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| THE NEW POST OFFICE, NEW YORK CITY. <br> On Saturday, August 28, the Post Office Department of New York city moved into the new and handsome structure erected at the south end of the City Hall Park. We give herewith an engraving (Fig. 1) sbowing the south and west fronts, and giving a good qeneral idea of the outer appearance of the structure. <br> The new post office is by far the finest edifice in this city. | The immense size, beauty, symmetry, and strength of the building, and all its splendid internal arrangements, can only be adequately realized by a close inspection. Ground was first broken on August 9, 1869, and it will have cost, when completely finished, about $\$ 8000,003$. The general plan is an immense triangle, inclosing an open triangular court. The light from this court extends down through three glass tesselated floors to the sub-cellar. The court is entire- | ly open down to the first story. All the upper stories are well lighted and ventilated by this open space. The building, which is fireproof throughout, occupies 21 city lots, has a frontage on Broadway of 340 feet, on Park Row of 320 feet, on the City Hall Park of 200 feet, and at its southern side a frontage of 130 feet. The hight from the sidewalk to the lantern crowning the dome is 105 feet. The first two Continued on page 178. |
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Fig. 1.-THE NEW YORK POST OFFICE.

## Srientifir gmoritan.

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VOLUME XXXIII., No. 12. [New Series.] Thirtieth Year. NEW YORK, SATURDAY, SEPTEMBER 18, 1875.


