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GLASS MAKING AT THE CENTENNIAL EXPOSITION. generally interesting, or which at all times attracts greater crowds of people, than the glass factory. This is located in a separate building, in rear of the huge shed wherein are exhibited the steam sawing machines, and there,for the first
time in the history of any world's fair, the visitor may with ness the entire glass-making process. Two weeks before the Exposition openedits gates to the public, the fires under the great cluster of pots were lighted, and since then, some seven tuns of materials have weekly been melted and con

There is
verted into tumblers, and goblets, and vases, and the hun-
dreds of minor articles designed as souvenirs of the Cenennial.
The operation of glass making begins with charging the pots, which are huge crucibles of clay arranged around the entral fire of a huge furnace, the lofty stack of which, distant pouring forth smoke, is a prominent object in any
grounds. In these pots the raw materials, sand, pearlash, lead, soda ash, lime, nitrate of soda, various xides, etc., are placed, previously being thoroughly ground
lbs. of ingredients, and but half of the total number of pots are worked at a time. A part of the charge is first in serted; then as this melts more is added, and thus the re eptacles become gradually filled with melted " me tal." The fre is now urged, and the workmen constantly thrust their ong iron bars into the viscid dazzling mass, withdraw uge drop or two at a time, and examine it, until at last the bubbles, which at first are thickly scattered through it, be come fewer and fewer the scum which forms on the su ace is ladled off the heat is carried to the highest degre Continued on page 308


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## ULTRA-DARWINISM.

The story is told of a tourist among the mountains of Wales who, amazed at the contrast between the thought and the language of a village preacher's sermon, asked an explanation of the marvel. The honest preacher confessed that, in default of ability to write an original sermon, he made a practice of translating the sermons of a leading English divine, first into Welsh and then into the dialect of his hearers: by which time, he naively,
himself wouldn't recognize them."
Sometimes we think there must be some such process of translation continually going on with regard to scientific discoveries, a translation into a dialect as unscientific as the Welsh preacher's was un-English; and what is worse, the the would-be scientific teachers usually manage to impart a greater confusion into the thought than the Welshman did greater confusion
into the language.
Anything about Darwinism, for example, in almost any Anything about Darwinism, for example, in almost any
religious newspaper will serve as an illustration of this process and its results. But the mischief is unhappily not confined to the religious press, so-called. It turns up in all sorts of places. One of the prettiest specimens we have seen lately appears in the last report of the Secretary of the Massachusetts Board of Agriculture. The chairman of the committee on poultry, discussing new breeds and how to produce them, gravely remarks

We are not of the number of those who believe in the ingenious but improbable theories of Darwin. The princi ple of selection, perseveringly carried out" (practice of se lection, we presume, is meant), "s productive of wonderfu results; but there is a limit beyond which progress is impossible, and it seems to us that the burden of proof rests with these philosophers till they can show hybrids which are ca-
pable of producing their like continually and not exceptionally. Neither do we believe with another learned profes sor that the strong desire of the original Bengal tiger to conceal himself, while crawling through thickets and cane brakes, produced the stripes on his body. If it did, why, we may ask, did not that desire go a little further, and produce a skin of a pea-green tint, which would have been a much better protection?" The italics are not ours.
This is a very pretty specimen, since it combines in a short paragraph so many of the leading errors of theory fact, and logic, which characterize the writings of anti-Darwinists everywhere. The first stroke is to beg the question by calling the theories of Darwin, in a lump, " ingenious but improbable." There is no possible reply to that except a flat denial, and that goes for nothing in an argument. The next stroke is an appeal to "fact," in an authoritative
way, very convincing to those who do not know that the facts are overwhelmingly against the position taken
Our poultry man's logic was in this wise: If specific evolution by variation is true, then crosses between related spe cies ought not to be invariably infertile. They are infer tile: in other words, are incapable of producing offspring able to breed with each other and breed true. Therefore evolution is false, and the theory of distinct and separate specific creations is true.
But it happens that the asserted infertility of plants and animals produced by crossing those of different species is not true : and in producing this as a crucial test of Darwin ism, the objector only confesses his profound ignorance of Nature. Among plants, fruitful bastards are plentiful; so
they are among insects, fish, and birds. And they are not they are among insects, fish, and birds.
uncommon among the higher animals.
For example, systematists have never questioned the spe cific distinctness of the hare (lepus timidus) and the rabbi (lepus cuniculus); yet for a quarter of a century a cross o these two species has been bred for the table in France. In their natural state, the two species will not pair, but when bred together from birth there is no aversion; they pair freely, and produce offspring which are neither hares no rabbits, but a clearly marked hybrid species, capable of pro pagating itself by pure in-and in-breeding. But this is no
nearly so remarkable as the cross of goats and sheep-two distinct genera-bred for industrial purposes in Chili. In this case it happens that only the offspring of the he-goat with the ewe are fertile, the ram and the she-goat pairing but rarely, and then without result
But we have wandered a long way from our typical antivolutionist. The faults we have pointed out are followe in the same short paragraph by two others, equally charac teristic and possibly more common among that sort of wri ters ; the first is misrepresentation, the second, erroneous in erence from incorrectly apprehended facts.
If he ever existed, the " learned professor." who account ed for the tiger's stripes by the strong desire of that anima to hide himself in cane-brakes, has been dead a great many years: so many that Darwin and his friends may fairly be reckonedinnocent of any responsibility for his intellectual vagaries. Only pretentious ignorance could seriously refer ern Science : but our poultry man evidently thinks the hy pothetical learned professor a model Darwinist, and the example given a true illustration of the accepted method of volution. It is a characteristic blunder of the school o thinking and writing which he so happily represents.
But the most charming exhibition of scientific and logical verdancy-pea-green tintedness, one might say-also charac
teristic of the school, appears in the closing question. It is triumphantly funny. Just think what a conspicuous objec a pea-green tiger would be in the customary haunts of

## tigers!

Whether he got his color by desiring it, or by the natural
green tiger would be equally an impossibility; while for
protection amid thickets of vertical stems, white and brown and casting the blackest of shadows in the glow of a tropi cal sun, no other coloring of his coat would serve nearly a well as the one he now enjoys. Tiger hunters declare that a motionless tiger is all but invisible amid jungle growths, even when his form is fully exposed.
At this late day it would seem impossible for an intelligent man-much more a man who aspires to be a teacher in any department of nature-study, even poultry breeding-to cram so many typical blunders unwittingly into one shor paragraph; but there they are, and we suppose that men will go on doing the like just as long as it remains more fashionable and "orthodox" to denounce Darwin than to read him, so much easier to settle questions of scientific theory off-hand than to examine them by the light of sound experience and verifiable observation.

## WAS IT VULCAN?

In our recent article on the intra-Mercurial planet, we published a communication in which a correspondent reported his having witnessed the transit of a dark body across the sun's disk on July 23, 1876, at about 3 P. M The instrument used, a $2 \frac{1}{2}$ inch telescope, defined the object as a clearly cut circle, not jagged nor presenting the well known characteristics of a solar spot. Observations made a few days after revealed no trace of the phenome. non.
Our correspondent's observation is now confirmed by the位er given below. The writer, Mr. Samuel Wilde, is a entleman of wealth, owning a private astronomical obser vatory, in which is located the $6 \frac{1}{4}$ inch refracting telescope to which he alludes. This instrument is the largest of its class in the State of New Jersey. It will be noted further that both Mr. Wilde and our correspondent B. B. saw the phenomenon from the same locality, Montclair, N. J., at nearly exactly the same time; so that, the conditions of weather, etc., being precisely similar, the mutual confirmation of these two independent observations is all the mor marked.
We hazard no opinion as to the nature of the occurrence. The circumstances, on one hand, are in every way opposed to its being a sun spot,while on the other they certainly tally with the descriptions given by Lescarbault and others of their observations of a supposed Vulcanian transit. The problem is one for the astronomers to solve, and to them we leave it. Meanwhile, here is Mr. Wilde's letter:
To the Editor of the Scientific American
Accidentally hearing of the article in your paper of Octo ber 21 on the subject of the intra-Mercurial planet and of the observation by your correspondent (B. B.), it brought to
my mind an observation of the sun I had on the same day Sunday, the 23d of July last. Having some friends visiting at my house, they desired to see the spots on the sun. Know ing that none had been visible for some time, and the day being exceedingly warm and my observatory some little way
off, they concluded to stay in the house until I ascertained if any were visible. At about one quarter to three oclock I di any were visible. At about one quarter to three oclock I di
rected my telescope (a $6 \frac{1}{\text { inch }}$ ) toward the sun's disk, and immediately perceived a well defined dark round spot on the lower left portion of the sun, substantially as given in B. B.'s drawing. I watched it 25 or 30 minutes, when, the sun becoming obscured by a passing cloud, I returned to the house. Knowing that the spot was of unusual character entirely difterent from any sun spot I had ever seen before,
remarked to my friends that none of the usual spots were visible, but that I had observed a dark round spot, apparent ly moving, which looked like the photograph of the transit of Venus. Not knowing of the expected appearance of Vul can, I took no note of its motion; and the occurrence had passed from my mind until my attention was called to th white light.
Samuei. Wilde.
white light.
Montclair,
The French scientific periodicals which have arrived since the above was written are filled with discussions and new relative to the supposed planet. M. Leverrier has reviewed his calculations, and now rejects all previous observations but five, three of which occurred in the month of March in the years 1849-56, and 1859, and two in October of 1802 and 839. Combining these, he calculates an orbit with greater precision than heretofore, determining the positions of the maginary planet within half a degree. The result is that he now announces the Vulcanian year as neither 42 nor 28 days, but as 33.0225 days.
Next comes Señor Ventosa, Astronomer of the Madrid Observatory, who proceeds to annihilate Weber's observa ion, on which all the present excitement is founded. On April 3, at 23 h .18 m . Berlin time, Señor Ventosa saw a sun spot and noted its position. On April 4, at 4 h .25 m . same time, M. Weber saw his supposed Vulcan, and noted its lo cality on the sun's face. Calculating back from Weber's position, for a period of 5 hours and 7 minutes, brings Weber's planet in exactly the place where Ventosa saw the pot. Ergo, Weber saw a sun spot; and as M. Leverrie imself accepts this conclusion, there is an end of Weber' fragile foundation. But this need not arrest the work of stronomers who are still watching the solar face. There re the two observations of our correspondents which yet emain, and which are certainly much more valuable and etter authenticated than that of M. Weber
M. Janssen, the distinguished physical astronomer, ha, sent to the French Academy of Sciences the following notes which offers excellent suggestions to observers. The oundness of an observed body, he says, on the sun's face is not a specific characteristic of an intra-Mercurial planet, neither does its disappearance after five or six hours incon estably prove a planetary transit. There exist however, features determined from the constitution of the photosphere which allow, even during the brief instants of a fugitive observation, of deciding whether the phenomenon seen is
solar or extra-solar. The sun's surface is covered with
solar or extra-solar. The sun's surface is covered with
granulations, which are called various names, but which are granulations, which are called various names, but which are
perfectly familiar to any practised observer. These become perfectly familiar to any practised observer. These become
modified near the sun spots, and the latter (independently modified near the sun spots, and the latter (independently
of the penumbra, which rareiy is absent, especially about of the penumbra, which rareiy is absent, especially about
round spots) are surrounded with circular faculæ which alround spots) are surrounded with circular faculæ which al-
most invariably throw out appendages. A body in motion, most invariably throw out appendages. A body in motion,
interposed between the eye and the solar surface, should interposed between the eye and the solar surface, should
produce a succession of eclipses of the granulations, covering those toward which it progresses, and uncovering others behind it. This phenomenon of emersion and immersion is the most decisive test during a rapid observation. It re quires, it is true, a good instrument of ample enlarging any case doubtful, as they cannot include all the true characteristics of the phenomenon.
Photography nowadays gives us such perfect solar images that it may best be used in work requiring great precision. The photograph of a transit, if made with a proper instruThe photograph of a transit, if made with a proper instru-
ment, carries with it the stamp of authenticity, and is betment, carries with it the stamp of authenticity, and is bet-
ter than the most perfect observation of the ablest astronoter than the most perfect observation of the ablest astrono-
mer. In order to search for Vulcan by photography, a sucmer. In order to search for Vulcan by photography, a suc-
cession of pictures of the sun will have to be taken so rapidly that no time, sufficient for a transit to take place, will elapse between any two. A revolving apparatus using dry plates and working automatically, so as to take a photograph once an hour, would answer all requirements best, especially as the astronomer, by using dry plates, can afterwards develope his images at his leisure, or need not concern himself with photographic manipulations at all. A certain number of such instruments, says M. Janssen, distributed systematically over the globe and kept going for a few years, question as to whether an intra-Mercurial planet does or does question a
not exist.

## THE CENTENNIAL AWARDS.

Viewing its work as a whole, the Centennial Commission has done wonders, it has made the Exposition a grand suc cess, it deserves the hearty thanks of the people, and will get them. Butits action in respect to the awards will, fear, give considerable dissatisfaction.
It was decided to make supplementary a wards, and there upon a board of judges of appeal was constituted. Had this board proceeded to review cases where injustice and oversight was charged, and to issue favorable reports when the facts warranted, signed by its particular members, all would he well; but probably incited by exhibitors who would not as val their demands one jot, and who wanted just exactly first instance, and nothing else, the Commission concluded to render all reports equal by erasing the names of all the to render all reports equal by erasing the names of all the
judges on all the reports, and substituting therefor the sigjudges on all the reports, and substituting therefor the signatur
bell.
The action, we learn, has been taken in the face of the opposition of General Walker, the Chief of the Bureau of Awards, and of prominent members of the Commission.

## THE RETURN OF THE BRITISH ARCTIC EXPEDITION.

The British arctic expedition under Captain Nares, com prising the steamers Alert and Discovery, has returned, the Alert having arrived at Valentia, Newfoundland, on October 27. The ships left England on May 30, 1875, and entered the ice off Cape Sable, on July 29. After a severe struggle, the north side of Lady Franklin Bay was reached, and here the Discovery was left in winter quarters. The Alert pushed on up to latitude $82^{\circ} 27^{\prime}$, and there wintered. At this point the sun was invisible for 142 days, and the lowest temperature ever recorded was experienced. The mercury fell to $\tilde{9^{\circ}}{ }^{\circ}$ below zero, and remained so for a fortnight, and at one period reached $104^{\circ}$ below zero. Sledge parties were fitted out, one of which traveled 220 miles to the eastward, and the other went to the north, proceeding on land up to $83^{\circ} 07^{\prime}$, and thence on the ice to $83^{\circ} 21^{\prime}$. Further on, nothing but ice could be seen, which was so rugged that scarcely a mile of advance could be accomplished daily. The floes in some places measured 150 feet in thickness. Four men died from the effects of the cold. Finally, becoming convinced that it was impossible to get any nearer to the pole, and seeing that his men were succumbing under the hardships, while the Alert herself had been much damaged by the ice, Cap-
tain Nares started homeward, leaving Smith Sound on Septain Nares star
This expedition, it will be remembered, was fitted out with every aid to polar exploration which Science could devise or the experience of the oldest arctic explorers could suggest. That it has failed to reach the pole is proof of the enormous difficulties to be overcome in that undertak-
ing, rather than of any inadequacy to the task of those who ing, rather than of any inadequacy to the task of those who
attempted it. Indeed, we may believe that, after latitude $82^{\circ}$ is reached, the obstacies augment in some compound ratio The results which have been obtained are, however, of considerable importance. Captain Nares has reached the highest northern point ever attained, latitude $83^{\circ} 21^{\prime}$. The Aus trian expedition, which sailed, in 1872, toward Spitzbergen, only reached Cape Fligely in $82^{\circ} 5^{\prime}$, and sighted Cape Vienna in $83^{\circ}$. It is remarkable, however, that the Polaris, ill equipped as she was, reached $82^{\circ} 16^{\prime}$, and wintered in
$81^{\circ} 38^{\prime}$, while Hall, with a sledging party, pushed onward to $81^{\circ} 38^{\prime}$, while Hall, with a sledging party, pushed onward to
$82^{\circ} 30^{\prime}$ $82^{\circ} 30^{\prime}$. Captain Nares has, therefore, advanced 51 geographical miles further north than the American explorer, and has approached within 400 miles of the pole.
The details of the other accomplishments of the expedition which have reached us are very meager, but indicate that Captain Nares' forthcoming report will be of consider
as value. President Land, usually marked on arctic maps, and from the fact that travel was conducted on the a bay the highest point reached, it would seem that no open polar sea was encountered. The northernmost point seen in Greenland, was in latitude $82^{\circ} \quad 57^{\circ}$. Excellent coal was
found near the place where the Discovery wintered, and a found near the place where the Discovery wintered, and a
number of valuable scientific collections and observations number of
The Pandora is still in the ice, and was met by the Alert on October 16 (where, not stated), when she signaled " all well.'

