receding liberate the fragments, which again
descend, and, if too large, are rearrested and crushed again, and so on un-
tilthe fragments have passed out through the open space at the bottom tilt the fragments have passed out through the open space at the bottom.
The distance between the jaws is to be djustable at pleasure, so that the
stone can be broken of any desired size. stone can be broken of any desired size.
(3.) A flywhel is combined with the revolving shaft and movable jaw
for the purpose of rendering the strain upon the power more equal. The claim is for-
A combination of a stone-breaking machine of upright converging jaw
with a revolving shaft and mechanism imparting a definite reciprocating ith a revolving shaft and mechanism imparting a definite reciprocating
novement to one of the jaws from the revolving shaft, the whole being
nd operating as set forth and operating as set forth.
The combination in a
aw with the revolving shaft and flywheel, the whole being and operating jaw with the
as set forth.
In combin In combination with the upright converging jaws and revolving shaf
inparting definite limited vibration to the mo mparting definite limited vibration to the movale jaw, so arranging the
jaws that they can be set at different distances from each other at the bot
om, thus producing fragments of every desired size. tom, thus producing fragments of every desired size
A, moment's glance at the model funishes a suffict answer to the ob
jection of the want of practical value. It would be passing strange if machine of that character could have gone through the severe conflicts o
litigation which this patent has encountered and have come forth victor
ous from every contest. It has proved equal to every ordeal to which it
has been subiected
 atents to Hamilto of the 30th of anuary, 1854, and the 5th of January,
1855, antedate the patent to Blake. It is insisted that each of them is fo a machine substantially the same with the one described in Blake's patent,
and that they are fatal to his claim of the requisite novelty of his alleged The machine for Hobbs \& Brown is for-
Improvements in the application of well
Improvements in the application of well known mechanical means for ne purpose of crnshing ice. * * * The improvements consist in apply
ng a hopper with one diaronal fixed side and wo parallel sides to contai
he ice, and compressing the ice by a movable fourth side the fixed the ice, and compressing the ice by a movable fourth side, the fixed diag-
onal side and moving side having within them dental projections cut or
cast on, to operate downward and prevent the ice from rising in the hopcast on, to operate downward and prevent the ice from rising in the hop-
per when compressed, and also to enter and split the ice.
The machine is operated "by the combination with these parts of a lever Tted with an eccentric or cann-rothed point ingredients nor the compound There is in this description neither of the ingredients nor the compount-
of the Blake machine. Every element and the eombination are both want
ng. There is no mention of the converging adjustable jaws, olving shaft, nor of the flywheel. The differencee are as mark
mode of operation as in the structural elements of the machine.
The Hobbs \& Brown machine does its work by the dow

 arying vibrations of the smooth-faced adjustable jaw driven without in
It ission by the revoviving shaft.
It is obvious that the Hobbs and Brown machine could not be applied with effect to the purpose of breaking stones without essential changes of
principle and details.
Hamilton's machine was "for crushing and grinding quartz or othe
In the specification annexed to his original patent, he says:
My invention consists in the use of a cylindrical nut or pestle in a sımi-
larly formed basin, the pestle haying a partial rotary and crushing motion larly formed basin, the pestle haying a partial rotary and crushing motion
communicated to tit by means of a lever attached thereto.
A is a basin, the lower part of which is made
 aoint, 2 , to $a$ pitman, passing to a, arrank, eccentric, or other euitable
mechanical contrivance to give the arr, , an oscillating movement, and
me pestle a partial rotary motion on its shaft, C. echanical contrivance to give the arm, E , an
the peste a partial rotary motion on its shaft, $\mathbf{C}$.
The claim of tis patent is for -
The means herein describer
The means herein described and shown for crnshing and grinding metal-
ii ores, consistingof the cylindrical pestle, $d$, provided with grooves in it
pper part to crack the lumps of ore and set partial rotary motion, and operating in connection with the basin, A, in
which said pestle moves to grind the ore into powder by the gradual ap
proach of the sides of said basin to the cylindrical peste, said pestle being
also provided with a scraper or agitator, 5 , in its lower surface to operate
an specied

## The second patent is declared to-

Consist in providing means for keeping the pestle down with sufficient force to pulverize the material operated on, and also to prevent the pestle
from grinding too finely, i.e., to furnish material for simply cracking the
ore or other material into small lumps of any desired size instead of grindng the same to a powder, thereby adapting the machine to different char
acters of metallic ores or, ther substances.
We have here no reflex or embodiment of either of the ideas that foun We bave here no reflex or embodiment of either of the ideas that found
expression in the Blake machine. The converging jaws, the revolving
haft, and the flywheel are all wanting, as in the Hobbs \& Brown shaft, and the flywheel are all wanting, as in the Hobbs \& Brown machine
Instead, there is a cylindrical nut or pestle, having a partial rotary nnd
crushing motion communicated to it by means of a qever attached thereto crushing motion communicated to it by means of a lever attached thereto.
The pestle rotates on a central a axis within an ecentric concave. The
work is done by this pestle. There is rothing of the vibratory motion of a movable jaw, alternately advancing and receding, as in the Blake invention
The difference is not that of mere mechanical 'equivenens. It is radic.
and goes to the essence of the organisms. These considerations are oo ob vious that further remark supon the subject are unnecessary.
The proofs show that but two of the Hamilton machines were ever made
Practically the invention was abandoned. This brings us to the question of of infring.
respondent's machine, which are not controverted. Itis forbreaking stone
It has two upright jaws for this purpose, one fixed and the onther respondents machine, which are not controverted Ind thre reter ng stone.
It has two upright jaws for this purpose, one ffxed and the other movable.
The jaws converge. The breaking is effected by the convergence. The
movable jaw alternately approaches toward and recedes from the fixed