## the woodbury patent.

In our number for January 9. 1875, we gave an account of the strange proceedings before the Patent Office, conducted under the immediate auspices of the then Commissioner of Patents, Leggett, by which that officer granted a patent for an old device that had been in common use for about a gene-
ration. This is now known as the Woodbury planing maration. This is now known as the Woodbury planing ma chine patent: the particular claim allowed by Leggett being through the machine. The patent as granted by Leggett is so drawn as to render every form of planing machine or lumber-dressing nachine an infringement of the patent consequently, if the patent can be sustained, it will be Big Bonanaz floor, must pay tribute to this patent. A large amount of money was spent iu obtaining the patent; and as soon as it was granted, a still larger sum was subscribed, and a join stock company was organized to endeavor to sustain it Leading lawyers were retained, and intimations circulated expressive of the determination of the company to exhaust every possible resource which money could command to en force the patent. Users of planing machines were given to
understand that their interests would lie in supporting, not in opposing the patent. By quietly submitting, they were promised the enjoyment of licenses under the patent for a small sum ; but in case of opposition, they were liable to los to this pressure, and took licenses. But the great mass of lumber dealers resisted, and joined in a united effort to test the validity of the patent, in a legal manner, before th courts, forming, for this purpose, a National Committee o Defense. It is now alleged that certain members of the executive committee of this association have turned traitors,
have accepted bribes from the Woodbury Company, and are now working, not to defeat, but to uphold the patent.
The following letter, published in the Northwestern Lum berman, gives a resumé of the situation:
the case of woodjury versus the planing-mill men.
Boston, July 26, 1875.
This case, one of the greatest in the whole annals of patent litigation, is still undecided, and, as the months roll on, even
gains in interest. In 1874, Joseph Page Woodbury invented, or claimed to have done so, a flexible pressure bar as an attachment to planing machines, to shpersede the heretofore commonly used
roller. The advanta ces claimed for it were that owing to the close proximity in which it could be placed to the rotary cutand, from its ready and varied adjustment, admitted of the speedy insertion of any thickness of board or plank.
On April 29,1873 some twenty-five or more yeara after his for his invention four points embodying the principles stat for his invention four points embodying the principles stt
forth above. Since the time of securing this patent the Wodbury Patent Planing Machine Company (Mr. Wood-
bury himself died some months since) have demanded from
all us:
alty:
The company has determined to charge a preliminary fee
of $\$ 0$ on euch machine using said invention and that all of \$0 on euch machine using said invention, and that all
ianing, tongueing, and grooving machines, and all molding Ylaning, tongueing, and grooving machines, and all molding
machines, which cost $\$ 300$ and upwards, using said invention, shall be considered first class machines, and to pay a
royalty of $\$ 200$ per annum, payable quarterly; and if said royalty of $\$ 200$ per annum, payable quarterly; and if said
quarterly license fees are raid within the first fifteen days from and after the first day of January, April, July, and October, respectively, a discount of twenty per cent shall be made. All other planing machines and molding machines Ma be considered decond class machines, and to pay a royalty
of $\$ 100$ per annum, payable quarterly, subject to the same of $\$ 100$ per annum, payable quarterly, subject to the same
terms of discount as the machines of the first class; and the company has determined to grant no licenses until the damages and royalty from the date of patent, April 29, 1873, to from pamphlet of Woodbury Patent Planing Machine Com from
pany.
"so
"So much for Buckingham!" Immediately on the issue o the Woodbury demands, the leading lumbermen, who were users of these pressure bars, and which they had been using unquestioned for the past twenty-five years (and they clain
that similar bars had been in use before the invention of said Woodburg), formed themselves into a National Executive Commictee of Defense, with W. N. Greene, of Bronsons, Wes ton \& Greene, Burlington, Vt., as chairman, N. M. Jewett, of
Jewett \& Piicher, Boston, Mass., as treasurer, and W. W rapo, of Crapo \& Co., Flint, Mich., these being the genera officers. This association, to defend the manufacturers and asers of pluning machines against the claims to royalty de manded by the Woodbury company, soon grew to vast pro-
portions, and now includes the loading lumber and planing poill men in all the princinal lumber cities of the Union,
mumbering in all some six huadred and fifty firms. Then the numbering in all some six huadred and fifyy firms. Then the
Woodbury Company endeavored to compromise with the ex Woodbury Company endeavored to compromise with the ex-
ecutive committee, hoping thereby to get injunctions against all other users of planing and molding machines, as they would not be strong enough to make a defence; whereat the
manufacturers of planing and molding machines foreseeing manufacturers of planing and molding machines, foreseeng
the danger and loss to their customers, pledged themselves to support the association, and urged its continuance in the
courts. All of which Mr. H. B. Smith, of Smithville, N. J., treasurer of the Manufacturers' Defense Association, mos concisely sets forth and ably advoca
Neco Jersey Mechanic, of July 1, 1855.
Neco Jersey Mechanic, of July 1, 1855.
Caleb Cushing, Hon. Wm. M. Evarts, Hon. Caleb Cushing, Hon. Wm. M. Evarts, Hon. E. Pierrepont,
Hon. B. K. Curtis, and John T. Drew, Esq. The Woodbury Company have Benj. F. Butler, with some others of note. The association have published pamphlets and papers
pithily presenting their position in the case, one of the most pithily presenting their position in the case, one of the most
witty and concise of which is quoted: "If a man can file a witty and concise of which is quoted: "If a man can ife
claima to an invention in 1848, have it rejected in 1849, and claim to an invention in 1848 , in 1852, and then obtain a patent in 1873 under one clause of a law, while he violates an other clause,and enlarges his claims and it creases his combi
nations, we certainly think Noah might, through some de nations, we certainly think Noah might, through some de
scendant, get a patent on steamships on a claim of havid been the inventor of the ark.
So the case now
So the case now stands, having developed itself into a
very pretty controversy in which we must confess our sym very pretty controversy, in which we must confess our sym-
pathies are wholly with the manufacturers aud users of planing machines. "But with the strong rests the victory." One of the later developments of the case here is the
withdrawal of two of the prominent lumber firms from the association, to form a combination with Almy and some other inventor of a bar similar to Woodbury's, they to work in unison against the association of which they were former emare of the stock.
It appears, further, that the Attorney General of the United States has issued an order for scire facias proceedings against the Woodbury Patent Planing Machine Company on
account of fraud in its procurement. It is suspended until account of fraud in its procurement. It is suspended until
October 15, 1875, to enable the Woodbury Company to file October 15, 1875, to enable the Woodbury Company to fil
The Woodbury Company has brought suit against several parties using machines. The first case is that of Hancock \& Greeley, Cambridgeport, Mass., the trial of which is likely o come on in the course of a year.