## THE NEW YORK AQUARIUM.

The new aquarium at the corner of Broadway and Thirty fifth street promises to be a positive and genuine addition to the city's resources for instructive entertainment. It is Central Park, and made a part of the valuable zoölogical exhibition already so popular there ; but as that was impossible, we are thankful that Mr. Coup has had the courage to undertake it as a private venture. Unless we greatly misjudge the interest which most intelligent people take in such things, the enterprise cannot fail to command its full meed of recognition and reward.
At present, however, the aquarium labors under serious disadvantages as an exhibition. The water in the tanks is
still almost turbid with decomposing vegetable and animal still almost turbid with decomposing vegetalle and animal matter, making it difficult to see the objects exhibited, and
even more difficult to keep them alive and well; while the work of stocking has been seriously hindered by the bursting of tanks and the death of many rare and valuable fish and aduatic animals. Nearly all the first supplies, including two white whales, were lost before the tanks were in proper working order ; and many objects which might otherwise have been saved were killed in consequence of the ob sorption by the water of poisonous vapors from the freshly painted and varnished interior of the main hall.
All these obstacles and mishaps, it is to be hoped, will soon be corrected and overcome; the water will be freed of organic matter by aeration ; new objects of interest will be added, and in a little while we may expect to see an exhibition of aquatic life such as will compare favorably with Already the collection contains representatives of many of our principal salt and fresh water fishes, with a few that are rare and curious, besides turtles, alligators, seals, a young whale, and a considerable number of the lower forms of marine life. In capacity the building compares favora bly with the more important aquaria abroad: not so large as those of Manchester and Brighton, but fully equal in tankage to many of the most useful and successful. The
main tank, which has a front of 65 feet. is the second in size, main tank, which has a front of 65 feet. is the second in size,
it is said, in the world. Here, at present, are numerous dog fish, a regular shark of considerable size, a gigantic sturgeon, several large sea turtles, and a number of skates and rays. In the center of the pavilion is a raised circular tank
30 feet in diameter, now occupied with a white whale 30 feet in diameter, now occupied with a white whale calf from the Gulf of St. Lawrence. In front is a depressed seals have already made themselves the pets of numerous visitors. Back of the whale tank, and occupying the larger part of the western end of the pavilion, are the sea lions' pools, surrounded by an attractive rockery, and spanned by rustic bridge from which a good view is to be had of the The exhibition hall
The northern side is devoted to a row of large tanks, lined
with rockwork and tenanted at presen with rockwork and tenanted at present with numerous re presentatives of our principal lake, river, and sea fish, besides crabs, lobsters, anemones, and the like. Four of these tanks present a crystal frontage of 8 feet by 10 feet each; and a dozen smaller ones have 4 by 5 feet fronts. On the southern side are twenty-five or thirty table tanks, glazed on all
sides, for the exhibition of the smaller fish, crustaceans, etc a large tank for trout and allied species; and-one of the most valuable features of the aquarium-Mr. Mather's tank for fish hatching, now occupied in part by an interestng lot of California salmon eggs in process of development. water through the tanks, for aerating the water when it enters the tanks, and again when it is on its return course to the main reservoirs, and for hastening the oxidation of the organic matter originally in the water and constantly being
added to it by its inhabitants, are ingenious and satisfactory. added to it by its inhabitants, are ingenious and satisfactory.
By these means only the loss by evaporation and leakage has to be replaced, the original supply of water being used over and over again, as in Nature, while undergoing a perpetual process of purification.
Specially to be commended are the educational features of this new enterprise, particularly those designed to assist practical students of marine life in the prosecution of their
researches. As an adjunct to the aquarium, it is proposed to have a free scientific reading room, and a laboratory, provided with experimental tanks, dissecting tables, micro scopes, and other appliances for the critical study of aquatic life and the anatomy of aquatic forms. This department, for which pleasant rooms have been provided over the main
entrance, is under the direction of Professor W. S. Ward at whose suggestion it was established. It is proposed to admit to its privileges all such teachers and students as may desire to avail themselves of the opportunity thus offered for the practical pursuit of zoölogical studies.
The general aspect of the main pavilion, with its rustic work, and foliage is quite pleasing, and we have no doubt but that it will soon become a place of great resort. Its popularity and its profitableness as well, we think, would be in-
creased by a large reduction of the admission fee; but that is a matter which the proprietors will have to demonstrate for themselves. It is to be feared, too, that an unfavorable impression of its value will be gained by many who visit it just now, for the collection is comparatively meager; and though containing much that is curious and interesting, it falls so far short of what one might expect from the bom bastic advertisement that it is really disappointing, for the money. As a beginning, however, considering the difficulties to be overcome in starting an enterprise so largely ex-
perimental in character, it is worthy of every encourageperime
ment.

## DETOXICATED TOBACCO

A correspondent, referring to our recent article "A Cigar Scientifically Dissected," asks whether there be not some method whereby tobacco can be rendered innocuous and yet have its agreeable aroma preserved. The fact that numer ous attempts in this direction have been made, and yet there is no substitute for tobacco and no de-nicotinized tobacco in general use, is in itself a sufficient answer to the question It is the combination of poisons which we enumerated which produce the agreeable taste and smell, and to remove any of the ingredients seems simply to render the tobaceo unpalat able.
Upo
Upon many persons coffee exercises a very deleterious influence; but they can, and often do, drink a chicory infusion, which tastes very like that of the Arabian berry, though
totally destitute of all the aroma of coffee. Similarly it is totally destitute of all the aroma of coffee. Similarly it is possible that there may be some vegetable which is sufficiently near in savor to tobacco to render it valuable as a substitute or as an adulterant for the genuine leaf; and it might be well for botanists and chemists to undertake researches with a view to discovering the same. Meanwhile the most successful efforts to render tobacco less hurtful have been those involving mechanical means. The Turkish nargileh or water pipe, in which the smoke is drawn through water, is probably the least harmful method of smokin practised, a fact proved by the thick dark scum of oil which appears on the water after use. A nargileh is easily made out of a wide-mouthed bottle. The tube attached to the pipe bowl is led down beneath the surface of the wate which half fills the vessel, and the smoke is withdrawn through another tube which enters the empty space above the water. Numerous pipes have been patented in which the smoke is filtered through cotton or sponge, or led into a lit tle chamber where the oil is deposited, and thence withdrawn Attempts have been made to treat the smoke chemically during its passage through the filter. M. Ferrier soaks the cotton in a solution of tannin, and dries it in the air. The annin, he claims, retains the nicotine in chemical combina ion. French chemists who have tested this plan are wide y at variance. Cahours confirms Ferrier's experimental re sults, and says that the nicotine is wholly removed. Barra objects that nicotine is not capable of uniting with tannin and that the latter substance is not less injurious than nico ine. We do not find many records of investigation in this branch of the subject, and researches here also might be valuable.
After the water pipe, the safest way of using tobacco is to smoke a mild quality in a pipe made of meerschaum, charcoal, or porous unglazed clay. The pipe bowl then absorbs the oils to a considerable extent, as the coloring oi pure white meerschaum plainly shows; and the impurities should be frequently burned out, or new bowls substituted, in order to keep the absorbent qualities unimpaired. The most hurt ful method of smoking is the Cuban paper cigarette, where he deleterious fumes of burning paper are added to those f the exceedingly strong tobacco enveloped.
It may be justly considered that in most cases the use of tobacco is an abuse : but it is equally true that devotees of the weed have lived to the most advanced ages, and that thousands habitually smoke without being able to appreciate any deleterious results. There is no standard, therefore, whereby the evil effects of the habit can be gaged for every body. Dr. Smith, some years ago, read a paper before the British Association, in which he adduced experiments showng that, while tobacco smoking causes a large increase in he rate of pulsation of some persons, in others no increase whatever occurs: and hence he demonstrated a marked di versity in the mode of action of tobacco on different sys ems. A typical experiment cited is that of a person who began smoking a pipe with the pulse at 74.5 beats a min ute. In nineteen minutes the rate rose to 110 , then to 112 Finally, at the end of half an hour after the commencemen of the smoking, it was at 88.9 . For more than two hours i remained above the natural average of frequency and force. In a person of full habit, such acceleration of the heart leads to apoplexy. It is clear that, if in one individual to bacco is able to produce conditions favorable to a disease which may kill at any moment, and in another is practically nert, it is useless to argue either that is generally highly dangerous, or, on the other hand, destitute of dangerous ef fects. As we said in our previous article, the ingredients of tobacco are separately poisonous; the probabilities are that hey are collectively so in every case. But some systems re strong enough to withstand their effects either wholly o in part; and for every individual to discover whether his particular constitution belongs to this last class, involves in
all cases a course of experiment in learning to smoke which all cases a course of experiment in learning to smoke which
is universally admitted to be one of the most unnatural nauseous, and disagreeable experiences of the human exist ence.

Equal parts of tin and copper form a white speculum metal as hard as steel.

THERMOSTATIC APPARATUS FOR CONTROLLING VALVES
We illustrate herewith a novel device designed for auto matically operating and controlling valves in steam or other pipes, which has for its object the retaining at a stated temperature either water or air. A represents a boiler of water, to be heated by the introduction therein of live steam, and an even temperature of the same maintained. $B$ is the steam pipe, through which the steam is conducted. C is the inlet and D the exit pipe, by means of which water is introduced and withdrawn from the boiler or tank. These parts may be of any ordinary form of construction, and therefore cal for no detailed description. E is a hollow stand G is hollow disk made from brass; and extending upwardly from its center is a brass tube H wardy fres tube, H. Th disk and tube are made of as thin sheet metal a is possible, so as to be very sensitive to the va riations in temperature. At the upper end of the tube, H , it is reduced to a less diameter, as show at $I$, so as to confine the action of expansion and contraction of the fluid, with which the disk and tube may be filled, to a small column, thus increasing its sensibility and rapidity of action The upper and reduced end, I, of the tube reache just above the water line, as shown. Into this reduced tube a piston, $a$, is inserted and attached to a connecting rod, $b$, which extends upwardly through the upper frame of the boiler to th through the upper frame of the boiler to the tached. It is provided with a check nut, $d$ which tached. It is provided with a check nut, $d$, whic may be adjusted to control the extent of motion The disk, $G$, and tubes, $H$ and I, are completel filled with an expansible fluid before insertion in
the supporting frame in the boiler. A light spi the supporting frame in the boiler. A light spiral spring, $f$, is attached to the connecting rod
operating the valve, $c$, and operates to forcedown operating the valve, $c$, and operates to forcedown
the plunger, $a$, as the fluid in the tube, I , contracts.
The boiler being filled with cold water, the ex pansible fluid in the disk and tube, $H$, is contrac ted so as to drop the plunger, $a$, to the full ex tent of its downward motion, opening wide the valve, $c$. Live steam then being admitted to pipe, B, it freely passes through the open valve and enters the water in the boiler, heating the same to the degree of temperature desired. This heating of the water conveys its action to the fluid and expands it in the disk and tube, forcing the plunger or piston, $a$, upward, thus closing th and shutting off the supply of steam, or so much of it as may be necessary. As the temperature of the water falls, the fluid in the disk and tube contracts, and the piston drops with it, again opening the valve and admitting a new supply of steam.
The operation of the plunger, $d$, may be so adjusted that it will rise and fall at a certain degree of heat, or close the valve and open the same at specified degrees of heat, which points may be indicated upon an indicator located above the apparatus and connected with the lever operating the valve. and actuated thereby. It is evident that this indicator will, as the valve rises or falls, indicate the changes and present temperature of the water in the boiler.
This apparatus was patented March 7, 1876, by Mr. H. R. Randall, of Brooklyn, N. Y

## $\triangle$ NEW FLOUR BOLT

We illustrate herewith a nove pparatus in which an air blast $r$ moves the fuzz and fine clammy dust from flour while the material is undergoing separation from bran and middlings in a bolt or reel. The short inlet pipes, $b$, connect with long perforated distributing tubes, which admit air below the tubes, which admit air below the bolt, $a$. The air is drawn by the ans through the chamber, $e$, and exhausts at $d . g$ is the spout to the dust room, and at $h$ are slides for regulating the draft.
This device was patented through the Scientific American Patent Agency, September 12, 1876, by Mr. John P. Agler, of Avoca, Iowa

Purifying Calcareous Water A company has recently been ormed in England to furnish pota ble water to the large district situ ted to the northwest of London. Water in that locality, although bundant, is so extremely hard obundan, is filtation hard, ime formation that it is scarcel ime formation, that it is scarcely utilizable. The object of the company is to remove the calcareous
matter, and to this end extensive matter, and to this end extensiv
buildings and reservoirs have been buildings and reservoirs have been
constructed. The water is pumped up from wells directly u


## ALGER'S FLOUR BOLT.

 pended by the thread.American character, and can hardly be regarded as an inter ational competition. Other civilized countries, it is true take part therein, and Great Britain especially, but the ag gregate does not equal one fourth of the articles exhibited from the United States. There is also marked evidence of patriotic spirit in the prodigious efforts made by individual citizens and firms to sustain worthily the mechanical reputa tion of the country. The extent, the money value, the excellence and originality of the objects displayed by them im press a stranger immensely; and however much he may have seen of former international exhibitions on the grand scale, these impressions survive.

The Sonorous Qualities of Metals.
M. Decharme has recently concluded a series of experi ments to determine the sonorous capabilities of different me tals. Cylindrical rods, 7.8 inches in length and 0.39 inch in
diameter, were suspended by threads or rested on cork diameter, were suspended by threads or rested on cork (herks, and is purified in prisms. Each was struck by a piece of wood covered with expense. Meanwhile, on this side of the Atlantic, we com
$0 \cdot 3$, tin a little less than 1 , zinc 1 , cast iron a little less than 2 , copper about 5 , wrought iron 12 , brass 14 , bronze 24 , stee 45. The author notes the fact that a steel rod, when sup ported on the sides of cork prisms, gives a sound which last but 25 seconds, or but little over half the period as when the steel is suspended. Brass, on the contrary, sounds from 20 o 25 seconds when on the corks, instead of 24 , as when

Painless Extinction of Animal Life.
The latest experimental researches which I have con ducted on lower living animals," says Dr. B. W. Richardson, " have had for their object the discovery of a ready, cheap, and innocuous method for killing ithout pain those animals which are destined, as yet, for the food of man. If the labor of the physiologist be allowed to progress, the da will soon arrive when the slaughter of animal for food will become unnecessary, since he will be able to so transmute the vegetable world as to produce the most perfect and delicious food or all the purposes of life without calling upon the lower animal world to perform the interme diate chemical changes. But until this tim rrives, animals will have to be slaughtered and my research has been directed to make process, which at present is barbarous and pain ful, painless in the most perfect degree. Fo this purpose the various modes of rapid de truction of life-by powerful electrical dis charges, by rapid division of the medulla oblon gata, and by the inhalation of various narcoti vapors-have been carried out. The experi ments, which have been exceedingly numerous have led me to the conclusion that the most per ect of the painless methods of killing is by the inhalation of carbonic oxide gas. So rapid and complete is the action of this gas that I may say physiological science has done her part, a ar as it need be done, for making the painles killing of every animal a certain and ready ac complishment an accomplishment also so sim e that the animal going to its fate has merely ple that the animal going to its fate has merel o be passed through the lethal chamber, in rder to be brought, in senseless sleep, into th hands of the slaughterer. The application of teaching and the putting into practice this hu ane process lies now with the world outside Science: bu to insure its acceptance, all the force of selfishness, of pre judice, and of practical apathy for the sufferings of the ani mal creation, has to be overcome. There is a great deal of talk and a great deal of sentiment abroad on the question of the sufferings of the lower animal kingdom; but when an attempt is madeto relieve those sufferings by the invention of methods for operating surgically, without the infliction of pain, or for painless killing, the true and vital sympathy which one would expect in support of such practical and humane efforts until they are made perfect and universal, can scarcely be said to be found at all. With the exception of a few, not a dozen altogether, of really humane ladie and gentlemen, I have found no one, out of the ranks of $\mathbf{S c i}$ ence, in the least interested in the saving of sufferings to which I am now directing attention. The man of science stands and wonders at the strangeness of the psychologica problem before him; and, in spite of himself, is forced to the conclusion that, practically, th noise that is made at him in th name of humanity is, after all sounding brass and tinkling cym bal."-Nature.