 The only point of diversity insisted upon by the respondents is that the
vibratory movement in the Blake machine is ilimited and unvarying, while
in the machine of the appellants it is not of this invariale character.
In the Blake machine the movable jaw receive its movementrom the
evolving shaft through iron rods and levers. In therespondents' machin evolving shaft through iron rods and levers. In therespondents' maching
ti is communicated from the revolving shaft through a confined column o
water.
In the appellant's model the revolving shaft is not shown. In their ma
chine it works the plunger of the pump from which the water is
 hydraulic arrangements we have described.
What is so employed in the appellant's machine is the obvious and exact
equivalent of what tis so dispensed with in the Blake machine. The liability
隹 equivalent of what is so dispensed with in the Biake machine. The liability
of the packerjoints to leakage is a serious objection to such use of water.
Any considerable eleakage would stop the machine. It could not be used
while that condition existed. Constant care and vigilance are necessary
 It is difficult to ruivalent





## A few remarks upon

 that subject will be sufficient.The proof is meager and indefinite.
The infringers made but four machines.





## United States Circuit Court-District of <br> patent lamp.-charles e. asicroft ve. whliam hollings. [In equity.-Before Shepley, J.-Decided April 13, 1877.]




$\underset{\substack{\text { infringe. } \\ \text { Bill dismissed with costs. }}}{ }$

## zerent (ancrican and fortign çatents.

## Notice to Patentees

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the Scientific Americans of merit, and publish them in the Scientific American on ver reasonable terms.
We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found
of value for circulars and for publication in other papers.

## NEW MECHANICAL AND ENGINEERING INVENTIONS.

 improved car axle box.Erward L. Colman, Vandalia, Mo.-This relates to an improved car axle box, with anti-friction and self-oiling devices; and consists of the journal revolving in an elongated box, which is made of a top and bottom section,
secured by bolted face and back plates. A number of friction rollers pass secured by bolted face and back plates. A number of friction rollers pass
around the journal and around a guide channel below the same, taking up around the journal and around a guide channe
the cil by a bottom inlet from the outer box.
improved brick maciine.
Thomas McNicholas, Memphis, Mo., assignor to himself and Thompson Walker, of same place.-The moulds are similar to hand moulds, except that they have notches formed in their bottoms to receive springs attached
to the bottoms of the channels in which said moulds slide, to hold them in place exactly beneath the discharge holes in the bottom of the mud box, and prevent them from being drawn back by the withdrawal of the push-
ers. The drive wheel causes pushers to bring the moulds beneath the discharge holes of the mud box, when the scrapers are in proper position to force out the clay, so that there may be no loss of time, and so that there may be no break in the passage of clay into said moulds to form imperfect or seamed brick.
mpioved lifting tongs.
John T. Campbell, Rockville, Ind.-This is an improved device for lift ing, carrying, dragging, or otherwise handling logs, timber, lumber, railjusted, as the character of the work to be done may require. It consist in a lifting tongs in which the handles are connected with the shanks of the jaws with an adjustable and reversible joint.
improved hair spring stud for watches Francis M. Martin, Cambridge, Ill., assignor to himself and John A Hart, of same place.- This is an improved hair spring stud for the balance
wheel of watches, by which the hair spring may be shortened or lengthened with great facility, and adjusted higher or lower, so as to be placed at a perfect level above the balance. The stud fastens to the hair spring without changing the same st the least at that point, so that it retains equa atrength all around and moves in perfect isochronism. The invention con-
sists of a sturd, composed of a fixed and morable jaw, projecting downwardly, and clamped to the hair spring by a screw with tapering or eccentric head. The jaws are made to fit the curvature of the outer coil of the spring, so as to clamp the same withont bending it out of its true shape. improved car coupling.
Edward B. Middleton, Charleston, S. C.- When the cars are brought together, the projecting end of a hook enters the mooth of the opposite
drawhead, strikes the beveled portion of a catch, raises the later, topether with its rod, and engages with the shoulder of a recess, thus completing the "lock" "automatically. The parts are hela so engaged so long as re quired by the gravity of the catch block.
improved railroad tie.
tallic cross tie of flange is cut out at the center. The tie is provided with sockets having bottom wedges for wooden filling blocks, retained by a central key driven
down upon the wedge.

IMPROVED CUT-OFF OR VALVE FOR PUMPS.
Job Mansir, Richmond, Me.-This is a cut-off for the suction pipe of a pump, which is capable of making
pipes, or both, as may be desired.
improved pipe-cutting machine.
Nehemiah Watson, Arcadia, R. I.-This invention consists, essentially, of a revolving circular saw, capable of cosing in place during the forward feeding and cutting of the saw.

## improved flying maciine.

Frank Barnett, Keokuk, Iowa.-This consists of a kite or horizontal sai provided with a boat or basket for passengers, which is placed on wheels, and istice for guiding poplor a device for guiding.