## shall we eat the horse ?

We have spoken from time to time of the progress of hip pophagy in Paris, regarding the same as an experimen which there was no particular need of putting into practice ing horse flesh as feless be demonstrated that, in yaluabl and palatable meat, of which there is sufficient quantity argely to augment our existing aggregate food supply Supposing that the horse came into use here as food, it can e easily shown that the absolute wealth in the country would thereby be materially increased. In France the aver ge price for horse meat, as compared with similar cuts from he steer, is about two fifths less. A horse is there sold to
the slaughterer for from $\$ 10$ to $\$ 15$. Estimgtinerer for from $\$ 10$ to $\$ 15$.
Estimating from this that $\$ 10$ is the gross value of every horse in the United States, over and above his worth
for working purposes, it remains to be seen how much of for working purposes, it remains to be seen how much of
that sum may be set apart as to be derived from his utiliza ion for may set apart all to be derved the French butchers derive a. Anue from hide hoofs, hair, etc., and as is well known, the same portions of the animal find industrial uses here. Placing the value of these parts of the carcass at $\$ 7$, we find that $\$ 3$ is the net value of each horse or alimentary purposes. In round numbers there are about million horses in the country. According to the above howing, we must add three dollars to the value of each orse, since, in addition to his value as a worker or as a raw Consequently the aggregate value of all the horses is inreased by $\$ 30,000,600$. But this accretion to the wealth in he country is of course not convertible into actual money, for, so long as the working value exists, the food value as well as the manufacturing value are practically at zero; ne1negatived. But there is a certain easily ascertained an-
nual proportion of the horses of which the working alue becomes less than the sum of their food and manufac turing values, and this proportion includes the class of which he working value is more than their manufacturing value but less than the above sum. We may estimate roughly hat one tenth of all the horses reach this condition yearly. Then, on this million animals, the food value is directly real zable, and therefore the wealth of the country may be con sidered as actually increased by the $\$ 30,000,000$ derivable herefrom.
Moreover, in order that the horses should be available to he butcher, they must not be diseased or worn out. By this he owners are directly benefited, since, while on one hand hey are obliged to sell their horses in fair condition, they re saved the expense of keeping the animals when the lat ter become used up and are unable to do but light work, hough requiring more attention and more feed. So also with colts, which, whetherthey become good or bad horses, cost about the same to raise. If the animal bids fair to turn ut poorly, he can be disposed of at once and at a remunera tive price. The result of this weeding out in youth and de troying when old, coupled with the facilities which the for mer affords of selection of the best types, will naturally conduce to the improvement of breeds and a general benefit o the entire equine population of the country.
We can adduce no more striking example of the art of utilization than the mode in which the French deal with their superannuated chargers. Onthe 1st of January last France contained fifty horse abattoirs, and during last yea onsumed $2,850.144 \mathrm{lbs}$. of horse, mule and ass meat. The lesh of each horse weighs about 350 lbs . The skin is sold the tanner for $\$ 2.50$. The hair of the mane and tail etches three cents. The hoofs are bought by comb, or toy or sal ammoliac, or Prussian blue, makers. The tendons are taken to glue factories. There are about ninety pounds of bone, worth sixty cents. The intestines, for purposes of manure, or as food for dogs, cats, and pigs, bring five cents. The blood is purchased principally by the sugar refiners, but also by fatteners of poultry and fertilizer manufacturers. Twenty pounds of dried blood, which is the average, ar worth forty five cents. The fat goes to the soap kettle, or is transformed into genuine " bear's grease," which, delicately perfumed and elegantly put up, fetches some exorbitant prices in the apothecary stores of the United States; or else is used as harness grease or as lamp oil. The yield s from twelve to eight pounds, at a value of ten cents a pound. Finally, it is said that even the waste flesh is al owed to decompose, and the maggots gathered as pheasan food, but this seems rather apocryphal. These utilizations are of course entirely outside the food supply.

## MR. DAWSON'S IDEA OF EVOLUTION

According to the reporters, the mantle of Agassiz has fallen upon Principal Dawson of Montreal: Agassiz dead, Dawson emains the great American opponent of Darwinism. The honor may be thrust upon him unsought; nevertheless it is ot wholly undeserved. At least, in his zealous opposition to the drift of the scientific thought of the day, he has no American rival-that is, in the scientific field.
We do not think the less of him for that. Next to the man who suggests a new and better way of interpreting the acts and phenomena of Nature, the most useful man is he who most intelligently opposes it. It is through such oppo ition that errors are weeded out, and exact trath ultimately prevails. Occasionally the victory of a good theory, like he undulatory theory of light, may be delayed, and a bad heory kapt in power by too strong an opposition: but th amage done thereby is more than offset by the good effected through the criticisms which innovating theories meet at
the hands of those who stand by the old. It is for this reaon that we rate the opposition of a man like Agassiz nex in usefulness to the constructive work of men like Spence ad Darwin. Wheu such opposition fails to shake a new heory, we may rest. assured that it is not based upon a de