The Cost of Big Guns.
The trials of the 81-tun gun which have recently taken place in England are reported as being con veniently satisfactory to the artil lerists; but it may be doubted whe ther those who are footing the bills, the tax payers, will share in the officially expressed gratification. A every discharge of this monster weapon, over 300 lbs . of powder are exploded at a cost of from $\$ 125$ to $\$ 150$. To this must be added the expense of shell and fuses. Then the gun itself, originally estimated to cost $\$ 40,000$, has actually ne cessitated an expenditure of some $\$ 125,000$, besides the construction of a railway at Woolwich, a barge for its transportation, and severa huge cranes. Moreover the firing of the gun at Shoeburyness has had the effect of blowing down or a least seriously shattering the huts and cottages of that military set tlement, so that it will nearly al tlement, so that it will nearly al basin and mixed with water in other receptacles, so as to to yield the rewest, or in ther ratio of 690 to lead was found form a milk. This, by its weight, travels into the main re-- $\quad 2,762$ for aluminum. The intermediate results are: For gold servoirs, which contains $2,000,000$ gallons of water, and is 976 , silver 1,034 , tin 1,161 , brass 1,303 , bronze 1,381 , zinc allowed to act on the water for about five hours. At the end of this time the bicarbonate of lime held in solution is precipitated, and the water is pumped off into a distributing steel, 2,322. As regards duration of sound, the following reprecipitated, and the water is pumped off into a distributing sults were obtained in seconds of time and fractions. le
placently view these rather costly proceedings, profit by the results of the experiments, and congratulate ourselves tha we are not paying for them.

The secret of making the hammered bronze Chinese gongs and Turkish cymbals consists in forging the bronze into shape while hot.

COMPENSATING STEAM GENERATING APPARATUS. Mr. John Cowan, in the apparatus illustrated herewith, has devised a certainly novel and ingenious and, according to the practical results which he reports to us, an important method of economizing in the use of steam. It opens the possibility of getting steam for nothing, and even making a small profit-a condition of affairs somewhat difficult to realize. Mr. Cowan's plan is a genuine one, however, and because it is so it is unlikely to carry conviction speedily in at least one good instance.
The gist of the
system may be system may be
explained in few explained in few words. In burning limestone in the kiln to make lime, an enormous amount of heat is wasted. Still the amount for which the lime will sell pays a profit despite the waste. Now there is no reason why this lost heat should not be utilized, Mr. Cowan lized, Mr. Cowan argues, and he further believes in burning adds to in burning adds to the heat; whereupon he builds his steam boiler over and about a furnace suitable for the calcining of lime, and makes steam,which costs nothing, with the waste heat which costs nothing. costs nothing. we explained the hot water hot water appara-
tus which had tus which had been constructed
on this principle on this principle
for heating green for heating green houses and build-
ings. At the preings. At the pre-
sent time the inventor goes a step further, and has contrived an application to steam boilers to supply motors with steam, and thus

ried on even more economically than isindicated by the foregoing figures. In addition to its application to steam boilers and to greenhouse heating, the invention has likewise been adapted for gas manufacture, and is said to be very successfully employed for this purpose. In fine, the uses to which the apparatus may be put embody all those where economy of working is the great desideratum, such as for pumping, driving stonecrushing machinery, mortar mills, etc., and for contractors' use, in the construction of railways, docks, and other works where large quantities of lime are required for building tunnels, bridges, retaining walls, etc. also for draining mines and quarries, irrigation and sewag
repaired without disturbing the connection between said head and the bottle.
The novel feature is an extension collar, $H$, upon which is ormed a screw thread to screw upon the neck of the bottle, and another a screw thread to screw into the inner surface of the base, A, of the head. Upon the collar, H , is formed groove to receive a packing ring, which is pressed agains a shoulder of the base, A, to prevent any leakage. Around the opening through the collar is formed a recess to receive he upper end of the glass pipe, and a shoulder to receiv the packing that prevents leakage through the joint between the collar and bottle. With this construction the head can be unscrewed from the collar, H , and detached, and the valve repacked or repaired withou disturbing the con nection between th e collar, H , and the bottle, and without disturbing the position of the glass pipe.

## The Carpet Eat <br> ing Bug.

For some time past the house keepers in Schen ectady and in Uti ca, N. Y., have suffered from the ravages of a pecu
liar bug, which liar bug, which
though wholly un like the carpe moth, is neverthe less fully as persis tent a destroyer of carpets. It infests the edges wher the edges where the abric is nailed to the floor, and eats large holes Occasionally enter ing a crevice be tween the floor planks, it follows the crack, eating as it goes, cutting th carpet as cleanly as if shears had been used to divide it The depredations of the insect hav lately increased and the pest seem to be spreading to cities adjacent to cities adjacent to those
he proposes a me
tically no cost.
The new apparatus is illustrated in our engraving. A is the furnace, $B$ the boiler, and $C$ a feed water heater. At $D$ is the firebrick lining, and at $E$ and $F$ the air space or sand backing and masonry. $H$ is the drawhole for removing the lime, and $K$ is the flue boiler. The use of the remainder of the apparatus is evident in the engraving. Layers of limestone and coal (anthracite is the best) are placed in the furnace, and the whole fired. The lime remains in lumps, while the coal goes to impalpable ashes and practically disappears. During the night, when fires should be banked (a process of course out of the question while the lime is being burned), the escape of steam is provided for, and an automatic apparatus preserves a constant water level in the boiler. The evaporation is thus kept going on a half rate, or thereabouts, during the night; and in closing the escape valve and opening connection with the engines, work can be begun in a few minutes. The labor required is said to be no greater than in firing with an ordinary boiler, and the furnace or kiln can be made any size. In fact, with the exception of the extra depth and the necessity of an aperture for removing the lime, the furnace is not materially different from that of any steam generator.
The inventor submits testimonials showing that in En gland a six horse engine was used, for driving a mortar mill and other machinery, at a cost for fuel of only from $\$ 1.25$ to $\$ 3.75$ per week. He also states that a 15 horse power engine, running under a minimum pressure of 45 lbs., has been operated at an average weekly cost for fuel of $\$ 4.52$. It is in heating greenhouses that cases have occurred where the system has yielded a clear profit over all expenses. At the gardens of Stackpole Court, the property of the Earl of Cawdor, in England, the cost of heating the greenhouses was $\$ 487$ yearly, with nothing on the credit side but dust and ashes. When the limekiln was used the cost was $\$ 425.16$, and as the produce of lime sold for $\$ 477.25$, it will be seen that the new apparatus thus cleared its cost and left a balance of over $\$ 50$, which, added to the cost under the old system, left a profit of some $\$ 540$.
In this country, where limestone and other carbonates of lime are abundant, and can almost always be obtained for the mere cost of quarrying and hauling; and where anthracite coal abounds, it is believed that the process can be car-
works, for use in chemical works and breweries, and where evaporation is carried out on a large scale.
Mr. Cowan, the inventor, is now in this country, and may be addressed at the Astor House, New York city. He is de sirous of disposing of all his American patents relating to the device. Through the kindness of Matthew Baird, Esq., of Derby Road, Philadelphia, Pa., an apparatus of this kind can be seen in successful use.

## IMPROVED SIPHON HEAD FOR BOTTLES. ETC

Mr. Joseph W. Stillwell, of Peekskill, N. Y., has paten

ted, through the Scieutific American Patent Agency, Sep vember 26, 1876, an improved siphon head for mineral water
bottles, etc., illustrated herewith, the object of which is to enable the valve of the head to be removed and repacked or

In appearance the insect is ovate, about $\frac{1}{8}$ inch in length and is thickly clothed with numerous short bristles like hairs, terminating in a bunch forming a tail. It is exceed ingly active in its movements. Professor Lintner, of Schenectady, who recently examined the bug, pronounced it the larval stage of a beetle, and in all probability a member of the very destructive family of dermestida, and belonging to the genus anthremus. Quitelately he succeeded in obtaining the first example of a perfect insect, a very minute beetle, approximately $\frac{1}{10}$ inch in length, but beautifully marked in red, white, and brown. This was submitted to Dr. Leconte of Philadelphia, and that distinguished authority confirmed Professor Lintner, and determined the bug to be the anthre mus scrophularice, a very common destructive insect in Europe, but never hitherto detected in the United States. It is allied to the $a$. varius or museum pest, which destroy stuffed animals and similar objects in museums. No preventive measures against the insect have yet been found

The Centennial Main Building To Remain.
The Fairmount Park Commission has yielded to the popular demand, and the Main Exhibition Building is to remain to be used as a grand bazar and industrial fair: with the to be used as a grand bazar and ind is to be removed after proviso, however, that the structure is to be removed after
two years' notice shall have been given. The charge for adtwo years' notice shall have been given. The charge for ad
mission is restricted to 25 cents for five days of the week, mission is restricted to 25 cents for five days of the week,
and 10 cents on Saturday; and when the income it yields is sufficient to pay expenses and interest on the investment, th admission fee is to be still further reduced, so that the public may enjoy the exhibition at the lowest possible charge for entrance.
The British Government has recently presented Philadel phia with the handsome buildings now occupied by the British Commission. What with the Main Building, Me morial Hall, Horticultural Hall, and probably Machinery Hall, together with the British edifices, the statues, etc., it appears that a considerable portion of the Centennial struc tures will be left, affording all the facilities for a very large permanent display.
The Exposition will close on November 10; but visitors will continue to be admitted as usual after that date, in
order to provide necessary funds to defray expenses of order to provide necess
police maintenance, etc.

## Centinued from frst page.

for some 20 hours, and finally the bubbles disappear, and the now fluid mass becomes homogeneous and clear. Then the furnaces are allowed to cool until the contents of the pots become pasty and viscid, the proper working state; and the heat is subsequently maintained at a degree sufficient to keep the glass in this condition.
At the Exposition, the glass is mostly pressed at once into the required form. Some blown glass is made, but the sketches shown on our initial page relate mainly to the former operation. The mold, which is represented taken apart, so as to show its construction, is one of those designed for pressing goblets. It consists first of two hinged iron pieces, in each of which are hollows, corresponding in shape to the portion of a goblet below the bowl. The ring portion shown, above the mold proper, holds the glass which forms the bowl of the goblet,and the still smaller ring above fits in the one just mentioned and limits the hight of the bowl in the mold. Lastly, the conical plunger enters the bowl portion, and between it and the mold the glass is pressed into proper cup shape.
The mold is placed on the greased metal table of the press, as represented in the sketch, and the plunger is attached to a screw rod which passes through a crosshead which slides on vertical guides. The cross head is eccentrically connected to disks on the side of the machine by pitmans, and to one of these disks is secured the long lever manipulated by the workman. The apparatus being ready, a "gatherer" the workman. The apparatus being ready, a gatherer
takes a long iron rod called a punty, to the end of which a takes a long iron rod called a punty, to the end of which a
little ball of viscous glass is attached. This he dips into little ball of viscous glass is attached. the pot of molten glass, and twirls it around until a moderate
sized nodule is gathered on the end. Carrying his rod over sized nodule is gathered on the end. Carrying his rod over
to the press, he ho!ds it so that the glass slowly drops into to the press, he ho!ds it so that the glass slowly drops into
the mold, until the workman deems that a requisite quantity the mold, until the workman deems that a requisite quantity
has entered, when a pair of shears is used to clip off the mahas entered, when a pair of shears is used to clip off the ma-
terial. If too much glass remoins on his punty, the gatherer rolls it along the edge of the iron slab beside the pot of water shown, when the excess of glass falls hissing into the water, and the remainder is rolled into a neat ball. The pressman now pushes his filled mold under the plunger, seizes his lever, and forces the plunger down with such force that the hot glass is driven into every crevice of the mold. A moment of waiting follows, the plunger is thrown up by the action of heavy spiral springs, the mold is drawn back and opened, and there stands the goblet, rapidly changing from cherry red to its natural transparency. An attendant now has ready a punty with a bit of hot glass at the end, which he deftly attaches to the bottom of the article, to serve as a long stem. The goblet is thus carried to the glory hole, a smaller furnace, and here it is reheated. This gives it its subsequent polish. While hot and blackened, it is removed and passed to a workman who sits on a bench on each side of which are long inclined iron-covered arms. Taking the stem or punty in his left hand and resting the object on one arm of his chair, the workman rapidly rolls it forward and back, holding meanwhile inside the bowl a flat piece of charred stick termed the "battledore." This smooths the glass and renders it perfectly circular in shape. Next the punty is removed. and another stem is attached to the bowl portion, as shown in the sketch. The glass is again rotated as before, and the workman now holds against the bottom the flat upper portion of his tongs or "pucellas." This tool is represented separately in the engravings, The effect of this is to smooth the bottom and render it perfectly flat.
When these operations are concluded, a boy seizes the glass in a fork, and carries it to the annealing oven and stands it on the floor. Here the annealing is continued over several hours at a low heat; and as it concludes, the floor of the oven is carried rearward, so that the glass passes into cooler compartments and finally is withdrawn at the rear. Grinding the bottom smooth on a grindstone follows, and any engraving or like ornamentation is done. Nothing then remains except to polish the glass, when it is ready for the market.

When glass is blown, of course no pressing operation comes into use. The blower first gathers the requisite amount of glass on the end of a long tube and rolls it on a smooth polished cast iron slab called a "marver" until it assumes a cylindrical form. Then he blows into the tube, expanding the glass as much as he thinks necessary, and also swinging the tube when he desires to elongate the object; then by means of tongs, scissors, and battledore, he molds it into the desired form. After the shape is once produced, the sub
quent operations are similar to those already described. quent operations are similar to those already described.

## the meeting of the national academy of SCIENCES.

We give below our usual brief abstracts of the principal papers read before the above-named body at its recent meeting in Philadelphia.
General H. L. Abbott gave a synopsis of the results obtained by his observations of the
vibrations from hell gate.
The instrument employed at the various stations, for notng the vibrations, was a seismograph, which principally conists of a basin of mercury, giving what is called an horizon of that metal. The agitation of its surface when the vibrations reach it is observed by telescopes with delicate means of measurement. So easily is it disturbed that the footfall of a horse 300 feet away is at once indicated A number of experiments led to calculation that the explosion on Hallett's Reef, where 8,680 charges were fired simultaneously, ought to be indicated at 59 miles; but General Abbott was very anrious to obtain something more than negative or
doubtful results, and hence selected distances not much doubtful results, and hence selected distances not much
over 9 and 12 miles. An observation was attempted at $W$ est Point, 52 miles away, and no results were obtained. The stations used by General Abbott are all on Long Island; their distances from the reef were very accurately ascer tained, and are given in round numbers in the table below

| stations. | Sistance, | ${ }_{\text {in }}^{\text {Areconals }}$ Arival |  |
| :---: | :---: | :---: | :---: |
| Fresh Pond Junctiou. |  | 63.0 | 3,873 |
| Jamaica. |  | $23 \cdot 5$ | 4,521 |
| Willett's Point. |  | 72.3 | 8,300 |
| Springfield Junction | 12 告 | 19.0 | 5,30 | Springfield Junction.

## 19.0

 i, 309The sound, as distinguished from the rumbling of the earth, is described as a dull roar such as comes from a torpe do explosion at a distance. At Springfield Junction, the
noise is spoken of as a low, rumbling sound, gradually innoise is spoken of as a low, rumbling sound,
creasing to a maximum and then dying away.
creasing to a maximum and then dying away.
(deneral Abbott said that he had never seen
explosion. Within half a second of the setual quick an explosion. Within half a second of the actual time of firing, the water of the East River thrown up had reached half
its hight. During the discussion, Profess.r O. N. Rood reits hight. During the discussion, Professor O. N. Rood referred to Professor Mayer's experiments at South Orange, N. J., which gave for the vibrations from this explosion a speed of about 3,000 feet per second. Professor Henry mentioned the curious coincidence that the boiler of the Lighthouse Board's steamer sprung a leak at the time of the Hallett's Point explosion; steam had been blown off just previously. It was also mentioned in connection with the heories of vibration that nitroglycerin will tear gun cotton to pieces if exploded upon it ; but the cotton does not explode. But if the converse experiment be tried, the explo sion of gun cotton sets off the nitroglycerin. Gun cotton will not explode gunpowder.
Professor Loomis discussed

## AST SUMMER'S HOT WEATHER,

and stated that during the whole "heated term," a low ba rometer was associated with high temperature. On a very hot day, especially selected for observation, the excess of heat was about $20^{\circ}$. Of this about $10^{\circ}$ may be fairly attributed to southerly winds bringing hot air from the more heated regions to the south of us. For the other $10^{\circ}$, Professor Loomis proposed to account by the prevalence of extraordinary dryness at the northwest-a region usually dry indeed in summer, but in this instance subjected to unusual drouth, while southerly winds, sweeping over it, kept back the north wind by which it is ordinarily visited at intervals. Here a stratum of beated air was continually formed, which supplied to the general weather of the country $10^{\circ}$ of the extra $20^{\circ}$.