## mproved pitman connection

Joseph Warren Blood, Minneapolis, Minn.-This is an improved pitman connection for that class of mowing and reaping machines that have a
hinged finger bar and tilting device. It is so constructed as to admit of the different movements which occur while in operation without binding.
improved circulating device for steam boiler.
Henry S Coleman, Chelmsford, Eng.--This consists in the employment in a boiler of circulating tubes suspended within the tubes connecting the two shells of the boiler. The said circulating tubes are straight vertical tubes of about half the sectional area of the outer tubes, and extend up-
ward a short distance into the upper shell, and downward to the bottom. ward a short distance into the upper shell, and downward to the bottom.
They are so supported as to be readily removable out of the way for cleanThey are so supported as to be readily removable out of the way for clean-
ing the boiler, and for this purpose a rotating shaft is nounted, to which in the upper shell all the tubes are connected, so that they may be raised simultaneously. The tubes are also constructed in two parts, one sliding within the other.
improved windmill.
William Ap Williams, Cambria, Wis.-The object here is to diminish the friction in the working parts of the mill, and thus enable it to be run is such that the leverage is the same when lowering and when raising the pump rod.
mproved bark mill.
Willam F. Mosser, Allentown, Pa.-This is an improved mill for grind ing bark, provided with a safety device to prevent breakage should a for eign substance get into it. The breaker serves as a coupling, and is of should any hard substance get into the mill, the collar will break and thus prevent the mill from being injured.
mproved turbine water wheel
Nathan H. Gould, Oakfield Centre, Mich.-This is an improvement in the class of water wheels having guides for directing the water against the buckets. The desk or surface of the throat plate is flat and smooth, so
that little impediment is offered to the free passage of the water through that little impediment is offered to the free passage of the water through
the outlet holes, and the guides are so constructed as to aid materially in the outlet holes, and the guides are so constructed as to aid materially
directing the water at right angles against the buckets of the wheel.
improved boot and shoe sole trimming maciine.
William E. Forster and Willard C. Tolles, Nashua, N. H.-This consists of a revolving cutter in combination with a feed table and adjustablegauge. The cutting knife is keyed to the shaft in such a manner as to be readily taken off for sharpening, and projects about the thickness of the sole or
heel above the table on which the boot or shoe rests. The table is vided at the front part with a straight or concave throat plate on which the sole or heel of the shoe rests when being exposed to the action of the knife. The shoe is run along the gauge, which bears against the upper of
the shoe, the heel or sole being turned on the throat plate and trimmed off the shoe, the he
by the cutter.

## NEW MISCELLANEOUS INVENTIONS.

mproved ice cream freezer.
John Salter, Baltimore, Md.-This invention relates to an improvemen upon that form of ice cream freezer having a stationary scraper in a re volving cylinder, which scraper is held stationary by its connection with a
top plate, while the cylinder is revolved through a horizontal shaft with a bevel wheel that en gages with corresponding beveled teeth on the top or a bevel wheel that engages with corresponding biveled teeth on the top or
cover of the cylinder. The improvement consists mainly in making the horizontal drive shaft hinged or jointed, and fixing its outer extremity in an outside independent bearing, so that the inner portion of the shaft wit its bevel wheel and the top plate of the freezer may be together lifted of the tub and supported away from the same whenever it is desired to remove he tub and supported away from ther or inspect its contents.
improved filtering apparatus.
James Gainey, Augusta, Ga.-It consists of an adjustable plunger, to filter under compression of the filtering material in adapting the device to for passing the water through the filtering chamber in the opposite direction to cleanse the filter without reversing the position of the same. It also further consists in locating an expansible spring directly in the filtering
material, so that when the pressure of the plunger is relieved the movement of the spring in expanding loosens up the filtering material to adapt it to be thoroughly cleansed by the passage of the water through it. The apparatus is designed to be used in both double and single form, and is
adapted to all kinds of filtration, but more especially to the filtering of water for household purposes.
mproved ladle for metal founding.
William Fawcett, Omaha, Neb.-In the manufacture of car wheels, iron of high specific gravity has to be used in order to procure the necessary
depth of chill. In wheel foundries a large ladle holding from five to ten tons of molten metal is placed in front of cupola and allowed to run full before pouring off. During the time of melting and casting, the hard, dense, and close metal will settle to the bottom by its own gravity, while
all impure and light metal will rise to the surface. The wheel cast with metal from the top cannot have the proper chill, while those cast from the bottom iron are so hard and brittle as to be unsafe to be placed under passenger car. By drawing the metal first from or near the bottom, a uniform chill is procured all through the heat, and to this end the invention of which opens into the bottom of the ladee, so that as the latter is tilted the purer and denser metal at the bottom of the ladle passes up said con duit and discharges first into the mould, leaving behind the lighter meta and the scoria floating in the top of the ladle.

## improved safety pocket.

Frederick Wendt, Utica, N. Y.-This consists of a pocket having fitting into the small pocket, so as to close or open the main pocket.

IMPROVED ROWLOCK
William Spelman, Portland, Me.-This oarlock is so constructed as to iminish the friction between the oar and lock. It is made square, with corners cat of, and there is an opening in its rear upper corner for the blade or the suitably pivoted to the gunwale.

## mproved hop dryer.

Samuel R. Templeton, John C. Templeton, and Joseph H. Templeton Brownsuiile, Oregon.-This is an improvement in the class of drying appa ratus in which a furmace and fan blower are combined, the one to impar heat and the other to impel the heated air through or in contact with the
substance to be dried. The hops to be dried are placed upon a cloth, laid pon racks in layers of any desired thickness, so that the hot air may b forced up through them, expelling the moisture and drying the hop

## improved rear sigit for firearms

Charles F. Robbins, Brooklyn, N. Y.-This is a gauge for adjusting the rear sights of rifles

## mproved vermin trap.

Jean M. A. Berger, Charleston, S. C.-This consists of a frame or base of willowware, provided with boards having proper interstices attached to position in close proximity to the willow frame. The trap is plattre nd slats, or between bedstead and bedding, or at any other place wher he insects are apt to congregate. The bugs, roaches, or other vermin ar attracted by the large number of recesses and cavities of the trap, and ar ond of hiding in the same.