But the opposition must be genuine to be useful. It must ot call something else by the name, and expect the crown of victory for demolishing the substitute. That is a trick of theologians, rarely resorted to by men of Science; but we fear, it is precisely what Principal Dawson has, con ciously or unconsciously, been indulging in. We may be rong, but to our mind his faculty for misapprehending the osition and arguments of intelligent evolutionists is some thing marvelous in a man of his acknowledged scientific ability. In Dr. McCosh it would not be so surprising.
We refer to his address at Detroit, in which he reviews at great length the geological record of life's origin, and in ists that the facts are overwhelmingly against the theory f specific evolution through natural causes. What he un derstands by evolution is nowhere distinctly affirmed, though it is clearly indicated in numerous passages. That it is very different from the understanding of the living disciples of volution is plain enough from assertions like the followDis:
Discussing the insufficiency of evolutionary hypotheses, he ays: "We have all no doubt read those ingenious, not to ay amusing, speculations in which some entomologists and otanists have indulged with reference to the mutual rela tions of flowers and haustellate insects. Geologically, the acts oblige us to begin with cryptogamous plants and man dibulate insects; and out of the desire of insects for non-ex istent honey and the adaptations of plants to the require ments of non-existent suctorial apparatus, we have to evolv he marvelous complexity of floral form and coloring, and the exquisitely delicate apparatus of the mouths of haustellate insects."

Believing Dr. Dawson to be an honest man, the only inference we can draw from a sentence like the last is that he utterly misapprehends the views of modern evolutionists. Certainly nothing in the writings of Wallace, or Darwin, or Lubbock, or Gray can be found to sustain such an ultra Lamarckian method of development. To be guilty of such a mis.statement of the position of another is to forfeit one's claim to any respect as a scientific critic. Even Agassiz' mantle will fail to cover errors so gross and obtrusive.

## THE NEW DEPARTMENT OF AESTHETICS.

Professors of the humanities have ever been inclined to look down upon the pursuits of naturalists as little becoming the refinement and dignity of gentlemen and scholars. They have delighted to picture such as turn their attention to the inferior world as eccentric fellows, chiefly employed, like the unfortunate spouse of Lady Jane in the "Ingoldsby Legends," in bug-chasing and poking into all sorts of dirty places for the ugly things that squirm in filth and darkness, solving the infinite (unlike the Breitmann) as one eternalevolution!
We fancy that the cultivators of polite literature will therefore be taken somewhat aghast by the address of the retiring President of the American Science Association, espe cialiy by that part in which he serenely asserts that the chief requirement of the modern naturalist is an inborn and nighly developed æsthetic faculty.
In the physical sciences everything depends on accurate observation, with strict logical consequences derived therefrom. In biology, on the contrary, while the basis of knowledge equally depends on accurate and trained observ́ation, the logic is not formal but perceptive. Consequently the first requisite for excellence in this crown of the sciences is $æ$ sthetic perception.
Savages are usually keen observers, but they would not make good biologists: they lack artistic tact. The native Australians furnish an illustration. In them the absence of this faculty is complete. Oldfield relates that when one of them was shown his own portrait he called it a ship, another said it was a kangaroo, not one in a dozen identifying a portrait as having any connection with himself. Professor Le Conte gives a higher illustration of the same incapacity in a well known class of travelers. Having penetrated to the inmost chamber of the temple of Art, even the Hall of the Tribune at Florence, they stand in the presence of the most perfect works of art, and gaze upon them with the same indifference that they would show to the conceptions of the mediocre artists exhibited in our shops. Perhaps they even wonder what one can find to admire in the unrivaled collection there assembled. They may be highly educated, and good and useful members of the social organism; but they lack the æsthetic sense which enables one to enter into spiritual harmony with the great artists whose creations are before them.
Such unæsthetic and unappreciative persons would not delight a Ruskin, as students of Art; nor would a professor of rhetoric be hopeful of making poets of them. Professor Le Conte maintains that they would make no better students of biology. The æsthetic character of natural history makes it for ever beyond them, just as it prevents the results of its cultivation from being worked out with logical precision.
This view of the fundamental difference between biological and physical science claims accord with the views of such mastess of biology as Helmholtz and Huxley. To the genius of the artistic interpreter more than the patience of the collector its future progress will bedue. A rising giant has invaded the domain of polite literature, and the humanities must make room!