## 'THE SUN'S TEMPERATURE.

The actual heat of the sun's surface is one of the unsetled questions of Science, and estimates have varied between $10,000,000^{\circ}$, and $2,700^{\circ}$ Fah. Professor S. P. Langley read a paper detailing how he compared the sunlight with that from the molten steel poured out of the Bessemer converter, and thus approximately estimated the solar temperature. A heliostat arrangement was employed to transmit a sunbeam into the foundry of the Edgar Thomson Steel Works, and a Ritchie photometer was used to measure the respective intensities of the lights. The first conclusion reached was that the sun's light, which turns the light from the molten steel into a black spot, must be at least 50 times the greater. Then the spectroscope was employed and the two rays compared. The steel rays were again blotted out. Hence the sun rays must have been at least 64 times bright r. Next, Professor Langley made comparisons of the sun's ays with those from the flames above the converter, when the latter were at their brightest. This was a less difficult proceeding and furnished more specific results. The photometric comparison could be made directly. It is admitted, however, that the flame light may not be quite as bright as that of the molten steel. The arrangement was somewhat like that of a camera obscura. It gave the image of the sun so accurately that sun spots could be easily examined; it also gave an exact representation of the furnace flame. Each was alternately superposed on the other. The conclusion is that the sunlight is at least 2,168 times brighter than the furnace flame. As the heat is presumably of the same relative order, the result is adverse to the law of Dulong and Petit. The actual heat of the sun is probably among the higher values that have been suggested.
Professor Henry's important paper on ocean echoes we re serve for fuller review

## Ciatrespoudence.

$\begin{array}{r}\text { Centennial A wards. } \\ \hline \text { To the Edetor of the Scientific American: }\end{array}$
In your issue of October 28, on page 273, are some edito rial comments, to which a few additions may usefully be made.
If there are a large number of awards, it must be remembered there are a large number of exhibits; and there may be a few judges or groups of judges that did not fully com prehend their duties, the consequence being that mistakes
may have been occasionally made. I know, indeed, that some judges have not recognized the difference between a report and an award, and that awards have been made which are mere copies of the reports by secretaries of groups, who did not quite understand the difference; and the General Board of Judges could not go well behind these awards without the greater chance of injustice to the exhibitors. I fancy juror in a group that has had almost continuous exercise since the beginning; and considering the novelty of the
plan, I am surprised to see how few are the exceptions to its working well.
Your statement of the plan is not quite correct. You say "The judges simply write reports on exhibits which they deem commendable, and the Centennial Commission there upon decides which out of the exhibits so reported on are en titled to the medal and diploma." I will not say what some groups of judges may have understood to be their duties but our group not only reported on those they deemed commendable, but on every person's exhibit. The failure to send in descriptions, to which you refer, made no difference ; these requests for descriptions were only to ascertain judge use exhibitor claimed. If no description came, the did not select, from our rert, the awards. We selected them ourselves from our own reports. These have to be confirmed by the Commission. The actual merit of every man's exhibit is the matter of the report ; the special merit, the matter of the award. To show you that awards are by no matter of the award. To show you that awards are by
no means scattered as you suppose, I will say that in one particular line of articles, I examined five hundred in one particular line of articles, I examined five hundred
and twenty-six different exhibits, and have notes of each and twenty-six different exhibits, and have notes of each
exhibit on my judge's memorandum book; only forty wards were made
It is quite possible that some of the judges have not understood their duties under the system, or the system itself; but this should not militate against the whole system, which, from the extended experience I have had of it now, I believe to be the best ever devised, and far superior to the old plan of specified premiuns for specified articles, of which, too, in imes past, I have had an ample experience.
Philadelphia, Pa.
One of the Judges.

## CUTTING A LEFT HAND SCREW WITH A RIGHT HAND

 TAP.J. W. S. sends us an interesting letter upon a method of cutting a left hand screw with a right hand tap, which we
herewith illustrate. Fig. 1 represents a piece of iron with

Fig. 1.
Fig. 2.

the hole (of the size of the bolt to be threaded) drilled in it. A V slot is then cut in it, and a tap ground to an angle with the thread left on the narrow end, which projects into the hole. If, then, the bolt be placed in the hole and the tap in the V slot, and we screw the whole into a vise, with the jaws gripping the back of the tap and the opposite side of the piece of iron, the pressure of the vise will hold the tap and force it to its cut, which is taken by screwing the bolt through the hole in the piece of iron.
The reason why this can be done is as follows: Suppose that Fig 2 represents a piece of iron with a thread cut upon it, and that at one end it is filed down to half its diameter as shown: it is evident that the side of the thread furthest from the observer stands at an angle slanting from the left to the right, during half its circumference, as denoted by the ine, $A$, shown; so that, if we commence at the bottom and follow the thread for one half a revolution, we shall ad vance in the direction of $A$; whereas, if we perform a simi ar operation, beginning at the bottom on the other side of the thread, we shall, in moving half a revolution, travel in the opposite direction, B: showing that, notwithstanding that the thread advances in one direction, its threads slant in an opposite direction on one half of the circumference as compared to the other.
J. W. S. uses one side of the thread to cut the other with and thus reverses the angle; and if he will turn to page 21 , volume XXXI, Scientific American, he will find the same principle explained for cutting up inside chasers, in which operation a chaser, to cut a right-handed thread, must, to have the teeth start in the right direction, be cut off a lefthanded hub. J. W. S. has, however, given us a new appli cation of the principle.
J. R.

New York city.

## Watering House Plants.

If the causes of failure where plants are cultivated in windows were minutely investigated, the system of water ering would be found to be the principal cause. A plant ought not to be watered until it is in a fit condition to receive a liberal supply of that element, a good drainage being pre viously secured, in order that all superabundant water may be quickly carried off. Those who are constantly dribbling a moderately small quantity of water upon their plants will not have them in a flourishing condition for any length of time. This must be obvious to all, for it is quite evident that the moderately small quantity of water frequently given keeps the surface of the soil moist; while at the same time from the effects of the good drainage, which is essential to the well being of all plants in an artificial state, all the lowe roots would perish for water, and the plant would become sickly and eventually die. In many instances when the contents of flower pots are sprinkled daily with water, the soil in the middle will become hard and dry. When the ball of earth becomes dry, it takes water a long time to penetrate it, and surface waterings do not accomplish the object. In this case set the pot in a pail of water, and let it soak until the earth is thoroughly wetted through. If pro-
per care in the respect above mentioned fails to induce a plates the holes are made taper, as shown at A, in Fig. 101; $^{2}$ proper growth, then the plant must be re-potted with fresh earth, and have a portion of its top cut back. Irregularities in shape must be corrected from time to time by pinching off the shoots which may start to grow out of place.
The red spider is quite averse to moisture ; the green fly, however, likes it, but may be destroyed so readily by tobacco smoke that only neglected plants will suffer from this cause. The mealy bug is so large that it may be easily picked off.
Watering must be properly attended to; and while the plant must not suffer from lack of moisture, the roots must not be kept saturated with water. The sound of the pot when struck by the knuckles is quite different from what it is when dry. This, and the lagging look of the plant, will indicate that water is needed. A little practice will soon enable one to anticipate the wants of the plant and to supply water at the proper time. Plants growing in a cool atmosphere will be found to flourish much better by giving them water which is almost hot. House plants that have bloomed freely during the winter should be denied their usual supply of water, and be placed in the open air for a few hours during the middle of bright days, if this course is practicable.

## PRACTICAL MECHANISM.

by Joshea rose.
Skcond Series-Number XiV pattern making.
The construction shown in Figs. 92, 93, and 94 is so nearly the same, and the slight difference is so obvious, that an explanation of Fig. 94 will cover the ground. For Fig. 94 we plane up a piece over twice as long and more than half the size of the required Hlange, and out of this piece cut the two half flanges. If, however, the flange is of sufficient size to make it necessary to study economy, the two half flanges may be set out on the plank, lapping each other, as shown in Fig. 99. We next, with a flat scriber, draw a line on the chuck exactly through its center, and set the half flanges to this line, and then screw them to the chuck and turn them as if they were solid. By setting the halves ex actly true to the line, it is insured that the flange shall part exactly at the center.
To make the pattern shown in Fig. 93, we take two pieces

of wood long enough to make the two halves, and allow about half an inch or an inch to turn off each end, so that the impressions of the fork and center may not appear on and disfigure the finished work, and for other reasons here after to be mentioned. We plane these pieces on one edge and on one face, making them of equal thickness. We make the flat surfaces, which come together, true, trying them with the winding strips shown in Fig. 37, to detect any twist. Our next operation is to insert the pegs, and we may, for this purpose, adopt either of the two following methods, the more ready of which we will take first: Clamping the two jointed faces together, as shown in Fig. 100, we bore

two holes right through the top piece and into the bottom, one to a little greater depth than the hight to which the pin is intended to project, as shown by the dotted lines. We then plane up a piece of hard wood, about two and a half feet long, to fit the holes tightly. It is just as easy to plane a long piece as a short one, and what is left over will serve for a future occasion. A useful tool for preparing pin stuff is illustrated in Fig. 101, which represents a hardened plate

Fía. 101.

of steel, pierced with holes of the sizes of the pins usually required. The wood for the pins, having been planed up to the required size, is driven with a mallet through the plate, saving a great deal of time, and making the pins more near ly round than is possible by hand work. In some of these this, however, is detrimental, and the parallel hole is the best, because it guides and supports the stick while it does not impede the cutting action of the tool. A hollow formed around the edge of the hole, as shown in the sectional view, at B B, would improve that action; or it might be still further improved by inserting bushes in the plate, with a portion left projecting above the plate and beveled off to resemble a chisel, as shown at C.
The pin stuff being prepared and inserted into one half of the pattern, the projecting end is then tapered off as shown in Fig. 102. The formation of this projecting pin may seem

a very simple matter; but if sufficient consideration is no given to it, a great deal of annoyance is caused to the molder, and the castings will be imperfect. If we reflect for what purpose these pins are inserted, we shall find the proper shape. First, with regard to the projecting length, some making it project to a distance equal to its diameter ; but it is obvious that a short peg or pin will govern the position as well as a long one, and will be less liable to stick in the loose half of the pattern: hence it is better to let the protruding end stand out from three sixteenths to one half inch, and let from one sixteenth to one eighth inch of the large part fit the hole, the nut being tapered off so as to be sure that the pin can be released easily. These conditions inevi tably bring us to the parabolic form shown in Fig. 102. Another point to be observed is to make the pin of as large a diameter as is consistent with the work; for the larger the pin, the longer it will remain free from shake. Above all, it is essential that the pin be perfectly round at the part that fits the hole; and if these elements are neglected, castings will be produced of which the halves will not match, which is always very unsightly. Nothing is gained by making the pins to a tight fit in the loose half of the pattern, as they will not work that way; and the molder will enlarge the holes with a red hot rod, and then, after a little while, the charred pa
too slack.
After inserting our pins, the two halves of our patterns After inserting our pins, the two halves of our patterns
are to be fastened firmly together; and this may be readily done by brushing the end faces with hot glue for a breadth of one half or one inch, according to the amount we have allowed our pieces to be larger than the finished work. Then we hold them firmly together with a screw clamp, leaving them until they are perfectly dry. If there is not time for the gluing, the two halves may be screwed together; and indeed, if the job be a heavy one, it will not be safe to trust entirely to glue, but to use screws or dogs. Dogs are a kind of square staple, made of steel, and of the form shown in Fig. 103; and two of them driven in each end of a pattern will hold its loose halves very firmly together. While very
Fig.103.
 handy, howeere, on large or small work, they are cumbrous; and the gluing or screwing is preferable. Th work can now be mounted in the lathe, and turned as though it were solid. Care must be taken that the cen ter points are exactly in the joint, and it was to ascertain if this was the case that our two halves were planed of equal thickness; for if, in the process of turning, one flat is

at A B, it is proof that the centers are not in the joint; and unless the error is corrected, one half of the finished pat tern would be thicker than the other. To remedy the error, we tap the pattern lightly with a hammer in the required direction, and then screw up the lathe centers a little more, continuing the process until the flat sides upon the pattern, when very nearly trued up, as shown in Fig. 104, at C C, are equal, and finally disappear.
Our pattern being then turned and sandpapered, as already directed, the next proceeding is to stop up all holes or cracks that are not desired to appear, with either beeswax or putty. This is a simple process, but it may have been no than others, at least when beeswax is the stopping material. One who is expert at this work guesses just the pro per amount necessary for each hole or crack; then he forms the wax into a worm-like shape, and with a warm chisel (that is not hot enough to make the wax run but only to
cut it easily) he presses the wax into the hole, and seldom leaves any surplus to remove. The same knack is necessa-
ry in filleting, that is, in filling in an internal square sharp corner, when it is thought too small to be filled in with wood; for if the worm or string of wax of the right size be laid along the corner, the pressure of a warmed gouge wil cause it to expand to the required fillet; while if too much wax is inserted, much time will be occupied in trimming off the surplus.
The third and last of the finishing processes is the application of two or more coats of spirit varnish, which adds to the appearance of the pattern, and increases its durability by giving it a surface impervious to water, and by producing that smoothness so necessary for its easy extraction from the sand. A varnished pattern escapes much of the rough usage commonly bestowed upon patterns, because the mol der does not rap it so much as he otherwise would do. Seder does not rap it so much as he otherwise would do. Se-
veral thin coats of varnish give a much finer appearance than fewer and thicker ones. The first coat fills up the pores of the wood, and frees the fibrous projections left by the sand paper; and after the first coat is dry, fine sand paper is again applied to remove the fibers so fixed. The second and ucceeding coats give the gloss.
The pattern maker invariably mixes his own varnish which he does in the following manner: The varnish pot should be of stone, and not of iron, which would discolor the varnish. The cover should be of thick leather, having hrough the middle a hole of such size that the brush han dle, forced through it, will be suspended, and will not pass through to the bottom of the pot. The object of making the cover of leather is that the varnish collects around the lid and sticks the cover down, requiring sometimes so much lid and sticks the cover down, requiring sometimes so much force to remove it that wood would be liable to split. In
the pot is placed so much shellac, and there is added just the pot is placed so much shellac, and there is added just
sufficient alcohol to cover the shellac, the whole being oc sufficient alcohol to cover the shellac, the whole being oc-
casionally stirred with a piece of stick, and not with the casionally stirred with a piece of stick, and not with the brush. The consistence should be that of raw linseed oil; and to hasten the mixing, a little warmth may be applied. The color of the varnish used is, strictly speaking, optional; the usual plan, however, is to use clear varnish for the pattern, and black for core prints and the insides of core boxes, which thus distinguishes them. The black is made by adding the best dry ivory black to the clear varnish. A very durable varnish may be made by adding powdered oxide of iron to the clear varnish, which gives a hard varnish with a reddish brown color. In mixing colored varnishes, however, we must remember that, the lighter the pigment, the easier the work. Ivory black is the lightest pigment, and so always pervades the varnish, and does not readily settle to the bot om; hence it does not often require stirring. Oxide of iron equires frequent stirring, even in the course of varnishing one pattern, if it be a large one; because it settles so rapid $y$ that a perceptible difference in the coat is apparent un ess the varnish is stirred previously to each insertion of the brush. The brush should never go to the bottom of the pot and the pot should always be kept covered when not in ac ual use. Varnishing lathe work cannot be done while run ning the lathe; but after the work is varnisbed, running the latter hastens the drying. Work should always, if possible be varnished on a dry day; for if the air is damp, the var ish becomes what is technically termed chilled, that is, it assumes a soapy or milky appearance, as though it had aborbed water, and hence is spotty when dry.
Having thus finished our example, we may now explain he process of putting pins in patterns, which we omitted to do, when speaking upon that subject, to avoid digression There are many cases in which it is not suitable for the pin hole to show on the outside of the pattern; and again, in large work, the holes would require to be bored so deep and the pins made so long that it would be too elaborate an affair al ogether. In such circumstances, lines are resorted to, be ing drawn in the following manner: Place the pieces side by side, with the planed edges touching and the ends fair as shown in Fig. 105, the line, G, representing the edges; and make two fine notches at A B. Then separate the pieces

nd square the very fine lines, C C, D D, across with aknife Then set a gage to half the width of the pieces, and mark he intersecting lines, E F; and the centers for the respec ive pin holes will be the intersection of the lines, C E and D F. If, however, we have no planed edge to work from, and the job is of such size as to involve so much labor as not to admit of planing, we may take two small brads or finishing nails (or as many as we desire to have pins', and drive them almost entirely into one piece of the wood in the spots where the pins are ultimately to be, and then file the projecting part of each to a point. By then resting the other half in its proper relative position upon the filed points, and, when adjusted, applying a little pressure to it, the nail points will enter the top piece and mark the correspoading centers for the holes to roceive the pins. We may tl en extract the brads or nails, and proceed to bore the holes and insert the pins.