## improved cigar cutter.

H. Friedrich Schultze, Philadelphia, Pa.-This is an improved device for cutting off the points of cigars by the use of one hand only, the tipe being dropped into a storage receptacle. It consists of a storage receptacle havand resting on a spring cutting-knife, that passes below the gauge holes and resting on a spring cutting-knife, that pas
and cuts off the points by pressure on the lid.
improved fountain pen
Henry N. Hamilton, White Plains, N. Y.-This fountain pen is so con ructed that it may receive and hold enough ink to write one or mor pages of manuscript. It also may be adjusted to let down the ink more o less freely, and it may be carried in the pocket, if desired.
improved engraving machine table
Augustus E. Ellinwood, Garrettsville, O.-This is a table for holding the patterns or forms used in engraving machines by means of an elastic lip, attern, and a longitudinal slot that receives a lipformed on the otheredg of the pattern.
improved shotbag and charger.
Thomas J. Jolly, Etna, Mo.-By this shotbag and charger any given quantity of shot may be uniformly and quickly taken out from the bag for the purpose of loading shotguns. The bag has a perforated bottom and sliding pivoted plate, with a downward extending tube, having a bottom ange, interior charger, and plug fitting into the bottom hole to close the ame and lift the charger.
improved boot or shoe.
Thomas J. Greenwood, Warren, IIl., assignor to himself and Thomas D.
Thornton, of same place.-This is an improved seamless-back shoc. It Thornton, of same place.-This is an improved seamless-back shoc. It has a quarter, which is cut of one piece of leather, along a center line and
symmetrical curved side lines, and with holes near the highest point of the symmetrical curved side lines, and with holes near the highest point of the
instep, to produce front sections and back tongue. The front sections are spread or sprung forward, and a top quarter of corresponding shape is placed between the same and stitched to the edge of the quarter. In thi style of top quarter or vamp.

## NEW TEXTILE INVENTION

IMPROVED STOP MOTION FOR LOOMS
Fred.Christen, Homestead, Iowa.-The object of this invention is to provide a simple and effective weft stopping device for fancy looms using two or more colors of thread. It consists in a novel arrangement of fin gers, between which the filling passes as it runs out of the shuttle, on series of which, on the breaking of the filling threads, moves so as to actuate a stopping device. The improvement is designed for that class on duced into the warp in succession; and it is intended for stopping the loom or the pattern-forming mechanism of the same.

## NEW AGRICULTURAL INVENTIONS.

## IMPROVED STUBBLE GUARD FOR PLOWS

Benjamin F. Phillips, Lowden, Iowa, assignor to Nicodemus Henry, of veeds, and othertrash. By it the plow can be cleared by the plowman while standing erect in his place, and without stopping the team. It is pivoted bar, attached to the beam, having pronged ends which rest on the

## mproved cultivator.

John Rhodes Tilley, Demerara, British Guiana, South America.-The wew features include wered to the ground, and ad ward motion beside that caused by the forward progress of the machine. improved straw cutter.
Eric M. Hesselbom, Riceford, Minn.-This machine for cutting stial and fed forward when the knives are cutting. It may be readily adjusted mproved sulky plow
Albert A. Fowler, Plano, Tex.-This invention relates to the construction and arrangement of parta whereby the tongue and connected devices may e adjusted laterally according to the number of plows employed at on he plow beams are held rigidly parallel, although adapted for adjustmen laterally and allowed free vertical movement.

## NEW WOODWORKING AND HOUSE AND CARRIAGE

 BUILDING INVENTIONSmproved method of forming blanks for bootjacks Henry A. Brown, Toledo, O.-This consists of taking a continuous stri of woor of suitable length, and of the width and thickness of the main olique ande, so to produce seperte piece wing ends and thicker intermediate point or seat for the cleat. The tapering ends of the bootjack allow the more convenient packing for shipment.

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## Thelect Murais <br> C. N. will find a table of the prices of me