## LIGHTNING RODS.

We published, in our last number, a very interesting communication from Mr. George B. Prescott, the electrician of the Western Union Telegraph Company, concerning an alleged electrical phenomenon, observed during a thunderstorm, within a private dwelling, and described by a correspondent in our paper of August 14, 1875.
The phenomenon in question consisted of electrical dis. charges from the water and gas pipes of the dwelling, which was furnished with a lightning rod. The question was as to the cause of the electrical manifestation. Mr. Prescott believed that it was due to the defective connection of the lightning rod with the earth ; but in order to satisfy himself fully in the matter, he took the trouble to send an assistant to the locality, and subject the premises, pipes, and rod to actual electrical tests with the galvanometer.
The result was that the lightning rod was found to be so sadly defective in its ground connection that it could not conduct the electricity into the earth, except feebly; and whenever a thunderstorm occurred, the house became charged with electricity, and the current, being unable to pass down the rod, made its way through the building to the details given by Mr. Prescott are quite interesting. He advised the immediate connection of the rod with the water pipe, which would thus to serve as an extensive conduct. ing terminal for the rod, ensure the safety of the building, and put an end to the electrical manifestations among the pipes before mentioned.
This case is a representative one, as the rod was pat up in the same defective manner as are the majority of rods, that is, the bottom of the rod was simply stuck down a few feet into the ground or rock, and thus practically insulated. We have repeatedly advised our readers that a lightning
roc, in orcigr to serve as a protection for a bui.ding, must rod, in oriar to serve as a protection for a bui.ding, must
have a large conducting terminal in the earth. This termi.
al may consist of an iron water pipe, as in the present case, or a very considerable extension of the rod itself into wet or
damp earth; or a trench, filled with iron ore or charcoal, damp earth; or a trench
The aggregate annual losses of life and property in this country, by the striking of buildings by lightning, is im. mense, but might be almost wholly prevented if properly arranged conductors were generally employed. But it is evident that a more intelligent class of lightning rod men are needed in their erection; and it is probabie that electrical instruction must also be given in our common schools before much improvement can be expected.
If a man, employed to put up a tin pipe to conduct the rain water from the roof to the cistern, were to solder up the bottom of the pipe, thus preventing any flow, his work would be rejected, and he would be stigmatized as a fool. But this is substantially what our lightning rod men are doBut this is substantially what our lightning rod men are do-
ing every day. They put up rods for the alleged purpose of conducting the electric fluid, but seal or insulate the bottoms of the rods so that the fluid cannot flow into the ground; and the majority of employers are so ignorant of the subject that they are unable to detect the fraud.
The known laws that govern the flow of electricity are almost as simple as those relating to water. If a proper connection exists between the rod and the earth, the building will be protected, for electricity will flow through the rod leader same certainty that water if pass bottom of the pipe be sealed, the water cannot run; and if the bottom of a lightning rod be sealed or insulated, the electricity cannot flow.
Tests of lightning rods with the galvanometer, as directed by Mr. Prescott, will al ways show whether they are safe or not. But it may be taken for granted, without a test, that a rod is unsafe which merely has its bottom stuck down a few feet into dry earth. We repeat, the golden rule for safety is to have the bottom of the rod placed in connection with a arge mass of conducting material in the ground.
ANOTHER VIEW OF MR. CROOKES' LAST DISCOVERY. In a recent issue we gave a summary of Mr. Crookes' recent observations on the behavior of delicately suspended pith balls when acted on by a beam of light. In a vacuum the pith balls, and disks of cork similarly suspended, seemed to be repulsed by the light under conditions which demonstrated, Mr. Crookes asserts, a hitherto unrecognized power of light.
Similar observations with substantially the same apparatus were made fifty years ago, so that the discovery is not new if true; it simply reasserts what was generally believed when the Newtonian theory of light prevailed, namely, that luminous radiations are capable of exerting a direct push upon matter. It is strikingly inconsistent, however, with
the now dominant theory of light; and according to some careful observers, it is equally inconsistent with fact. Professor OsborneReynolds suggests that the action of the pith balls or disks is due to the evaporation of some fluid on the surface of the disks, the recoil of the evaporating particles, as they leave the disk, driving it back.
A better explanation, because better sustained by experimental evidence, is that given by Professor Dewar, of Edinburgh, who claims that the heating of the disks is the efficient cause of the action observed. In his investigation Professor Dewar used substantially the same apparatus that Mr. Crookes employed, simply changing the composition of
the disks and incerposing certain substances having well the disks and interposing certain
known effects upon the radiarions.
known effects upon the radiations.
Placing a candle before the appar
Placing a candle before the apparatus so as to cause a large
deflection, he first interposed a vessel of ordinary glass, deflection, he first interposed a vessel of ordinary glass, and
the deflection was diminished. On filling the vessel with the deflection was diminished. On filling the vessel with
water, the disks ceased to be deflected. Now it is well known water, the disks ceased to be deflected. Now it is well known
that water, though transparent to light, is almost opaque to that w
heat.
The experiment was then reversed. A smoked piece of rock salt was interposed, shutting off the light but allowing the heat to pass through. The disk remained deflected: so likewise when a solution of iodine in carbon bisulphide was used, a substance opaque to light but transparent to heat. These experiments show that it is not the luminous radiations which have power to move the pith balls, but the obscure radiations commonly known as heat rays.
The next question was: How do the heat rays produce the motion? To test this, aisks of rock salt (transparent to heat) and glass (transparent to light) were substituted for those of
pith or cork. When a beam of light was thrown pith or cork. When a beam of light was thrown upon the
clear salt no motion ensued, the radiations passing through unabsorbed. When the light was received on the glass, part was arrested, the glass was heated, and the disk was deflected. The effect was reversed when the back of the rock salt disk was coated with lampblack. The radiations were absorbed by the lampblack at the surface of contact; the lampblack was heated and, by conduction, heated the salt, and the result was (at first) repulsion. Were the lampblack a good conductor, it would heat through first, and then there would be repulsion from that side, or apparent attraction. This in a vacuum : at ordinary pressure the motion is always forward from the side of the disk most heated.
Other experiments were made with disks of sulphur, clear and ordinary ; and with transparent disks coated on one side with white phosphorus, which is opaque to the ultra-violet rays. In the latter case, when the disks were acted on by
light, chemieal action ensued with disengagement of heat, light, chemical action ensued with disengagement of heat,
resulting in a motion of the disks away from the side heated. The reverse was demonstrated by bringing ether near a disk; and doubtless the same effect would have been produced by a piece of ice. The chilling substances caused a radiation
of heat from the side of the disk toward it; the distant side became the heated one, and apparent attraction was the result.
Professor Dewar's explanation of these phenomena is sim ple, and does not involve any new or inexplicable power in radiations. The apparent attraction of the disks by light under ordinary pressure is caused, he says, by convection cur rents. The air or gas in front of the disk is heated, and, rising, tends to cause a vacuum ; the disk consequently ad vances, pushed forward by the power that drove the ship of the "Ancient Mariner"
"The air is cut away before
In a vacuum the effect is different: the disk is repulsed instead of attracted-repulsed by the recoil of the residual molecules of the gas, which leave the beated side of th disk at an increased velocity after impinging upon it in the course of their travels.