## IMPROVED RIBBED BALE TIE

We illustrate herewith a new and very simple tie for cot ton and hay bales, etc., which is quickly adjustable, and is ton and hay bales, etc., which is quickly adjustable, and is claimed to allow of no expansion of the bale after it is se-
cured. This is an important consideration, as the bales alcured. This is an important consideration, as the bales always expand several inches in thickness after leaving the
press, and, through their bulk, cost more for freight and stopress, and, through their bulk, cost more for freight and sto-
rage than would be the case did the bands hold them in the rage than would be the case did the bands hold them in the
shape given by the pressing. In Fig. 1 the tie is shown applied, and in Fig. 2 it is represented on a large scale. The novel feature consists in making slightly raised ribs on the band, at something less than an inch apart. The buckle is a mere frame with a cross bar, A. The band is applied ribs inward, and the end is inserted through the buckle, as shown in Fig. 2, and under the part to which the buckle is attached. The crossbar, A, and front part of the buckle are suitably beveled to enable the end the buckle are suitably beveled to enable the end
to be easily inserted and fastened without bendto be easily inserted and fastened without bend
ing the band. The ribs, being formed along the ing the band. The ribs, being formed along the entire length of the band, enable it to be ad
justed to any size of bale. The employment of justed to any size of bale. The employment of
the device in no way damages it, so that it may be repeatedly used.
This bale tie is in use by many of the larges cotton-packing firms in the South, among whom are Hadden \& Avery, Memphis, Tenn., Dunn, Ogletree \& Co., Atlanta, Ga., and Woodruff \& North, Selma, Ala.
Patented July 11 and 25, 1876. For further particulars address the manufacturers, Messrs. P. Hayden \& Son, Columbus, Ohio.

Ozone Produced by Waves and Fountains. The mechanical action of pure air over vegetation is productive of ozone, but still more mani festly is this subtle quality produced by the dashing of waves and spray against the air. These lashings of air and sea mixed are, electrically speaking, in the nature of one substance rubbing on another. They evoke ozone, which, being in haled in breathing, gives a stimulus to the constitution. Hence the benefit to health from a sea voyage, or a residence at a pleasant seaside re sort. Mr. Binney stated. at a recent meeting of the Manchester (England) Literary and Philoso phical Society, that the atmosphere of to wns may be sensibly ozonized, and of course improved in quality, by the action of public fountains. He says: "A quality, by the action of public fountains. He says: "A he friction of the water issuing through the jets developing electric action, materially assisted by the conversion of the spray into aqueous vapor. I would suggest that this fact should be prominently brought before municipal bodies, to induce them to erectfountains in all available places in large cities, as sanitary agents. They might prove highly benefi cial in crowded localities.

## THE CAMACHO ELECTRO-MAGNETIC ENGINE

The following description, with the diagrams annexed, from the English Mechanic, will enable the reader to obtain tolerably correct idea of the new electro-magnetic engine patented by M. José S. Camache, of Paris, and which has attracted considerable attention from students of electriciy and motive power. Theinvention conty and motive power. Theinvention consists mainly in the employment of an improved armature and the arrangement of the commutator, by means of which
the speed and power of the engine can the speed and power of the engine can
be varied; but $M$. Camacho claims the be varied; but M. Camacho claims the
use of tubular magnets for the purpose, as well as his improved armatures and commutators.
The new engine may be constructed according to two modification , the elec-tro-magnets being stationary, and the armatures movable, or vice versá. In both cases the principle of the apparatus remains the same, the details only of the engine being varied. The armatures are formed of metallic plates insulated magnetically from one another, in order to netically from one another, in order to cause the engine to generate a greater
amount of force. The magnetic inertia amount of force. The magnetic inertia
of a temporary magnetic is so much of a temporary magnetic is so much
greater in proportion as the volume or greater in proportion as the volume or
mass is increased; consequently a commass is increased; consequently a attain its maximum of magnetization if the mass is considerable. Moreover, in the case in question, and when the armature is placed in proximity to the magnet, it has a tendency to become magnetized throughout its whole extent. It should further be observed that the near est part of the magnet (which is alone effective) cannot attain its maximum amount of magnetization except at the same time as the whole of the armature-that is to say, when the latter has arrived opposite the magnet. Now it is precisely at this instant that, in rotatory electro-magnetic engines, the passage of the current, which produces the attraction, would cease; whence it results that the armature has finished its course or travel without attaining its maximum of magnetization; and consequently a great diminution of the force, which would otherwise be produced by the en-
electro-magnetic engine, in which the electro-magnets are fixed or stationary, and the armatures are movable; Fig. 2 is an elevation of one of the electro-magnets, and Fig. 3 a an elevation of one of the electro-magnets, and Fig. 3 a
horizontal section of one limb of a magnet, a longitudinal horizontal section of one limb of a magnet, a longitudinal
section being shown in Fig. 1; Figs. 4 and 5 show the imsection being shown
proved commutator.

The electro-magnets, A (shown detached in Fig. 2) are four in number, and fixed at equal distances apart from one an other between two disks, B, serving as a frame and support to the whole of the apparatus. (One disk only is shown in the figure.) The movable part of the engine is composed of a shaft or axis, C, upon which are fastened recessed or hollow disks, D, to which the armatures, E, are attached. These armatures in the present example are three in number, and they are formed, as before mentioned, of a series of plates or blades of metal insulated electrically rom one another and arranged in parallel or ra diating positions,as shown in the engraving. The shaft, C, also carries the commutator (F, Figs. 4 and 5), in contact with which roll fcur rollers, each of which is in communication with one of the electro-magnets, A. The current enters the apparatus by a binding screw attached to the frame or disk, B, passes thence into the shaft, C, and into the commutator, $F$, whence it reaches the rollers, which direct it successivelv to each of the electro-magnets, $A$, by the intervention of binding screws insulated from the frame, and fixed on a disk of wood or other insulating ma terial. The current issuing from the electro-mag nets passes to binding screws attached to a me tallic ring, which unites them all, and which is insulated from the frame by a disk of wood or other suitable material; the current then passes ff by a binding screw, to return to the passes The positions of the binding screws on the mehe posic allic ring are shown in dotted lines.
An ordinary commutator may be used, but $M$. Camacho prefers the improved commutator, $F$, shown separately in Figs. 4 and 5, which is provided with triangular contact makers, admitting of the duration of the passage of the current being varied or regulated in each electro magnet, according to the position given to these contact makers relatively to the friction rollers before spoken of. The adjustment is effected by causing the commutator to slide along parallel with itself


## THE CAMACHO ELECTRO-MAGNETIC ENGINE.

consequence of their small volume, are thus brought to a condition of maximum magnetization as soon as they come within the range of magnetism of one of the electro-mag. nets of the engine, and the travel of the armature is completed in maximum magnetization, giving greater production of force with the same expenditure of electricity. As this effective force is the product of forces multiplied by velocities, it is also evident that an increase in the effective force is produced by reason of the greater rapidity of the magnetization and demagnetization of the armatures formed of insulated plates or blades."
In the new commutator the piece of metal or contact maker, serving as a conductor, instead of being made rec-
or triangle,so that the rubber which acts against it continues in contact therewith, during only a fraction of a revolution, varying according to the position in which the contact maker is placed. It will thus be seen that it suffices to advance or draw back the commutator upon its axis of rotation, while the rubbing surfaces of the engine remain stationary in order to modify the passage of the currents in the electro-magnets, and consequently to regulate the speed and power of the engine.
In the diagrams, Fig. 1 is a transverse section of a rotary complished in the night. above manner. It is estimated that at ach of the large lighthouses on the coast some 2,000 birds The The circumstances also serve to indicate that the flight of the birds, which migrateduring the months named, is ac

Varnish for Silverware.-Gum elemi, 30 parts; white amber, 45; charcoal, 30 ; spirits of turpentine, 375 . It must be used in a heated state, the metal to which it is to be applied being also heated.

## THE GRINDSTONE COLUMN AT THE CENTENNIAL.

 It would hardly be imagined that such homely objects as grindstones could be grouped tastefully and even elegantly, and yet an enterprising manufacturer of these useful articles (Mr. J. E. Mitchell, 310 York avenue, Philadelphia) exhibits his productions at the Centennial Exposition in so artistic a manner as to challenge universal admiration. From the center of his allotted space, which is located on the southern main passage in Machinery Hall and near the Corliss engine, rises a superb Tuscan column, twen ty-six feet high. This is composed of thirty-six grindstones of different grits and qualities, piled one above the other. Slight variations in diameter of the stones produce the graceful swelling out line of the pillar; and their different colors, ranging from red to bluish, gray, and yellow, are harmonifrom red to bluish, gray, and yellow, are harmoni ously combined to produce the effect of tinted bands. The general appearance of the column isshown in the annexed engraving, and it forms one shown in the annexed engraving, and it forms on
of the most prominent objects in the vast display.
Mr. Mitchell's exhibit is not merely artistically attractive, but is also one of those sensibly arranged contributions from which any one, studying them, can obtain, by simple inspection, a fund of useful knowledge. For instance, there is a collection of mounted grind3tones from which the machinist may learn all the different modes of adjusting the stone, and make valuable comparisons. He may also see all the various kinds of stones, and thus note the differences in grit, and determine which is best for his own especial purpose. There are huge stones weighing from 1,000 to $4,000 \mathrm{lbs}$. each, such as are used for grinding saws, files, edgetools, and cutlery, for beadstones in nail works, and for finishing the iron work of locomotives. Thence downward, every si
of stone may be examined, to the smallest made.
Three medals have been awarded to Mr. Mitchell
for this exhibit. A very interesting pamphlet, on for this exhibit. A very interesting pamphlet, on the subject of grindstones, their history, and how to hang and use them, may be had free by addressing the manufacturer above named.

The Physical Properties of Gallium.
M. Lecoq de Boisbaudran, in a recent note to the French Academy of Sciences, states that he has prepared about $7 \frac{1}{2}$ grains of gallium. In liquid state, the metal is a beautiful silvery white; but in crystallizing it turns blue, and its brilliancy be comes greatly diminished. The point of fusion is fixed, for the metal melts very slowly at $86.27^{\circ} \mathrm{Fah}$., and crystallizes very slowly at $86.09^{\circ}$. The density of the specimen is 5935 . Gallium crystallized under water crenitates sometimes on heating.

## FLYING LIZARDS.

The remarkable lizards of our Western hemisphere, pro perly termed the iguanas, have their counterparts in the agama family of the East. The tribe contains between thirty andforty genera, and many of them are peculiar and inter esting. Our engraving represents, first, the fringed dragon (draco fimbriatus), which is commonly found in Sumatra. The head is grayish white, covered with an irregular network of dark brown, and on the throat are a number of circular specks covered with granular scales. Upon the under parts of the male, the scales are rather large and keeled: and upon the wings are a number of rather on the wings are a number of rathen
short, white dashes of a partly trian short, white dashes of a partly trian-
gular shape. Along the sides run segular shape. Along the sides run se-
ries of small triangular keeled scales. ries of small triangular keeled scales.
The other specimen shown in our illustration is also a so-called flying lizard, called the flying dragon (draco volans. It is a native of Borneo, Java, the Philippines, and the neighboring islands. The prominent characteristic of this reptile is the singular developed membranous lobe to be found on each side, which lobes are strengthened by certain slender processes from the six false ribs, and serve to support the animal during its bold leaps from branch to branch. The flying dragon is the most agile and daring of the winged lizards; and it can leap a distance of 30 paces, its so-called flight being similar
to that of a flying squirrel or to that of a flying squirrel or flying fish. The color of this reptile is variable, but is usually as follows: The upper surface is gray, with a tinge of olive, and daubed or mottled with brown. Several stripes of grayish white are sometimes seen on the wings, which are also ornamented with an angular network of dark blackish brown. When the dragon is at rest or even When the dragon is at rest or even
traversing the branches of trees, the parachutes lie in folds along the sides; parachutes he in folds along the sides; but when it prepares to leap from one
bough to another, it launches into bough to another, it launches into
the air and sails easily, with a slight the air and sails easily, with a slight fluttering of the
wings. It makes itself more buoyant by inflating the wings. It makes itself more buoyant by inflating the chree
membranous sacks that depend from the membranous sacks that depend from the throat. It has been commonly supposed that these animals gave rise to the fabled dragons of the ancient mythologies; but the probability is that the real clue to the origin of the monster is to be found in the gigantic saurians of ancient times, which were
found on earth for some time after man made his appearance on the planet. We select the engraving from Wood's 'Illustrated Natural History.'

## Fall of a Meteorite in Kansas City.

 Mr. J. D. Parker, in a letter to the American Journal ofScience, says: " On June 25, 1876, between the hours of Science, says: "On June 25, 1876, between the hours of
nine and ten in themorning, a small meteorite fell upon the nine and ten in the morning, a small meteorite fell upon th


## MITCHELL'S GRINDSTONE EXHIBIT.

in roof of Mr. Isaac Whittaker's business house, No. 556 Main street, Kansas City, Mo. The meteorite came down with sufficient force to cut a hole in the tin roof on the front part of the house near an open window; but not pass ing entirely through the tin, it bounded back a few feet and lay on the roof. Mrs. Baker, who occupies rooms in the front part of the house in the second story, and Mrs. Whittaker were standing near the window when the meteorite fell, and heard the sharp concussion when it struck the roof. Mrs. Baker immediately picked up the meteorite as it lay near her on the roof, but dropped it again, finding it too hot to retain in her hand.
"The meteorite is a plano-convex specimen, about 18 inches in diameter, and about $\frac{1}{8}$ of an inch in thickness. The outside or convex surface possesses the usual crusted appearance, while the inside or plane surface differs from


FRINGED DRAGON AND FLYING DRAGON. rdinary meteorites in possessing the appearance of sul phuret of iron, subjected to some degree of heat, instead of nickeliferous iron. One might easily infer that the meteore was scaled off from a large bolide that passed over the city at that time. As it fell in the city, I have named it the Kansas City meteorite. It has not been subjected to chemical analysis."

Growth of the Earth.
" Since meteoric matter is continually falling upon the earth, she must of course be growing larger, and the daily number of meteors is so immense that it would be natural to suppose that the increase might be quite appreciable in a few centuries. It is not so, however: the surface of the earth is so enormous, compared with the quantity of mete diamethat,even on the most favorable hypotheses, he dred million years by accessions of this kind. A few figures will make this clear.

As to the number of visible meteors, there is sub stantial agreement among authorities. The estimate of Professor Newton is as large as that of any one I believe, and he puts it at $7,500,000$ per diem, which number we will use. As to their average weigh there is more difference of opinion. Probably, how ever, the most careful and best founded investiga tion is that of Professor Harkness, published in his report upon observations of the November meteors o 1866 ; and his conclusion is that 'the mass of ordi nary shooting stars does not differ greatly from one grain.' Professor Newcomb appears also to con cur in this estimate. There are reasons, which it would take too long to discuss, for thinking that this value is likely to be somewhat too small; but on the other hand it is almost absolutely certain that the average mass cannot be as great as one fourth of a ounce. To be on the safe side, we will assume 100 grains as the mean weight of the visible shooting stars.

Remembering that the pound is 7,000 grains, we shall then find nearly 107,000 pounds, or about 50 tuns, for the total weight of one day's supply of shooting stars. An allowance must also be made for the meteors too small to be visible (which are know by telescopic observations to be very numerous), and for the matter brought down by aerolites. If we double the quantity stated above we shall certainly be abundantly liberal, and this will give us $214,000 \mathrm{lbs}$ a day, or about $78,164,000 \mathrm{lbs}$. per year, as the earth's rate of grow $h$ in weight.
'Her increase of bulk depends upon the density of the meteoric matter, and probably this density does not differ much from that of ordinary soil, or nearly three times that of water. If so, each cubic foot would weigh about $187 \frac{1}{2}$ lbs., and the annual meteoric acces sion to the bulk of the earth would be not far from 417,000 cubic feet. A cube about 75 feet on each ide would be a little larger. It would take more tha four millions such to make a pile as large as Mount Wash ington. Now, since the surface of the earth is about 5,48 millions of millions of square feet, it follows that the an nual supply of meteoric matter, if spread uniformly, would
 a foot, or very nearly $1100000 \pi 0$ of an inch. In other words, even on such extravagantly favorable hypotheses as we haveassumed, the formation of a sheet of meteoric mat er covering the earth to a depth of 1 inch would require a period of eleven hundred millions of years.

If we suppose meteoric matter to have been just as abun dant in space as now, since the beginning of time, and that he velocity of the earth's orbital motion has remained un changed, and that the effects of her atmosphere and of he gradual shrinkage under the action of gravity can be neg lected, then it can be shown by an eas course of reasoning, which would, how ever, hardly suit these columns, that her dianneter must have grown during her whole existence at the same uniform rate as now, and we find that to build her up to her present dimensions by such a pro cess of aggregation must have taken a period of at least twenty seven and a hal millions of millions of years.
" It is not intended to assert, however that the earth was really formed in this way; and even if it was, the above estimate is of little value except as indicating the order of magnitude involved; since there is no certainty whatever-not even a probability-that in the early stage of the formation of the planetary system circumstances nearly enough resembled the present to warrant any conclusion. Nor must it be forgotten that the mor probable estimates of Harkness and other as to the weight of meteors would length en all the periods of time mentioned from ten to one hundred fold. We have given the smallest values possible.".-Pro fessor C. A. Young, in Boston Journal of Chemistry.