 tals on p. 169, vol. 33. As to powerful explosives, see p.2, vol. 34 . As to the most deadly poison, see p. 155 , vol. 2, vol. 34 . As to the most deadly poison, see p. 155 , vol.
31.-A. K. will find something on the properties of seTextile Manufacturer is published in Manchester, Eng-land.-G. H. W.'s query was answered under the in-
itials G. H. M., p. 268, vol. 36 .-A.A. can calculate the
horse power of his engine by the formula given on p .
33 , vol. 33.-F E. M. will find something on removing 33, vol. 33.-F E. M. will find something on removing
moles or freckles from the face on p. 374, vol. 32.-J. A. MCN. will find an explanation of the apparent variation D. should use crude or pure rubber in the preparation of marine glue.-C. W. I. will find directions for removing mildew rrom cloth on p . 250, vol. 34.-R. should consult his family physician.--D. S. R. will find on p. 20 , vol.
30 , directions for deodorizlng cod liver oil.-W. C. R.'s query as to gas cylinders for calcium light is answered
on p. 380 , vol. 36 .-S. A. M. will find that the claims of the Keely motor people are fully exposed on p. 400 , vol 32.-P. W.'s query as to weight near the surface of and in the depths of the ocean is answered on p . 363 , vol. 36 . J. C. B. will find good tables of logarithms in Culley's
"Handbook of Telegraphy."-J. L. C. will find directions for building an aquarium on p. 90, vol. 30.-G. C will find directions for tempering small drills on $p$. 8 ,
vol. 33.-T. J. S. S. will find a formula for the width of belts on p . 58 , vol.27.-J. G. K. will find the address of the inventor of the calculating machine in the article escribing it- - E. L. L. F. will find an article on wate
melon sugar on p. 191, vol. 25. -C. P. will find full part culars as to the Great Eastern steamship on p. 346, vol.
31.-S. A. E. will find something on utilizing mica on 31.-S. A. E.
p. 241 , vol. 34 .
(1) J. says: You recently informed a cor respondent that you knew of no better way of pourin Babbitt metal box, where the box is solid instead of being in halves, than by wrapping paper around the
shaft to allow for shrinkage of the Babbitt lovenly plan has two objections, The paper is to lovenly plan has two objections. The paper is on the paper and makes the box difficult to remove after pouring. Neat workmen warm the shaft and coat it
with soap. But I have seen workmen make use of with soap. But I have seen workmen make use of a
plan so simple, so perfect, and so novel that 1 think it worthy the name of a wrinkle. It is simply to place the ox horizontally, pour it half full, and let it cool. Then pour the other half. The result is a sold box in halves.
The metal will be found to fill the casting solidly and ot to have shrunk on the shaft.
(2) J. O. C. says: I have a wood lathe, bed ade of $41 / 2 \times 14$ inches oak timber, head and tail stock of wood, with a cast steel head spindle with $11 / 4$ inches
bearing, 4 inches long. In turning wagon hubs, the athe runs smoothly and without jar. Please let me know if can turn
slide rest? A. Yes.
(3) G. H. asks: What particular bones of he whale supplies us with the article of commerce known as whalebone? A. Whalebone is not, as its
name might seem to signify, obtained from the bones of the whale, but from a substance which forms a substiute for teeth in the Greenland and other whales. This substance consists of flat plates or blades, hanging fro
the sides of the upper jaw (occupying the position the sides of the upper jaw (occupying the position of
tether animals). They are usually about 300 in number on each side, and are arranged paraliel with each other, at right angles to the jaw. They are usually,
at the middle of the jaw, about 9 feet in length. A ull siz midale of the jaw, about 9 feet in length. A
(4) W. E. G. asks: At what part of the crank proke of an engine should the slide valve open the
ports? The port should be about $/ 2 /$ inch open when the crank is on the dead center.
(5) G. W. S. says: I am about completing n invention that requires the use of a small cord,
not to exeeed $11 / 2$ inches in circumference. I would prefer that it should be $11 / 8$ inches in circumference,
and desire it to sustain strains of at least 400 lbs . I do not think wire can be made to answer, and wish to know whatis the best material in a rope or cord of the two dimensions? What are the breaking and safe strains of
such cords? A. Good hemp rope, of either size mentioned, can be made of the requisite strength. Silt cord can be made much smaller. You should apply to manufacturers for prices.
(6) H. B. says: I am engaged in file cutting and have considerable troublefrom the files cracking in
empering. In 170 gallonsof water used for tempering, use the following ingredients: $1 / \mathrm{p}$ pint oil of vitriol b. alum, $1 / 4 \mathrm{lb}$ borax, $1 / 1 \mathrm{lb}$. prussiate of potash, and
ave the water salted so that a potato will float on it have the water salted so that a potato will float on it.
What additional ingredients must be used, or what can be done to prevent the files cracking? A. Your files are probably heated too high. Try heating lower, and dip
vertically. (7) F. S. says: We have a four horse power caloric engine, which we would like to run with oil. We now run it with anthracite coal, which costs us $\$ 10$ per much gritin the cylinder as to cut out the packing ring and the cylinder in a short time. Which would be the cheapest, coal or oil? And if the latter, which would be the best kind of oil? A. We advise you to confer with the manufacturers.
We have a cistern built in clay ground; after having nished it, we found that water had made its way in Thinking that it was not cemented enough, we put on done with its A. We could not tell without knowing nore particulars. If there is a spring in the neig
hood, it may be necessary to give it another outlet. We have an iron roof on our factory which sweats rosty weather, the sweat dripping down on the machinery. What can we put on to prevent it? A. Yo fectually, or cover the iron with some non-conducting
(8) C. H. M. says: I have a $12 \times 14$ inches engine. The steam follows the valve 10 nches. I am more lap so as to make the valve cut-off earlier. of
course the exhaust will open the same, but will close earlier, unless I make it open very early. I want to Know whether there will be any gain in so doing? A.
You will gain by giving your valve sufficient lap to cut the steam at about 3 stroke
(9) T. R. W. asks: What is the best disin
chloride of lime (hypochlorite of calcium), or carbolic
acid.
(10) E. M. L. asks: How can I utilize small scraps of tortoiseshell? A. Small pieces of good tor-
toiseshell may be joined so as to form one large apparently seamless piece in the following manner: Slope off he margins of the shells for a distance of about a quarter of an inch from the edge. Then place them so that the margins overlap one another; and thus arranged put some time. The pieces by this means become so perfect.y united that the joint cannot be seen. The filings and very small scraps may be softened in hot water and consolidated by hydraulic pressure in metal moulds.
Protracted heating of tortoiseshell darkens it, and reatly lessens its beauty.
(11) J. H. B., of Leeds, England, says: I equire a peculiar kind of cement. I have used plaste of Paris and white lead, which, when moulded and ho pressed, forms into a very hard substance: but it rub off on to fabrics when ocing pressed on to them in that will keep the white from rubbing off? A. You might try a wash of strong alum solution. Perhaps a better cement for the purpose would be that made with lime and albumen. Slake freshly burnt lime with boil-
ing water; this occasions it to fall to a very fine dr
ing water; this occasions it to fall to a very fine dry