What takes place is this: The particles of the gas are flying about in all directions, with a velocity which depend on the temperature. When they impinge on the he ted disk, they go off with a greater velocity than those which go off from the colder side, and hence there is a recoil of the disk. When the gas is at all dense the particles get a very short way before they are met by another and sent back, and so the velocity gets to be a common velocity before any visible action takes place. When the gas is rare, the particles may get a long way off before they meet others, and so the may get a long way off befo
The vacua employed by Professor Dewar were formed by The charcoal method, the density of residual gas being re the charcoal method, the density of residual gas being re-
duced to one four-millionth of its density at ordinary pressduced to one four-millionth of its density at ordinary press
ure. In such a vacuum, the average path between two colli ure. In such a vacuum, the average path between two colli-
sions is about 1 foot against an average of one four millionth of a foot at ordinary pressure. It will be seen, therefore that the particles may have relatively a very long way to travel after leaving a disk.
For the benefit of those who have dreamed of securing a profitable direct motive power derived from solar radiations, it may be added that the total work done by the radiations in these experiments did not amount to the five-millionth par of the available energy received by the movable surfaces.

## EXPLOSIONS IN GUNPOWDER MILLS BY ELECTRICITY

 A correspondent remarked, some time since, that the mysterious explosions of some powder mills may probably be due to an electric spark given off by persors dressed in woolen clothing, who, when the air is dry, may (by friction of their clothing or feet) produce from their finger ends a spark of electricity sufficient to ignite a gas jet. He submitted the question whether it would not be possible that men at work in powder mills may create so much electricity in their bodies that, when their hands come in contact with metallic conductors, it may be, if not sufficient to ignite powder, enough to ignite some inflammable gas generated rom the chemica's.This letter has drawn the attention of the London Chemical Review, which states that in England they have often seen in American journals the statement that an electric spark, sufficient to ignite gas, may be given off by the human hand ; but the editor says that he never beard of such cases on his side of the water. We know that the air in England and all the countries of Western Europe is very damp, owing to the prevailing west winds and the absence of extensive areas of dry land, blowing over which the wind would become very dry, as are our west winds, coming over our prairies.
It is asked what inflammable gas may be generated in the manufacture of gunpowder? To this, it may be an swered that, in the manufacture of fulminates for percus sion caps, inflammable vapors, as vitrous ether, etc., ar given off, while the dust of gunpowder and even of charcoal when floating in the air in a proper quantity, may form an explosive mixture. Even the dust from the mineral grahamite, which in its character is very sin ilar to gun powder charcoal, has repeatedly exploded in the mines in Western Virginia, when mixed with air in the right quantity. It is well known among electricians that a weak tlectric spark will more easily explode gunpowder than a strong, in tense spark: the latter will scatter a heap of gunpowde without igniting it, but, when the spark is weakened by without igniting it, but, when the spark is weakened by
substituting for a part of the conducting metal a less consubstituting for a part of the conducting metal a less con-
dacting material, such as water or a moistened thread, then ignition will readily take place.
We acknowledge that we have no positive evidence that powder mills have actually been exploded by electricity; bu the possibility of such a cause was only suggested in our paper, and it must be admitted that this suggestion is no unworthy of serious attention.