A Severe Hurricane.
A cyclone of remarkable severity pass ed over the Central American states dur ing October. The town of Managua, in Nicaragua, was inundated; four hundred were blo nown, and damaged to the amount of $\$ 2,000,000$. In Blewfield, on the Mosquito coast, three hundred houses were destroyed, and the coffee crops over an immense district were utterly ruined. Twenty lives were lost, and several vessels on Lake Nicaragua were sunk by the disaster. The total damage is estimated at an amount of over five million dollars.

The hydrost HYDROSTATIC APPARATUS. he pressure of a hydraulic press is a machine in which the pressure of a piston, on a body of water of relatively small sectional area, is made to propagate the force to a cy linder of multiple area, where the force is directly and the is or repairs. The vessel is brought over a platform whic speed inversely as the difference. We extract from Knight's which pass over pulleys, The lower ends of the chains are "Mechanical Dictionary "* the annexed engravings of a large variety of appara tus based on the same principles. A
hydrostatic press pump is represented at A, in Fig. 1. $q$ is the water cistern, and $r$ is the pump barrel which has a sucking tube, $t$, and a conical valve, $s$. The plunger is operated by the lever, which may be adjusted so a to give greater or less rapidity of stroke 4 is a safety valve, and $z$ the discharge valve. On lifting the plunger, water is drawn into the barrel, $r$ through th tube, $t$, and by depressing it the water is forced out through the pipe, $j$, the valve, z, rising to permit its passage. B, same engraving, is an

HyDRAULIC indicator or gage, used to indicate hydraulic pres sure. Water, under the pressure to be tested, is admitted through the pipe, $a$, to a cylinder inclosing a piston, which tends to depress the short arm of the lever, $b$, counterbalanced by the weight, c. A movable weight slides on the long arm of the lever, and weights, $d$, are added to its outer end when a very great pressure is to be measured. An
hydraulic pulling jack is represented at C. A cylinder, $a$, contains a tube, $b$, to which the piston, $c$, is attached. $d$ is a smaller tube sliding within the piston and tube, $b$. A valve, $e$, closes the communication between the cistern, $f$, which contains a pump, $f^{\prime}$, operated by the hand lever, $h$, and the cylinder, $a$. Two passages, $g g$, afford communication between the tube, $d$, and cylinder, $a$, at the back of the piston, $c$. Water is poured into the cistern, and the jack is suspended, cistern end downward. Working the hand lever forces by means of the plunger, $h$ water through the tube $d$ and $h$, wate through the tube, $d$, and passages, $i i$, and depresses the piston to the bottom of the cylinder, $a$. The water at the
back of the piston returns at the same back of the piston returns at the same time to the cistern through the passages, $g$. On unscrewing the stop valve, $e$, the water returns through the tube and passages, $i i$, to the cistern, relieving the piston from pressure and allowing a sus pended weight to fall. D is a
bOok PRESS.
It is arranged with either one or two pumps for forcing water into the lifting cylinder, the piston of which raises the platform on which the printed sheets are placed. This is kept in horizontal posiplaced. This is kept in horizontal posi tion by upright standards, and between it and the head of the press the sheets
are compressed. At $E$ and $F$ are shown a are compressed. At E and F are shown a
HyDRAULIC Rail bender and shaft straightener.

hydrostatic presses.
which one half of the boat is swaged at a time between dies. The engraving shows the disposition of the press clearly and needs no further description.

## Who Originated Electroplating?

In our recent obituary notice of Mr . Thomas Fearn, which we extracted from the Birmingham (England) Gazette, it was stated that he was the probable inventor of the electroplating process, the patent of which he sold to the Messrs. Elkington. Mr. T. Spencer writes to the British Trade Journal to deny this and to claim theinvention for himself. He says:
" Those who wish to see the first elec troplated article-as I suppose it to lemay have their curiosity gratified in the Liverpool Museum, in which there is an electroplated teaspoon with my initials engraved on it, and the date, May, 1838 This date, be it observed, is above two years in advance of that of the Elking tons' patent. This spoon, though it was not in the legal sense sold, was thickly covered with silver, and given to my friend, Mr. Joseph Mayer, the eminent silversmith of Liverpool, on the day, as it happened, the date was engraved on it. Its history is briefly this: During my electro experiments, Mr. Mayer had requently seen their results in copper and naturally became desirous to know how far the art was applicable to the de position of silver. So for this purpose he sent to me, at my request, a white metal teaspoon, and with it a flattenedout Mexicandollar to act as the opposing late in the small galvanic arrangeme had then in use. Some fortnight af ter I took it to him, thickly coated with silver, but rough as it came from the trough. I remember it was weighed and found to be about $\frac{1}{4}$ oz. heavier than when it was received. The object in put ting so much silver on was to test the adhesion of the one metal to the other
"I suggested that the better mode of arriving at this would be to cut int it deeply with a graver, which Mr Mayer had done accordingly, and on call ng on him a few days after I was told t had stood the test I suggested. I then aw that he had got his engraver to put my initials on it, with the date."

Germination at Low Temperatures.
It has recently been discovered tha seeds will germinate even if placed be tween blocks of ice. M. Haberlandt has conducted further investigations int this subject, and has kept a large num ber of different linds of seeds at a tem rature of $45^{\circ}$ In 23 days 8 species out of 22 showed distinct signs of germina tion, while others remained sterile to the end. M. Haberlandt plausably conjectures that those grains of any given species which will germinate at a lowe temperature than others will require less amount of heat for their perfect de velopment ; and thus by artificial sowing In the first of these, the action of the lever, $a$, operates a attached to the platform, and they are fastened above to a a variety might perchance be obtained precocious in habit small force pump within the casing, which is connected horizontal wooden beam which communicates with the ram and needing little heat. with a larger cylinder. the piston of which forces the plun- of an hydraulic engine. When the ram, which is placed in ger against the rail, midway between the points where it is horizontal position, is moved, by the injection of water into held by the lips, $c c$. In the shaft straightener, F , the beam, the cast iron cylinder in which it works, the motion is com$a$, and shaft, $b$, are each inserted within the col:ars, $c$, and municated to the horizontal beam, and thence by the chains pressure is applied through the plunger, $d$, operated by a small hydraulic press, inclosed within the casing, $e$, and worked by the lever, $f$. G is an
which comprises a force pump and operating cylinder, in which the piston carrying the punch, $b$, is inserted, inclosed in a case, $a$. The lever, $c$, operates the pump to depress the piston and to force the punch through a plate beneath; it is then raised by the lever, $d$, to punch another hole. H is a
juice press,
used for the extraction of liquids from the more solid saturated portions. In this a horizontal plunger, $a$, actuated by a screw, $b$, works in a water chamber, $c d$, to raise a ram, $e$. A vertical screw, $f$, works in the head, $g$, on the standards, for raising or depressing the piston, be tween which and the ram, $e$, substances are compressed. I is the
hydrostatic bellows.
Water poured into the funnel-mouthed tube, $a$, flows into the flexible-sided box, $b$, and raises a weight many times greater than its own. The weight may be lifted in this way until its combined pressure $\mid$ to the platform, so that the vessel is thus slowly raised. The pean immigration is prevented, there is a stronger probabil and that of the column of water in the bellows, $b$, is equal engravings give both a longitudinal and an end view of the ty that whatever can be done will be, and earnest measures to that of a column of water having an equal surface and apparatus.

Another application of the hydraulic press is illustrated to every interest as well as to every prejudice of the coun Fig. 2. Here it is used in making metallic life boats in try.-Bulletin of the Iron and Steel Association.

## CENTENNIAL NOTES.

the remington button hole machine
Among the thousands of curious machines seen by the visitors to Machinery Hall, one of the most novel is the Remington button hole machine. Since the advent of the sewing machine, many attempts have been made to produce something that would make a bntton hole, and usually such efforts have been directed toward an attachment for an ordinary sewing machine. So far as known, such efforts (either as an attachment or a complete machine) have been attended with only partial success; and until the production of the Remington machine no device for completely finishing a button hole has been a perfect success. This machine is complete in itself, being about the size of an ordinary sewing machine, but is made upon entirely new principles. The invention seems to be based upon the idea of a single thread as used in handmade work, forming a loop stitch exactly as made by hand, and which is concluded to be the only proper stitch for such work. A combined shuttle, bobbin, and needle is attached to the needle bar, resting in a socket in the latter. A hole of the required size is first cut in the material to be worked, then the latter is, pushed upon a coneshaped piece, and, by a movement of the operator's knee, is firmly clamped; and when once in position, it is automatic ally revolved around the cone, and does not require any manipulation to insure perfect work. The stitch is formed by a loop (taken from the needle after it has passed through the cloth) carried up and thrown over the shuttle and needle. When the cloth is taken from the machine the button hole is found to be complete, the ends being strongly barred or stayed; and no handwork of any kind whatever is required

The speed of this wonderful machine is from 1,800 to 2,000 holes in 9 hours' work : and judging by the rapidity and ease with which the work is handled, both by the machine and the operator, this aarge product seems easy of accom plishment. The range of work includes shirts, linen col lars, knit goods, underwear, and many other classes of goods. The machine is simple in construction, durable, aud not liable to get out of order

A CORK WATER COOLER.
Cork, as is well known, is porous, and is a non-conductor of heat. These peculiarities have been taken advantage o in the manufacture of a water cooler made entirely of cork which is displayed in the Spanish section, and represented below. It is made of a slab of the wood, bent round cir

cular heads of the same and bound with brass hoops. The porosity of the cork allows the water to percolate slowly to the surface, and there to cool in evaporating, while its non conducting nature prevents the heat of the sun warming the water within.

## spontaneous Fracture of Glas

A Singular Accident.-A light of glass, eight feet square, slightly marred by an accident, was removed for a new one on King street, in Troy, the other day, and placed against the side of a building. Suddenly the glass flew into a thousand pieces. One of the fragments struck a workman, and penetrated the right leg of his pantaloons, and cut a deep gash in his knee. No cause can be assigned for the singu was heard some distance away.-American Architect and wailding Neios.
Remarks: This occurrence was doubtless due to the im perfect annealing of the glass. The British Journal of Pho tography says, on the detection of bad glass :

We have more than once experienced, and, doubtless, many of our readers have similarly suffered, the loss of a large glass vessel through the occurrence of a crack, pro duced no one could tell how; but when, on one occasion, an unusually thick vessel fell to pieces before our eyes, though it had not been touched or heated for some days, the cause became plain to us. The fracture and the cracking arose from the imperfect annealing of the glass, which remained whole till some unnoticed vibratory impulse caused suffi cient molecular disturbance to allow the stronger of the un equal strains existing in the mass to assert itself, and, over coming the cohesion of the whole, to produce a crack or complete fraciure, according to its strength. To guard against such accidents, a suggestion has been made, by $G$. Hagenbach in Poggendorf"s Annalen, to examine all articles by polarized light, when, if a hidden flaw exist, its presence will be revealed by the occurrence of prismatic colors. He was led to this discovery by the examination of some frag ments of two glasses which had suddenly cracked in the unoxpected manner we speak of ; they all showed prismatic colors."

## DECISIONS OF THE COURTS

Supreme Court of the United States.








#### Abstract

United States Circuit Court---District of Massachutent Pressing machine for setts. Cint presing machine for tailors.-Granted june 8, 1858.-Levi be storrs $v s$. patrice howe et al. storrs 08 . Patrick howe et al. [fn equity.-Before Clifirard, J.-Decided September 2, 1876 .]     


United States Circuit Court--mistrict of Massachu setts. [In eq
Clifford, J. [In equity.-Before Clifford, J.-Decided September 1, 1876.]






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stitching hat linings.-alover sanford et al. vs. merimac hat company
[In equity.-Before Clifford,














#### Abstract

atent billiard table.-hugh w. collender vs. john e. came et at [In equity.-Beforecuiford, J.,-Decided September 2,1876 .] A patent, indue form, was granted to the complainant on January 12 .   reissued to the same patentee for the same invention. Due application was subsequantly made for an extenito, and the record showsthat the relssued patent was subsequently extended for the further term of seven years from phen        


## NEW BOOKS AND PUBLICATIONS

hoke bore Guns, and How to Load for All Kinds of Game By W. W. Greener, Aathor of "Modern
New York city: Cassell, Petter, and Galpin
. Grer and
roduced into that country the American practice of contracting has in zles of fowling pieces, so as to deliver the pellets of shot in a compa mass, to ensure longer range and greater penetration. The system ha net with great success there, not only in the fleld, but in shooting matche of the improved weapon; and he gives accounts of its proved effletenc which are conclusive and convincing. His remarks on the chotce of a gu and care in its use are practical and sensible; and he givesour country full redit for the valuable invention which he has improved on and introduce n Elementary Handbook of Applied Mechanics. With Eighty-eight Diagrams. An Elementary Handbook of Theo retical Mechancs. Wit One Hundred and Forty-Five Dia grams. By Work city: G. P. Putnam's Sons, Pree 75 cents each. New Yo
and 23 street.
essrs. Putnam's two "Sclence Series," elementary and advanced. Al andes selected for pubication in this cheap and popular form are of itelliglble, and accurate information, given to the reader in a strictly wer the demand for practical education, now so loudly heard in all our
he Compendium of architectural sheet Metal work, with Rules and Directions for Estimates, etc. Price $\$ 10$. Salem, Ohio: The Kittredge Cornice and Ornament Company.
ntaing 50 enable 1 ll kinds of ornamental metal work, and is lavishly illustrated with dia rams, etc. It is likely to be very useful to architects and builders employing sheet metal dccorations. The Kittredge Company's price catalogue is
distinct from the technical information and tables; and the latter afford neans for ascertaining, by a simple plan of analysis, the complete and exa ery description of work
e Textile Colorist, No. 10, Volume II. Published Monthly. Subscription Price,
Son, 15 Astor Place
This val on beriodical mang, and pinigh textle ete volumes form handsome and elaboratc treatises on the whole art an science of dyetng.

## Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From September 5 to October 4, 1876, inclusive
abdominal Support.-J. Herts, New York city.
, Jith (of Pitsburgh Pa), Leamington, Englan
axle and Box--J. F. Pray et al.
Canceling Stamps, etc--T. G Palner, Shultzville, n. Y
Losing Doors, ETC.-J. T. Foster, Jersey city, N. J
luting Machine.-A. Rose, New York cits
Gove.-W. F. Foster, New York city.
insect Fan.-S. W. Lambeth et al., Philadelphia, Pa
Knitred Fabric.-C. H. Landerberger, Philadelphia, Pa.
feather-Beveling Tool.-J. Smith et al., Boston, Mass
Lubricator.-T. Haynes, Kangas, Mo.
Makina Sugar.-D. M. Weston, Boston,
Mining Machinery.-P. Sheldon, Jamestown, N Paper barrel, etc.-W. H. Murphy, Syracuse, N. Y.
Paper Barrel Head.-W. H. Murphy, Syracuse, N. Y. Piston Packing.-Adair Packing Co., Bowling Green, Ky Pulp Box Machine, etc.-S. Wheeler, Albany, N. Y Purifying oil, ktc.-G. W. Tilton, New York city. Purifying oll, etc.-G. Wr. Tition, New York city reducing Ores, etc.-A. t. Hay, Burlington, lowa. Refrigerator.-E. B. Smith, Albany, N. Y.
Rock Drile, bto.-W. Weaver, Phonixville, Sewing Le, Sewing Machine.-J. Butcher, New York city. Sewing Machine, etc.-R. Whitehill, New York city Sewing Machine Shuttle.-J. Butcher, New York city sewing Machinery.-J. Folk, Brooklyn, N. Y.
Spool-Printing Machine.-I. Dimock, Hartford. Conn. Stone Saw, etc.-R. S. Robertson, Pittsburgh, Pa. Stove, etc.-J. J. Jarves (of Boston, Mass.), Florence, Italy, et al. teaching Singing.-G. N. Carrozzi, Chicago, Ill.
Tie Buckle.-H. W. oliver, Jr., Pittsburgh, Pa. tir Buckle.-H. W. Oliver, Jf., Pittsburgh, Pa troverr protector.-J. h. Anderson, New York city Ventilating Ships, etc.-W. F. Thiers, New York city, et al.
Winding Yarn, etc.-I. L. G. Rice et al., Cambridge, Mass.

## Fecent 2merican and foretga zequats.

## NEW MISCELLANEOUS INVENTIONS.

combination lap ring.
George W. Atkins and James C. Harris, Noble's Lake, Ark.George W. Atkins and James C. Harris, Noble's Lake, Ark-at one side. The parts are secured together by rivets working in
slats, so that one part may be slid or adjusted on the other. When they are adjusted in one position, the opening in the respective parts coincide; but when adjusted in another position the openings do not coincide, and hence the ring is closed or betached to or detached from chain links and singletree or doubletree hooks, etc.

IMPROVED WHIP
Dexter A very, Westfield, Mass.-The object here is to strengthen De whip at the joint, between the handle and stock, without increasing the cost of construction. The invention consists in a
handle counterbored from its forward end to receive the end of handle counterbored from its forward end to receive the end of it from its lower end, and driven into the stock within said counterbore.