powder, if excess of water has not been added. White of egg or blood albumen should be intimately mixed by he lime powder should be added to form a thin paste which should be used speedily, as it soon sets. This is valuable cement, possessed of great strength, and capable of withstanding ste am or boiling water.
(12) M. A. says: We have a lot of plated spoons that are discolored with a bluish purple cast repolish. Can you tell us how to clean or remove the s very probably due to the formation of a film of sulphide of silver. This may be removed by dipping for moment in strong nitric acid, and then washing immediately in running water. If the silver is permitted to ment or two, the polished surface will be injured, so that it is preferable to rub off the film with a little finest ripoli powder and a piece of chamois skin or a soft brush.
(13) C. W. G. asks: How do you account for the fact that some of the genuine fifty and twentyve cent picces have not the ring of true metal? 1 sound like lead; and yet they stand all the other tests, and are to all appearances genuine silver coin. A. may be attributed to some flaw, crack, or strain due ion
(14) P. M. B. asks: How can I remove an oil stain from granite, caused by having left some
resh oiled putty on the same? A. Moisten the spot resh oiled putty on the same? A. Moisten the spot
with bisulphide of carbon, and immediately cover it with dry pipeclay or kaolin.
(15) E. P. H. says: I have a bronze mirror, and it has become dull and a little defaced by handling cannot find anything that will restore the polish. Ca ou tell me what to do wish it? A. Rub it over with cloth moistened with dilute sulphuric acid; wash with
water, dry, and polish, first with finest tripoli, and then putty powder on a piece of chamois skin.
(16) A. C. A. asks : How can flowers be (apped up so that they can be sent by mail without y mails Wip is y mails A. Dip them for a moment in dilute glycer boxes. Roots or bulbs should be wrapped as tightly about 1 part glycerin to 3 parts water, and packed mall pasteboard boxes.
(17) C. H. says: Can you give iull particu ars of the preparation of powder paper? Would it exprobable that it would. We have not tried the experiment.
(18) T. H. L. asks: Do all animals above shes perspire through the entire surface of their bodthe case with all of the higher animals.
(19) R. S. H. asks: What will take the tain of apple juice out of white cambric muslin? A. Rub the spots well with strong alcohol, and then moist-
en with a little very dilute sulphuric acid (1 part acid to en with a litte very dilute sulphuric acid ( 1 part acid to chloride of lime) until the spots disappear. Finally,
(20) W. H. J. says: I have a parchment diploma that has hung against a brick wall till it has beome wrinkled from gathering mosture. How can bibulous thin blotting paper, and pass a warm iron over the reverse side until it is properly smoothed.
(21) M. B. H. says: I am sprinkling the streets with a 300 barrel tank, from which I fill my how much rhloride of calcium would be necessary to keep the dust down. going over the ground two or three times a day? Would it be better to put the chloride into
the large tank or the small one? A. We think the the large tank or the small one? A. We think the
smallest quantity to be used is about 1 lb . to the barrel smallest quantity to be used is about 1 lb . to the barrel
$(=1 / \mathrm{oz}$. to 1 gallon). If you can make sure of its complete solution, you had better add it in the small
(22) C. T. L. says: In making fly paper, I wish to put a preparation of sticky materials on calening of glue; but I cannot spread it evenly and it stains through the paper A. Use a sizing of a thin solution of shellac in borax, or dip the paper for a moment into of shellac in boras, or dip the paper for a moment into
a solution of beeswax in methylic alcohol, and then pass
it between hot rollers. The sheets may then be giue-
sized by laying each sheet, face downard sized by layingea
face of the bath.
(23) H. M. H. asks. What are the chemical changes produced on the photographic plate from the ution is washed off? And what are the lights and shades composed of before and after the plate is fixed? A. Upon putting the collodionized plate intothe silver bause a iodides or bromides contained in the collodion siver on the collodion. On exposing this to light, a partial recuuction of these salts ensues wherever the light
strikes it-the stronger the light the greater the reducstrikes it-the stronger the light the greater the reduc-
tion-and this reduction is in so far completed by the action of the developer that the parts exposed to light become insoluble in the fixing solution (hyposulphite of are composed of potassium). Before ixing, the she lights of unreduced salts. In the fixing bath all of the unreduced salts are dissolved out, while the rest remains unchanged. The lights in the finished negative
are therefore the transparat re therefore the transparent portions
(24) F. P. asks: How can an aqueous solution of Liebig's extract of beef be prepared? A. Dis-
(25) H. L. C. says: I wish to make some permanent U magnets of cast steel, of $3 / 8 \times 1$ inch bar. 8 or 10 lbs . Can I charge them by using an 18 by 1 inch round iron formed into a $U$ shape, and wound with 75 feet of No. 14 cotton-covered wire, with battery power
consisting of two Hill cells? A. Yes, but one Grove or
(26) B. says: I have a cistern which is made in clay ground; and it lets in water through the
cement, and makes the rain water hard. It has 6 or 7 cement, and makes the rain water hard. It has 6 or 7
coats of cement, and still the water comes through. What coats of cement, and still the water comes through. What
is the reason, and how can I prevent it? A. No kind of is the reason, and how can I prevent it? A. No kind of
cement that is mixed with water can be depended upon absolutely to make a lining impervious to water. You require an asphaltic cement put on in several coats, and fortified and loaded down with a brick or concrete bottom and sides, to keep it in place, so as to resist the
pressure of the exterior water when the cistern is not filled.
(27) F. D. H. asks: In connecting the coils of an electromagnet, which are the proper ends of the
wire to join, those nearest the cores orthe outside ones?
(28) J. C. W. asks: How can I build a hot. ouse of lumber, for flowers in the winter? A. Locate it so as to harmoniz $\in$ with surrounding buildings, but place front wall be 2 feet sufficiently high to give the glass roof a slant of $45^{\circ}-$ the height depending upon the width of the building. If the soil is dry, the floor may be sunk 2 feet below the
surface of the ground you have stone, build foundation walls 18 inches thick up to 6 inches above surface of ground, lay silis around and set your posts about 4 feet apart, their size being 4 by 4 inches. Cover the front and rear, both on the exterior and interior, with tongued and grooved boards, nd pack the 4 inch space between the boarding with no stone, use locust or chestnut posts, driven well into the ground and sawed off level for the siil. Make your rafters of sufficient size to suit the width of the building, and placed so as to properly receive your glass
frames, and provide in the 2 feet wall at bottom, and in the und row of sashes a 2 reet wall at bottom, a every the upper row of sashes, a ventilating shutter to every
other opening between the rafters. Put the door in the warmest end, and construct the ends of glass. To prohouse stove severe weather, procure a hot waterreenthe directionsgiven.
(29) J. W. S. says: A house that cost $\$ 15,000$ caught fire from a chimney; the gas had eaten that can be put in mortar that will counteract the effects of the gas? A. Make your mortar of lime and clean sharp sand (no clay or loam); make the walls of the
flues fully 4 inches thick, and fill the joints of the brickwork with the mortar properly, and there will be no anger of the gas eating through the mortar to set the