Resignation of Commissioner of Patents.
The daily papers announce the resignation of Mr. J. M. Thacher, the present Commissioner of Patents, to take effect October 1. His successor has not yet been announced by the President, but the name of R. H. Duell, of Courtland county, N. Y., is $m \leftarrow n$ nioned as the probable appointee. Mr. Duell is reputed to be a lawyer of considerable ability as well as a first class politician. He was formerly a member of Congress.

New Russian Gun.-A great cannon, lately built at the works at Oboukorsky, has cost $\$ 65,000$, and weighs 40 turs. It is a breech loader, entirely in crucible steel, 20 feet 6 inches long; its largest ring is $57 \frac{1}{2} \mathrm{i}_{\mathrm{L}}$ ches in diameter, and the tube has thirty-six grooves.

Continued from first page fice, and the third and fourth floors by the United States lived, in Jersey City
courts and offices (the interior of the United States Court is shown in our Fig. 2). There are ten elevators for mail matter, and four for passengers. The building looms up grandly above the structures in the vicinity, and attracts and interests the attention of every beholder. The solid walls of the post office contain half a million cubic feet of granite. Every credit is due to the great ability shown by A. B. Mullett, formerly United States Supervising Architect, in perfect ing the plans of the building, and giving to New York an edifice that will be a continual source of pride to it.
The business transacted in the post office in this city is something marvelous, being nearly double that of any other city in the Union. The average number of domestic letters received and distributed daily is 300,000 ; the number of foreign letters re ceived, 30.000 ; the number dis patched, 35,000 ; and the number of local letters received and distributed, 120,000 . There are 5,795 lock boxes for letters, and 372 lock boxes for newspapers. At the post office and stations there are about 1,300 employees, and 390 carriers are employed. In the post office proper there are 600 clerks.

Experience has shown that Mondays and Thursdays are generally the heaviest days. To properly manage a business so vast and so complex as that trans acted in the New York post of fice requires the highest order of executive ability, combined with a quick perception of details needed to systematize the work so as to make one harmonious machine
the elevators.
One of the most noticeable fea tures of the interior of the building is the telescopic hydraulic elevator. Eight of these are used for handling the mails, and four for passengers. Of the latter the two principal ones are located in the wells of the grand cated in the woll spiral stairways which occupy the pavilions at either extrem ty of the north or park front. The elevator cars are of elabo rate design and finish. Their most striking peculiarity, however, is their mode of operation. Imagine an iron telescope about 18 inches in diameter and 30 feet long when closed; set the small end up, with a car resting on the eye piece. Now this telescope, being strong enough to resist great internal pressure, has its three polished wrought iron slides working through watertight stuffing boses; and it is obvious that, when water is forced into it, the slides will be forced out and up, and the car, resting on the upper one, will in consequence be elevated. To lower, the confined water is permitted to escape, when the weight of the car and slides causes a prompt descent. These operations are controlled by a threeway valve, actuated from the car by a guide rope i the usual way; and by its means the beed in ith the usual way, and by its means the speed in either direc tion can be instantly adjusted to any rate, from an almos imperceptible motion to 100 feet a minute with perfect ease
and steadiness. and steadiness.
The engraving, Fig. 3, represents one of the large passen ger elevators extended to its full hight. Their range is from the first to the fourch floors, a distance of about 80 feet. These elevators were built by Messrs. Davidson \& Mars, of 36 Courtland street, New York city.
The foregoing engravings are all executed by the new process of the Photo-Engraving Company, No. 62 Courtland reet, this city, an account of which we give in the sub joined article.

## Photo-Engraving.

The production of metallic plates engraved by the aid of light, for use in printing, was attempted as early as 1813, by Niepce, about twenty five years before the art known as photography was invented. Since then, many attempts at photoengraving have been made, and numerousspecimens of more or less merit have been exhibited; but it is only within the last few years that this art has been brought to such a degree of perfection as to serve a useful purpose.