IMPROVED TRUSS.
Winfield A. Turner, Hiawatha, Kan., assignor to himself and J . Koehm, same place.-This is a pad made of a ball and adjustable socket tube, the pressure on the ball being regulated by a spring
and set screw. The ball socket slides on a fixed socket of the base plate, and is secured by small set screws. A belt and thigh strap secure the truss in position on the body.
improved trace fastener.
Ephraim N. Banks, Wilkesbarre, Pa.-This consists of a socket notch formed in it at the side of said groove. There is also and a having a circular head which fits into the groove of the socket. The hook can only be attached and detached by pressing the free end o
tally.
IMPROVED Parlor SKate.
William Lockwood, Danville, Mo.-This relates to spring brakes for parlor skates, an attachment which has been heretofore used so as to bring the brake to bear upon the front wheel and connect is a spring, from which a string extends down through a guide and up to the band of the operator, in such manner that the brake is forced down on the wheel by pulling up the string

> IMPROVED HOOF EXPANDER.

Charles H. Shepard, Elizabeth, N. J.-This has reference to an improved device for preventing and curing contraction of the
hoors of horses or mules, and consists of a V-shaped spring having inner opposite rings and projections, the whole secured by suitable devices to the interior of the hoof.
improved hainess saddle and saddle tree. Samuel E. Tompkins, Sing Sing, N. Y.-The first invention consists of a rib formed on the ends of the tree plate to make a finish at the ends of the flap or top leather, the said rib being raised up in the construction of the plate. The upper surface of the leather
is flush with the top of the rib, and is made in concave form to facilitate the finishing of it with a file and to furnish room for the back band. The second invention is a saddle-tree plate, having a bridge for the terret screw, constructed with jogs or shoulders
only, or the same and a bar. These are connected at the upper side of the bridge to support the flap against downward strain. There is also a tlap, made solid the entire breadth of the tree above
the bridge, and having support against downward strain by shoulthe br
improved belly pipe nozzle for blast furnaces. Sigismund F. Vielhaber, Conshohocken, Pa.-This consists in a
double walled nozzle made with a tlaring inner end, and provided double walled nozzle made with a flaring inner end, and provided
with a ring partition at the base of its flaring inner end, having two holes formed through it. Said apertures correspond with the holes in the outer end, in which the inlet and outlet pipes are inserted. There are two longitudinal partitions in the straight part, midway between the inlet and outlet pipes. There is a circulation of the water through the space in the flaring end of the nozzle,
and said end causes the blast to enter the lower part of the fur and said end causes the blast to enter the lower part of the

IMPHOVED POCKET BOOK LOCK.
Ernst Schnopp, East New York, N. Y.-This lock may be opened and closed by direct pressure. It consers that are operated by a top plate, which has a conical lug, entering recesses of the jaw levers, so as to release the knob on the flap part of the lock.

## improved toy carrier.

John H. Adamson, Clifton, N. J.-This is a weighted carrier run Jing by a pulley over a tight rope, and provided above the pulley and rope with a sui
ures are attached.

IMPROVED SCALE BEAM. Edward A. Rock, Ludlow, Vt.-In these weighing scales, the be offered to the eye upon the sides of the beam to prevent the position of the indicator from being readily seen. The scale beam is slotted longitudinally to receive the stem of the weight, and
there is a T indicator, the knife edges of the arms of which rest there is a $T$ indicator, the knife edges of t
upon the notched upper edges of the beam.
improved sack filler and packer.
Edward M. Whitney, Batavia, N. Y.-This consists of a follower valve in the spout of a funnel, containing flour to be packed, which
is made to rise up and let the flour descend into the sack, the is made to rise up and let the flour descend into the sack, the
mouth of which is attached to the funnel. The valve then closes over and presses down the uesired quantity of flour into the sack, shutting the spout against the further escape of the flour while the filled sack is removed and an empty one put on. The contrivance
is such that the quantity of tlour can be varied at will for sacks of is such that the quantity of flour can be varied at will for sacks of different sizes. 'The invention also comprises an adj
form for holding the bags when fllling and pressing.

NEW WOODWORKING AND HOUSE AND CARRIAGE
BUILDING INVENTIONS.
improved dumping car.
Eugene Davis, Clinton, Ill-This has reference to certain improvements in car-unloading apparatus in which a tilting track on and off said section. The invention consists in the combination, with a centrally pivoted track section, of a segmental rack bar engaging with a spur wheel on a driving shaft. By the ar-
rangement of the rack bar below the axis of the tilting track section, the same can be depressed at either end by simply turning the operating gearing in opposite directions, thus dispensing with two sets of devices for tilting the track.

IMPROVED WINDOW BEAD FASTENER.
Hiram W. Stetson, Black Brook, N. Y.-This consists of a metal
ic fastening plate, having a key hole slot that is secured to a de achablestrip or bead and connected to the window frame by fixed screw. By tightening or loosening the fastening screws, the putting on or removing of the beads or strips is facilitated, while the same time, the reliable fastening of the beads to the win ow frame is obtained

IMPROVED WOOD-PLANING MACHINE.
Andrew M. Mortimer, Salt Lake City, Utah Ter.-This machine has novel mechanism, which operates in such a way that a board, after being passed through the machine and being planed upon on and planed upon the other side.
improved dumping wagon.
Francis M. Pennebaker and William F. Pennebaker, Pleasan Hill, Ky.-This consists of the combination, with the box con
trived to síide back on the wagon bed and tilt down behind for dumping, of a windlass under the driver's seat, and cords so con nected with the box that it can be run cut and allowed to dump and drawn back.

IMPROVED COMBINED STEP AND HUB BAND. Robert McDonald, Georgetown, Col.-This is a step, hub band, or made in several parts, permanently fixed together. It provides and hub the desirable point and answers the purpose of a nut and hub band.
mproved singletree.
Louis Platau, Pittsburg, Tex.-This singletree has near each end a circular groove, and thence, running to the end, a longitu-
dinal groove. With this construction, the trace rings cannot be dinal groove. Why this construction, the trace rings cannot be the link into the longitudinal groove, and then slipping the ring off

## NEW HOUSEHOLD INVENTIONS. <br> improved mirror.

Ludger T. Berton, Paris, France, assignor to Pierre Leopold Brot, of same place.-This isa compound mirror, formed of a main
glass having a frame, within which are hinged, on opposite sides wo other glasses, to fold within said frame.
improved folding chair.
Frank F. Parker, Gardner, Mass.-This folding chair has arm extending from the back to the upper ends of the front legs, to which they are connected by links
the lower extremities of said arms.

IMPROVED DOOR CHECK.
William Cassill, Reed's Mills, O., assignor to himself and James M. Henderson, of same place.-As the door is swung open it strike which throws a catch forward to grasp the edge of the door and hold it open until released by turning back the said catch.

## NEW AGRICULTURAL INVENTIONS.

mproved barbed metallic fence.
William H. Gilman, Belvidere, Ill.-This consists of a bar of metholes arranged on a line either at rightangles with the bar or diagonally, and provided with pointed wire barbs fixed in the said holes.

IMPROVED WHEEL PLOW.
EdwardT. Hunter, Hallsville, III.-This is an improved riding at tachment for breaking plows, so constructed as to receive any de one side of the wheels, and may be adjusted to receive a left-hand or a right-hand plow, as may be desired.
improved corn planter.
Henry J. Snyder, Adams, Evansport P. O., O.-This machine combines several new mechanical devices which enable it to fur the field ma be planted in perfect che rows so that IMPROVED FRUIT PICKER.
John C. McEwen, Leesburg, Fla.-In this fruit picker a coubi nation of wires is fastened to a disk, being free at their oute that the fruit is allowed to rest in the picker before the stem excised.

IMPROVED CHECK ROWER.
William L. Black, Virginia, Ill.-This consists of a pair of forked levers attached to a supporting frame, and connected by rods with the seed valve bar of a corn planter. It is operated by a rope hav-
ing knots or buttons at regular intervals, which passes around a sheave at each end of the supporting frame and through the forks of the levers, and is attached to stakes at each end of the field.
improved plow.
George T. Hedrick, Mill Springs, Ky.-The invention is an im provement in the class of sod or turning plows, and relates, flrst, to
the construction of the stock whereby it is adapted for attachmen of right and left shares and moldboards; second, to the construc tion of said shares and moldboards, whereby they are adapted fo said attachment: third, to the employment of a detachable and
adjustable L or Thead brace for the share; and fourth, to the proadjustable $L$ or T' head brace for the share; and fourth, to the pro-
vision of an adjustable wheel which is so attached to the heel of vision of an adjustable wheel which is so attached to the heel of while being drawn or propelled from one place or fleld to another.

> IMPROVED HAY RAKER AND COCKER.

Moses Manlove, Muscoda, Wis.-The object is to collect the hay and deposit it upon the ground in cocks. To an endless moving belt are attached crossbars, which are provided with teeth inclined forward, and by which the hay is taken from the ground, carried up the said elevator to its upper end, and dropped into a box,
formed in the rear end of the machine and made of such a size as to contain enough hay for a cock. When enough hay has been collected for a cock, a lever is raised, and the weight of the hay forces the bottom and the door of the box open, and leaves the

NEW MECHANICAL AND ENGINEERING INVENTIONS. improved railroad crossing.
Darius Pierce, Tower Hill, Ill.-This is an improved crossing for ailroad tracks, on which the main and guard rails may be changed to be worn out entirely on both sides, being rigidly secured in secured on a suitable bed plate. The main and guard rails are bed plate. The concaved base rail of the crossing is retained by the rail sections and the inner recessed corner posts.

IMPROVED CAR COUPLING.
Leonard Fleckenstein, Cresswell, Pa., assignor to himself and Martin Miller, of same place.-This relates to improvements in the the same inventor, so that the working of the same is facilitated it being adjusted for cars of different hight, and always kept in the center to interlock perfectly square on curves. It is an arrange ment of spring hooks which couple readily when hung to the re quired hight, and are applied to the car frame by a swinging plat nd cushioned bar with the same degree of lexibility and adjust -on drawbars in gon
improved cotton and hay press.
William M. Penniston and William H. Penniston, Fox, Mo.-This acludes a lever presser, in combination with one side of the press ng case, to press the hoops against che side of the bale to hold ther lever presser, on the other side, to hold the hoops at one end wile they are strained and fastened; and a lever contrivance fo straining and holding the hooks for securing them.

IMPROVED GOVERNOR FOR STEAM ENGINES.
Robert W. Gardner, Quincy, Ill.-This invention consists of pendulous arms, with inner extension toes, acting on double-link par allelograms connected to the valve rod and regulated by a top setscrew bearing on a top stud of the links. The valve chamber has two steam passages and two disks that are detachably applied to ing guided below the steam passages

IMPROVED STOP WATCH
Henri A. Lugrin, New York city.-This consists in a wedge shaped lever and spring, arranged so that it will, when used, raise nterrupt the connection with the watch trainand stop the quarte second and split the quarter-second hands. When the lever is brought back to its former position, the beveled center whee with the ald of a small spring, attached to it and pressing against the bridge, is made to gear again
so with the train of the watch.
improved feed water heater.
John B. Mitten, Peru, Ind.-This consists of a series of chamers formed by longitudinal and lateral partition walls, of whic he lateral walls have central openings, so that the water is com djoining one and so on to the boiler. Bottom plugs of eac chamber serve for the purpose of cleaning out the impurities col ected on the bottom of the chambers, the water being thus heate and purified in its passage from pump to boiler.
improved bung machine.
Charles Abel, Brooklyn, N. Y.-This is an improved machine for orming bungs with tapering sides and beveled heads, from wood encylinders of the proper length. In using the machine a bung cam, bringing the blank between centers. A sliding center is the orced forward, and the holder is drawn back. Cutters are no are drawn back by springs, and the complete bung drops. The holder then moves forward with another blank, and so on, the whole operation being automatic, except the single act of placin the blanks, one at a time, in the holder.
improved machine for rolling nut blank bars. Henry Johnson, Haverstraw, N. Y.-This is a pair of rolls, each the shaft. One section of each roll is conical, and forms the fiat of the bar, and another section is chambered out to receive the smaller end of the conical section, and has formed on its side the reverse of the form required in the edge of the rolled bar. By this
arrangement the flat of the bar passes through the rolls at an arrangement the flat of the bar passes through the rolls at an
angle with the axis of the rolls between a line parallel with the axis and the axis of the rolls between a line parallel with th improved snuw plow.
Horace Resley, Cumberland, Md.-The improvements consist in He particular construction and arrangement of the scoop wit in the means for adjusting the scoop, and in the arrangement of utter blades at the pintsof thescoop where the divided colum of snow commence, to turn which, blades divide the columns int of the same to one sidc.
improved railroad switch.
Conzac S. Bastright, Lebanon, N. H.-This switch is so construc ded that the movable rails may be adjusted into the required position by the wheels of the advancing engine, so
no running off the track from a misplaced switch.

## IMPROVED WIND WHEEL

John J. Kimball, Naperville, Ill.-This improved wind wheel has ertical fans pivoted at the ends in fixed horizontal arms of a ver tical revolving shaft, so that they will turn edrewise to the wind and the wheel will stand at rest. For holding them so as to tak the wind sidewise, there is a stop bar extending along one side of each series from the outermost one to the center, where it is con bar, and stops the fans sidewise to the wind at one side of the wheel, while they are still free at the other side to turn edgewise thusenabling the wind to take effect for revolving the wheel. A
contrivance for lifting the weights, and thus freeing the fans to the wind on both sides of the wheel, is used for stopping it.

IMPROVED BLOWER.
John M. Cayce, Franklin, Tenn.-The object of the invention is particularly to furnish a blower which shall be capable of being perated with the least possible friction in which the use of valve ly add appliances liable to get out of order, and which necessa ith, and which shall be adapted to automatically regulate th mount of air forced through it in a given time. To this end the atentee employs, first, a hollow rotary cylinder having perforatached to its periphery; and second, an air eduction pipe, whic orms the hollow axis of the wheel and extends upward within th chamber of the cylinder above the level of the water in which the atter revolves; and thirdly, an expansible, hquid seal air receive which acts as a governor to regulate the speed of the blower

## improved car axle box.

Marion Jansen and Josiah Mekeel, Garrison's, N. Y.-The jour albox has a door, closed by a spring key. The oil cup has a halfround groove formed upon the lower side of its bottom, to receive and rest upon the journal. In the bottom of the cup are formed a al, and in which are placed pins to keep them clear, and facilitate the escape of the oil. To the front side of the cup is secured an in the cup, so that lower end of whimply opening the door, how much oil there may be in the cup.