(30) J. J. says: A large reservoir 20 feet deep, 2 miles from town and 200 feet above town, has wo pipes equal in size and length. One is inserted at both are led to the same point in town. Which would supply water firstor run the most? What would be the difference if the top pipe were connected to a small box three feet square which is kept supplied with water at the same height as the reservoir? A. The head of water, or the pressure at the bottom of the pipe in town, is the same in both cases, the only difference being in pipe which connects near the top of the cank ceasing to fow when the water subsides to that point, but the other continuing until the tank is fully discharged.
(31) B. \& C. F. say: 1. We propose building a storehouse. We desire to know which is best,
brick or stone, stone being witite sandstone of good quality and the brick medium? A. The brick wall could be laid up in less time than stone and would answer of less thickness-it would therefore most likely be more economical; it would also stand fire better. 2. Which is best for roofs, tin or sheet iron? Should it be painted? A. A roof of bright I C plate charcoaltin is the best; and
(32) A. G. says: I got some small articles or silver plating, and tried your recipe given on p. 299, vol. 31, but without success. The articles are of a composition of tin, zinc, and lead or antimony, 1 to 2 inches
ong and $1 / 2$ inch wide. How can I succeed? A. Probably you were not careful enough in cleaning the objects. Try boiling and rubbing them in a solution of caustic soda, made by boiling about 2 lbb . of common
soda crystals with milk of lime, produced by slacking inse the transfer immediately to the silver bath.
(33) V. \& G. say : 1. We cut off steam at 8 nches on one end and 10 inches on the other end of onr
tres inches cylinder. Is this right $W$ We find wake it cut off alike on both ends fand that opens wider on one part than the other. A. It is impossiblc in a common slide valve to make the points of admission cut off and release equal for each stroke; and is preferred to keep the points of admission equal. There is about $3 / 4$ of an inch space between the cylinder eake our cylinder head thicker and reduce thieam to uch space should there be? A. Ye nte back of the main valve, better than to vary the ut-off of the main valve by raising or lowering one en
(34) L. H. R asks: In electricity, what (34) H. R. ask: 1 . In $A$. The ohm is the anit of resistance in electrical measurements. It is quare millimeter in section, and 1.0486 meters long, ${ }^{0} \mathrm{C}$. The name ohm was given the unit in honor o which of the two metals, zinc and lead, has the greater affinity for silver? A. Zinc.
(35) A. H. R. says: I wish to make a pai of waterproof pants, in which to work in water from Will twilled cotton, thoroughly coated with raw oil wer the purpose? Or is there any better coating? No. Try a mixture of about 10 parts boilcd oil and part beeswax, thinned down so as to readily penetrat the cloth. A better way is to use a thin varnish made y dissolving india rubber in bisulphide of carbon conaining about five or six per cent of absolute alcoho A ver
cheap.
(36) J. K. T. asks: Is there any way to hrink boots, which have been stretched while wet, into per $A$. We do nows How can I polish a gun stock A. Put on several with pumicestone, and finish with a fine linen whad dre constantly moistened with thinalcoholic shellac and oc casionally a drop of oil.
(37) B. L. H. asks: Will you please inform me of the process of marbleizing iron? A. See article olors may be produced by the addition of oxide of animony, manganese, and iron to the glazing, before the inal fusion. Thisalso answers W. M.
(38) A. R. S. asks: How can I get the im icle becoming set in the pia - ter? A. If there are any inward curves or angles in the model you cannot make correct cast of it at once. For intricate work the mode must be in several parts, from each of which a separate cast is taken; and then all of them properly joined to orm one mould. This subject has been dealt with in etail by Mr. Joshua Rose in late numbers of the Sc ngles are not very sharp, it is sometimes possible to ret cast in glue, which, being more elastic than plaster mits of a certain amount of compression and stretch ing in removing the pattern. The water in which the lue is dissolved is mixed with enough glycerin to retai the glue as a stiff jelly on cooling. The patterns are carcfully oiled before being brought into contact with be taken, and from this, in turn, a plaster cast, tha copying the first.
(39) T. W. asks: What is the best non-con ducting material (for heat) whether of animal, vegetable gin, feathers, wool, hair. silk, etc.., are the best. Amon retable substances, charcoal, sawdust, shavinge, cot on, and dry fibers in general. All these, when dry. are excellent non-conductors. Of mineral substances, as bestos, mineral wool, porous tiles, and clay bric
slabs or bricks of porous infusorial earth, etc.
(40) N. M. W. asks: How can I clarify and polish horn? A. It is usually first scraped, and then rubbed down with emery powder and water, and fin lished with tripoli or rouge. In working horn, the bony or several weeks, which treatment loosens the core, so hat it may be pulled out. Boiling water temporarily out by pressure between hot iron plates.
(41) A. L. B. says: In one of your papers see a statement of the effect of sulpho-carbonate of potassium on the eggs of the potato bug. Would the ap
plication of this chemical to the field be likely to poison e that it mage their use dangerous? A. he tubers, if used excessively
(42) Z. H. asks. 1. Can grain nickel be aelted in an ordinary furnace used for melting brass ou may succeed in fusing small quantitics of it at ime. It requires a very high temperature, and a long exposurc in the furnace to get it liquid enough to run
( 1 . S. Qum
(43) A. L. S., Qucensland.-Remit 16 shil lings sterling for
Minerals, etc.-Specimens have been re cived from the following correspondents, and examined, with the result stated
J. M. B.-A. is properly an agate, of little value. B lay containing a considerable amount of inftia ilica. It is an excellent article for polishing pur poses, and, if properly washed, might prove mar-
ketable.J.H.C. - No. 1 is an indurated clay, contain-
ing much oxide of iron. No. 2 is a piece of red jasper.
No. 3 is a felspathic rock, containing small specks of ron pyrites and chalcopyrite (sulphide of copper). No. 4 is nodular pyrites (marcasite). See p 7, vol. 36. None magnetic pyrites (pyrrhotine).-M. s. - No. 1. The coat ing contains manganese and very probably zinc. No. 2 an carthy oxide of cobalt-a variety of No. 1. No.
gneiss rock with sulphide of iron. No. 4 is magnetite F. II. P.-A is a piece of hornblende B is gncisa rock, with a few iron garnets. The crystal is calcitecarbonate of lime. - M. W. R.-It is mica schist (a silicate of potash, alumina, magnesia, and ron) with chlorite (a hydrous silicate of magnesia, iron, and alumina -K. H. R.-They are pebbles of fint, common agate halcedony, and quartz. We do not consider them It is impossible for us to way where the pebbles came rom, or where simiar ones could be found in quantitics. We have seen magnificent agates from the Pacific coast, and we understand that they abound near San Diego, Cal.- E. E. E.- It is not coal, but clay contain ing a arge amount of carbon.-C: A. M.- It is a wax,
called by dealers Carnauba wax.
M. B. \& R., of Melbourne, Australia, say The greatest enemy that the fruit gardener has to conmatter of great wonder that no means have yet been in roduced to stop its ravages. Those who have not had cular demonstration would scarcely credit that thes ittle creatur s could commit such havoc. Settling in completcly denude them of every particle of ripe fruit. Iere is an opportunity for the ingenious American to distinguish himself by inventing some contrivance to reserve the trees from their ravages. Of course the in ention must also have the merit of cheapness, so as

## COMMUNICATIONS RECEIVED

The Editor of the Scientific American acknowledges, ith much pleasure, the receipt of original papers and On Painting Axes. By W. E. W. On the Dunkirk Microscopical Society. By C. P. A. d by J. E. S.
On the American Cicada. By II. II.
On a Discovery in Geometry. By L. S. B
On Torpedoes. By J. P. W.
On Converting Motion. By F
On a Decimal System of Computing Tince. Bジ C. E. D. On Capital and Labor. By
On Boiler-Covering Comporition. By P. C. On Liquors. By C. F. F.
On Water Evaporated through Engines. By W. A. Mr Also inquiries and answers from the following:
C. M. K.-S. B. E. - A. -J. B. B. - A. S.- J. M. W.

HINTS TO CORRESPONDENTS.
Correspondents whose inquiries fail to appear should epeat them. If not then published, they may conclud hat, for good reasons, the Edtor declines them. Th ddress of the writer should always be given, Inquiries relating to patents, or to the patentability cre. All such questions, when initials only are give re thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasre in answering briefly by mail, if the writer's addres given.
Hundreds of inquiries analozous to the following are sent: "Who makes machines for breaking down
rice straw for paper-making? Who sells stcam heatere in which the heat may be readily varied to suit the wants of the houschold? Who sells electric candles, as described on p. 3:39, vol. 36? Who sells decorative tiles? Who sells hydraulic lime?" All such personal inquiries
are printed, as will be observed, in the column of are printed, as will be observed, in the column of
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formation can in this way be expeditiously obtaincl.
official.
INDEX OF INVENTIONS
Letters Patent of the United States
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May 15, 1877 ,

## AND EACH BEARING THAT DATE

[Those marked (r) are reissued patents.]
A complete copy of any patent in the annexed lis!, ncluding both the specifcations and drawings, will be lease state the number and date of the patent desired and remit to Munn \& Co., 37 Park Row, New York city.

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Bag min press, J. E. Hanger.
Bark mill, W. F. Mosser.
Barrel trussing machine, w. Bayley Basin, J. H. Keyser.
Bed bottom, G. Eade
Bee hive, G. Kraetzer
Bessemer converter bottom, E. J. Mildren Binder, hand, J. O. Brown.
Binder, hand, J. O. Brown
Bird cage support, F. W. Long
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Blackwashing device, N. K. Wade
Blind slat adjuster, H. Gaylord..
Blowing machine, Cochrane \& Hendy
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