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## Yadest Munis

It has been our custom for thirty years past to devote a considerable space to the answering of
questions by correspondents; so useful hav these labors proved that the Scientific Ameri CAN office has become the factotum, or headquar ters to which everybody sends, who wants special
information upon any particular subject. So large range of their inquiries, so desirous are we to meet their wants and supply correct information, that we are obliged to employ the constant assis-
tance of a considerable staff of experienced writers, who have the requisite knowledge or access to the latest and best sources of information gines, boilers, boats, locomotives, railways, etc. are considered and answered by a professional engineer of distinguished ability and extensive
practical experience. Enquiries relating to electricity are answered by one of the most able and prominent practical electricians in this country Chemical enquiries by one of our most eminent Chemical enquiries by one of our most eminen
and experienced professors of chemistry; and so on through all the various departments. In this
way we are enabled to answer the thousands of questions and furnish the large mass of information which these correspondence columns present. The large number of questionssent-they pour in
upon us from all parts of the world-renders it upon us fible for us to publish all. The editor selects from the mass those that he thinks most likely to be of general interest to the readers of the Scientific American. These, with the replies, are printed; the remainder go into the waste basket. Many of the rejected questions are of a primitive or personal nature, which should be an spondents desirea special reply by post, but very few of them are thoughtful enough to enclose so
an could in many much as a postage stamp. We could in many to enclose a small fee, a dollar or more, accordWhg to the nature or importance of the case. When we cannot furnish the informate.
money is promptly returned to the sender.
W. H. L. will find descriptions of steam 36.-R. K. will find directions for galvanizing cast iron on p. 346, vol. 31.-J. T. will find directions for renovating worn files on p. 361, vol. 31.W.D. M. will find a description of a hydrogen lamp on p. 242, vol. 31.-G. S. will find directions for dissolving rubber on $p$ 119, vol. 28.-R. L. W. will find directions for making rubber stamps on
p. 155, vol. 31.-A. D. will find directions for p. 155, vol. 31.-A. D. will find directions for ma-
king farina (dextrin) from potatoes on p. 315, vol. 30.-J. C. W. will find directions for cleaning tions for p. 122, vol. 27.-L. W., Jr., will fal 3irecA. H. will find directions for dyeing felt bats black on $p .101$, vol. $30-A$. C. will find an expla-
nation of the ball and current of air puzzle on $p$. nation of the ball and current of air puzzle on $p$.
262, vol. 35 . -J . W. C. Will find directions for con262, vol. 35.-J. W. C. Will find directions for con-
densing milk on p. 343 , vol. 30 . - M. G. will find directions for drilling glass on p. 218, vol. 31.-W. H. will find the article on the penetrating power
of light on p. 180, vol. 33 . - F. S. will find a description of infusorial earth on p. 296, vol. 35.-J. McG. will find directions for preserving cider on $p .11$, vol. 31.-E. A. D. will find directions for making
a magnet helix on p. 220, vol. 35.-F. B. will find -H. E. will find a description of the templet odontograph on p. 181, vol. 35.-W. H. D. will find directions for painting theatrical scenery on $p$.
200 , vol. 26 . - R. should use black Japan varnish for lettering on marble.-G. S. should consult hard soap on pp. 331, 379, vol. 31. For toilet soaps, hard soap on pp. 331, 379, vol. 31. For toilet soaps,
see p. 289, vol. 28.-C. F. S. will find directions for purifying cistern water on p. 395, vol. 32.-F. B. will find that the best way to putbronze on paper is to draw the design in gold size, and dust on the bronze.-A. D. will find a good recipe for a white
metal on p. 139, vol. 31.-W. J. E., M. F. B., F.N.P., W. G., W. F. H., R. J. B., A. S., and otbers whoas subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.
(1) D. Z. asks: How can I separate chlorwater, and reprecipitate the solution by the addition of an acid, or evaporate to dryness.
(2) M. G. eays: I have about 35 gallons of
Rhine wine which seems about to sour. How can I reclaim it? A. Heat a test portion to near the boiling point. add a little carbonate of iron agitate briskly for a few moments, and filter. If this does not succeed,try a small quantity of lime
water. Let us know how these succeed. Foul or water. Let us know how these succeed. Foul or
sour wines are usually corrected by digestion sour wines are usually corrected by digestion
with a little chalk or the white carbonate ob tion and digestion with charcoal or boneblack, and subsequent filtration or decantation. Salicylic acid has lately been employed to cure the rancidity or foulness of wines, and to check fer-
mentation. In Germany varying quantities mentation. In Germany varying quantities of grape sugar is added to some wines. 2. Do wines
and liquors draw any copper from brass faucets ? A. Many wines do exert a more or less solvent
action upon copper, owing to the free acids which they contain. $3^{.}{ }^{\prime} \mathrm{H}$ ow is ${ }^{\prime} \mathrm{H}_{2} \mathrm{~S}$ most conveniently prepared? A. It is obtained by the action of diuted sulphuric acid on monosulphide of iron.
The gas is ordinarily dissolved in cold distilled The gas is ordinarily dis
water as it comes over.
What fulminate is used in pistol cartridges, and minate is generally employed. Percussion mix-
tures, of chlorate of potash, sulphide of antimo-
ny, sulphur, and gunpowder, and chlorate of ny, sulphur, and gunpowder, and chlorate of
potassa and amorphous phosphorus, are used to imited extent.
(3) D. W. asks: How many lbs. pressure will it require to break a cast iron beam in the center supported at each end? The beam is 36
inches long, 13 inches deep, and 1 inch thick. A inches long, 13 inc
About $100,000 \mathrm{lbs}$.
(4) C. E E Es.
(4) C. E. E. says: I have a pleasure boat propelled by an engine 6 inches in diameter by
inches stroke, which makes 200 revolutions minute, using steam at 100 lbs . pressure in the boiler, cut off at one half stroke. I wish to attach a surface condenser to it; please inform me of
what size it should be, etc.? A Make the conwhat size it should be, etc.? A Make the con-
denser with from $5 / 8$ to $3 / 4$ as much cooling surface as your boiler has heating surface. Use small cubes, quite thin, full particulars of which you
can obtain from a manufacturer. If you only wish to condense the steam to use as feed water you can discharge it into a pipe immersed in the water, and use a small air pump. By this ar-
rangement, which is in use on several smal teamers, you do not require a circulating pump (5) A. M. asks: If I have a cylnnder of nches bore, with an airtight piston in it, how much pressure do I get by compressing the air
into any fractional part of the cylinder ? A. If into any fractional part of the cylinder? A. pressure varies inversely as the volume. For the case in which there is no gain or loss of heat, se nswer No. 26, October 7, 1876 .
(6) J. F. asks: How can I make a paste or
paint for marking flour sacks? A. The aniline colors are perhaps the best materials you could use for the purpose. There are, of course, many other marking fluids that might give proper sa
isfaction as to application, durability, etc ; but they are al more or less difficult to extract from the fabric after application. The aniline color may be removed completely and with facility by the addition to the washing water of a small per entage of spirit of wine or wood spirit.
(7) E. M. C. says: By what process can I
soften plaster of Paris which fastens the brass soften plaster of Paris which fastens the brass
burners to lamps? A. Use plenty of water and burners to lamps? A
mechanical exertion.
(8) F. A. H. says: I have seen the idea ad vanced of lubricating sewing machines and othe think of it? A. It has been used, we believe with very good results. Dilute it with water.

1. What is the difference between writing in 1. What is the difference between writing ink
and writing fluid? A. In ordinary ink the iron and writing fluid? A. In ordinary ink the iron salts and otber ingredients are merely in me-
chanical mixture, being prevented from settling chanical mixture, being prevented from settling
to the bottom by the addition of gums, etc. In the writing fluids, so-called, the ingredients are
all in true solution. 2. What is copying ink? Copying inks contain sugar; in other respects dey differ but little from ordinary ink
(9) A. M. asks: 1. How can fnded silverlated ware be restored? A. Have it replated This is the cheapest and best method. 2. I have with a cotton regs and though this solution applied a splendid appearance, yet it does not stiek long. Is it hurtful to use spoons or forks thus silvered A. The mercury is very poisonous.
(10) E. A. asks: Can you give your readers any more details concerning the recipe in your
No. 17, vol. 30 , for making compressed yeast? A. The precise mode of preparing this ferment is more or less a trade secret. Make the mash in the ordinary way, of 1 part of bruised barley malt with 3 parts of bruised rye, the mash being cooled
with the fluid portion of the wash. Add sufficient yeast to start a brisk fermentation, gather the newly formed yeast as it rises to the surface, wash well with water, and place in a stout canvas bag under a press, by which means it may be btained asa stiff clayey dough. It is better to mix the yeast with from 10 to 20 per cent of po-
tato starch. Many of your questions you can best answer for yourself, by experiment. you can
(11) T. R. A. asks: 1. What substance
the worst conductor of beat? A. The poorest heat conductors are found among organic sub-
stances: feathers, cotton, wool, straw, bran,wood, etc. 2. How may it be formed into a paste, to be baked and glazed as pottery ware is done? A. This is impracticable.
(12) T. A. J. asks: How can I collect mercury after it has been dissolved with nitric
acid and diluted with water? A. Precipitate the acid and diluted with water? A. Precipitate the strong solution of caustic potash or soda (caustic alkali), decant the supernatant liquid, dry the precipitate, place it in an iron retort, the beak of which or its connection just dips below the sur-
face of cold water in a suitable vessel, and heat the retort strongly over a good coal fire until the pure mercury is all distilled over. It is advisable with water before drying it, previously to placing it in the retort.
How can I make a good carbon battery that will be strong and cheap? A. Place a suitable porous cup of unglazed porcelain in a glass or earthenware jar, and surround it with a thick
piece of zinc. Fill the outer jar to within about piece of zinc. Fill the outer jar to within about
2 inches of the top of the porous cup with water, to which add about 2 ozs. of strong oil of vitriol. Place the plate of carbon in the porous cell, and surround it with a solution made as follows: In a pint of water dissolve 1 oz . of bichromate of potash, and add to this 2 ozs. of strong oil of vitrio allow to cool before using. If the end of a cop-
per wire of any length be connected, one with the carbon and the other with the zinc, the current will run through it from the carbon end to the zinc.
(13) H. G. W. asks: Why is it that, if we make a small hole through a piece of paper and
hold it up before the eye at a distance of about 1
inch, and pass a needle down over the hole on th off from the bottom first? A. As the images of
of the the light appers to be cu all objects are inverted in the eye, when any ob-
ject goes down, the image in the eye goes up ject goes down, the image in the eye goes up and as the rays of light cross in passing throug smail holes, the going down on
alent to going up on the other.
(14) I. G. O. asks: What is the best method o extract the oil from belts that have got satur-
ted therewith? A. Wash with soap and warm ated therewith? A. Wash with soap and warm
water.
(15) E. F. asks: What acid can I use to use again? A. It is easiest purified by distilla-
(16) W.J. says: I notice that the connecting rods of most of the small American engines are connected with their straps by means of
bolts and one key. What advantage is there in bolts and one key. What advantage is there in
using these bolts? Is not the gib and key just as good? A. If a connecting rod strap is held to the rod by a gib and key, the brasses must meet at
the joint so that the key can be driven tightly home, thus locking the strap. If the joint of the brasses is left open so that driving in the key will take up the wear without having to flle off any of the face of the brasses at the joint, the key in no way acts to lock the strap at all. If the strap is locked to the strap by bolts, it is no matter whe-
ther the joint faces of the brasses are left not; the strap will always be held securely in position, and its wear will be considerably less. The bolts hold the straps more securely and enable us bolts bold the straps more securely and enable us
to keep the length of the rod as nearly correct as
possible by putting the key at one end inside and possible by putting the key at one end inside and
at the other end outside of the brasses, as shown at the other end outside of the brasses, as shown
on p. 490, vol. 2 , of the Scientific American Supon p. 490,
PLEMENT.
(17) S L. S. says: Does the use of coal oil on a mechanic's oilstone harden
It hardens stones of most kinds.
(18) S. N. M. asks: Is there not an error in the numbers given on p. 185, vol. 3.5, under title of
"New Arrangement of the Spectroscope?" We have addressed Professor Young on the subject, and his reply is as follows: "The numbers are both given wrong. Calculation assigns for
the velocity of the sun's surface $1: 246$ miles per second. My observed velocity deduced from spectroscopic observations was 1.42 miles. At lected to apply a correction for the latitude of the point on the sun's limb at which the observation was taken, and this made a little more diference than I expected."
(19) C. S. asks: What metal or combinaion of metals would be best suited to take a
sharp cast? The metal commonly used to tak casts from paper molds scorches the paper, and want something that melts at a much less temper-
ature. A. Try the following fusible alloy, which ature. A. Try the following fusible alloy, which
fuses below the boiling point of water, at $201^{\circ}$ Fah: Two parts of bismuth, one of lead, and one
(20) B. M. R. asks: When two shadows are brought near to each other, why do they seem to protrude toward each other and touch? A. The edges of shadows are not sharp, and when they
are brought near together the edges overlap and become visible. When single edges overiap and ible.
How
How does thunder turn milk sour? A. It is will coagulate the albumen in the milk; and it enders the sensitised gelatin, used in the carbon photo process, insoluble.
Do the trees of Australia turn their leaves edgeways to the sun? A. There are some instances in which they do, but not generally. The native
trees are all evergreens. Some shed their bark and not their leaves. There are in Australia plums with the stones on the outside. There does not appear to be any general law governing the growth of vegetation there.
What is the cause of equinoctial storms? A. Observations extending over a large number of years show that we have more storms when the
sun crosses the equator than at any other time. What people of ancient Greece spoke the language now called Greek? A. None.
(21) H. S. G. asks: Do you know of any der from a gold watch case? A. If the solder is
what you say, strong nitric acid will remove it what you say, strong nitric acid will remove it
without injury to gold ; but before you try the without injury to gold; but before you try the
experiment, be sure that the watch case is of gold.
(22) C. A. W. says: I am building a rustic ence of cedar poles, keeping the bark on; but I And that after a time the bark begins to fall off,
which of course disfigures it very much. Is there anything in the way of a varnish, etc., which would prevent this? A. The usual course is to remove the bark in the first place as neatly as
possible, so as to preserve the smooth surface of possible, so as to preserve the smooth surface of
the cedar intact. With a little care, this can still be done with your fence, and will save you furtrouble in this respect
(23) D. H. says: I am wearing a plaster with onezinc and one copper plate connected by
a wire. Will the verdigris which is formed, the skin being in contact with the copper, produce injurious effects? A. Possibly not verdigris, but other copper salts may be formed thatare as objectionable and injurious.
(24) A. F. T. asks: 1. How can I dispel the
bad odor arising from a damp wall indoors? A bad odor arising from a damp wall indoors? A.
If the wall is now papered, the bad odor may arise from thedecay of the paper and paste. Strip
off the paper and wash out the paste, etc. 2. How could this wall be best repaired,so that wall paper could this wall be best repaired,so that wall paper
would stick and would not become discolored? The dampness was caused by water escaping into
the cellar, which has since been flled up with yel-
low clay, the dampness and bad odor only bein. A. Place vertical furring strips on the wall 12 inches apart, and lath and plaster it anew. 3. Could the dampness of the wall have been caused by grass growing alongside the wall on the out probably comes up from the bottom of the wall by capillary attraction.
(25) A. C. asks: How can I make a steam nothing but pipes and fittings? A. Such pumps, as ordinarily constructed, require nozzles of a peculiar form, and we scarcely think that you can accompllsh the same object with common pipe
(26) H. \& S. ask : 1. Do the journals of the crank shaft of an engine support the whole weight of the fyywheel, or is it partly taken off by the whecl is in running balance. If it is unbalanced the centrifugal force will take off weight at one
part of the stroke, and increase it at the other. . Our flywheel is 9 feet in diameter, with a rim 5 segments, and weighs $1,500 \mathrm{lbs}$. It is made in $51 / 2$ inches, made secure in a center by 12 bolts. ize of engine running her at 100 renk shaft nches in diameter. A. Yes, if the wheel be well built.
(27) IT. A. H. asks: What is diastase? A.
During the germination of seeds, the starch unergoes a gecies of fermentation and is con verted into a mixture of dextrin and sugar, in Thich state it is assimilated by the young shoots iar ferment termed diastage, which cxists in all erminating seeds during the act of growth, be ng probably merely albumen or gluten in a pe uliar stage of decomposition. An impure solution of diastase may be obtanned readily from malt or freshly germinated barley by grinding it mowtening it to tand for a few minutes, ng out the liquid. Malt does not contain mor than $1_{-1}$ th of its weight of diastase. Diastase is not a commercial article.
(28) E. W M. says: 1. Can you inform me arough your valuable paper how an artesian we is sunk? A.Sometimes a drill like an auger is used. n rock, a drill is nccessary. 2. Are drive pipes driven well, a tube is sunk as fast as the hole is bored. 3. How do you ascertain when you have
struck water? A. The presence of water can be scertained by sounding, or by the aid ef a smal pump. It is by no meanscertain that an artesian well can be struck in any locality simply by bor ing.
(29) A. W. G. asks: Can you tell me what
will render horn transparent, or nearly so, and ufficiently soft transparent, or nearly so, and rden again when dry. A. Try muriatic acid.
(30) G. H. asks: 1. I wish to bring water 5 feet and there will be a head of 2 feet wher he water enters the pipe. What quantity pe day would be conveyed through a pipe 1 inch in iameter, and to what hight would the water be hrown at the lower end? A. The hight to which he water will rise at the discharge end of the pipe will depend upon the velocity. According to Weisbach's formula, if the pipe is straight and
mooth, you can raise the water about 14 feet for discharge of ${ }_{7}^{7}$ of a U.S. gallon per minute, ou can discharge about $21 / 4$ gallons per minute a the lower level of the pipe. 2. Will iron gas pipe answer? A. Yes.
(31) J. E. D. asks: How high will water rise ifrom a $1 / 6$ inch or $1 / 4$ inch jet if brought 1,200 eet in 1 inch pipe, with a fall of 18 feet? How many gallons per hour would flow through sai in diameter, you can probably throw a stren 14 inc rom 10 to 12 feet high, and discharge about 60 U . s. gallons per hour
(32) S. D. P. Jr. says: Is it a settled fact hat our best turbines yield a greater percentage power from the same amount of water than pecially where the stream is variable? A. In th ase of a variable stream, experiments seem to a good turbine. When the head and discharge are constant, the principal advantages of tur bines over overshot wheels consist in less weigh and greater velocity, so that less gearing is ordiaarily required.
Minerals, etc.-Specimens have been re ceived from the following correspondents, and examined, with the results stated
G. A. C.-It is fool's gold (sulphide of iron).are mixed up with sand and a little felspar.-J. K Cal.-It is sulphate of lime.-J. K., Texas.-It is soda.-C. E.-It is diorite.

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On an Intra-Mercurial Planet. By W. M. R
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T. D.-R. W.-J. B.-G. M.-G. H.-D. L-W. B.
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ook cover, c. w. Hill.
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