Among the various inventors in this field, John C. Moss, superintendent of the Photo-Engraving Company, of this city, seems to have achieved the highest success. Being both a practical photographer and a printer, his experience gave him great advantage in his endeavors to prepare plates, by means of photography, to be used on the ordinary typ press. He commenced his experiments with great enthusi asm, in the spring of 1858: but it was not till ten years late that he had so far succeeded as to get his process into prac- THE HYDRAULIC RLEVATORS, NEW YORK POST OFFICE
are ccupied by the post of -
attracted so much attention that he was induced to unite with others in the organization of a company for the purpose of carrying on the work upon a large scale. Accordingly the Actinic Engraving Company was formed. But this did no prove a financial success; and after a year and a half it wa

| mbarrassing circumstances, and subsequently, for a few |
| :---: | :---: | \(\begin{aligned} \& Actinic ang <br>

\& prove a fina <br>
\& abandoned.\end{aligned}\)


Fig. 2.-THE UNITED STATES COURT, POST OFFICE BUILDING, NEW YORK CITY.

There are some inventions which, though of great value are slow in winning their way to public favor. This proved to be one of them. There ex isted in the minds of many pub lishers a strong prejudice against process engraving, due to the fart that several prccesses had been introduced, of which the had made trial with very unsa tisfactory results. Time was re quired to prove that Moss' pro cess was not like the others.
Another and perhaps greater obstacle was met in the reluc tance of artists to adapt thei style of drawing to the require ments of this new art. The had been accustomed to mak their drawings with pencil and brush, often hastily, leaving the work to be perfected and finished by the slow and tediou toil of the wood engraver. Now they were asked to furnish pen and ink drawings, executed with the care and exactness ne cessary to secure the desired re sult. Their first attempts were generally failures, increasing the indisposition to change.
But Mr. Moss had pursued his invention too long to be dis heartened by these obstacles and delays. A new organization -the Photo Engraving Compa ny-was formed, something more than three years ago. Ex pensive apparatus and machine ry have been introduced, impor tant parts of which have bee invented and constructed ex pressly for this use; workmen have been carefully trained to perform their respective parts a corps of artists, patiently in structed, have become skillfu in the style of drawing required by this method of engraving and the process itself has, in several respects, been essential ly ehanged and improved.
One of the methods devised by Mr. Moss to save labor in the production of pen drawings is this: The copy from which the production of pendrawings is this: The copy from which
a drawing is to be made is photographed double the size of the plate required, on arrowroot paper, and then fixed and well washed, but not toned. Directly upon this print the drawing is made with a pen and india ink. When the out lines and all the important parts of the drawing are com plete, a saturated solution of corrosive sublimate in alcohol is flowed over the drawing, which bleaches away the photo graphic color without at all injuring the lines in ink. The finishing touches are then added, when the drawing is ready to be reduced and engraved. Thus the tedious operations of sketching and tracing are obviated, and a degree of accurac is secured which it would be difficult to obtain by any other means.
It should be observed here, however, that drawings are not required for all the engraving done by this company, since a large part of their work consists in the direct repro duction of woodcut, lithographic, and steel plate prints, eithe of the same size as the originals, or of reduced or enlarged sizes.
Up to the present time this company has engraved ove 50,000 relief plates, measuring over 500,000 square inches and it is estimated that, with about 60 employees, they ar annually performing an amount of work that would require for its accomplishment at least 1,000 skillful wood engravers. The view of the New York Post Office Building, on ou first page, was engraved by this process from a pen drawing made by one of their draftsmen.

## The English Polar Expedition.

News has been received in England from the polar expedi tion, which sailed early in the summer. Both ships had ar rived at Disco, Greenland, after a pleasant voyage, and pre parations for pushing further north were in active progress During next spring six sledges will start for the pole. One sledge will leave the party and return every week or so, trans ferring its surplus provisions to the others. When the ex ploring party is thus reduced to one sledge, that will push on alone and reach the pole by itself. If this is done satis factorily, and all the surveys are completed, the expedition will be able to return to England during the autumn of 1876.

Mr. Proctor, the celebrated English astronomer, who lectured in thiscountry two years ago with so much success is about to come again. $H e$ is an able and interesting speaker

## IMPROVED UNIVERSAL GRINDER.

The new emery grinder herewith illustrated is so constructed as to facilitate operations upon a large class of wor done by machinists, stove fitters, and others, which cannot conveniently be performed upon horizontal machines. The principal feature of the device is the manner in which the wheel may be adjusted to work at any angle by simple mechanism, involving the use of no extra pulleys and belting.
ly among these may be mentioned the means by which ho mogeneity of structure is attempted to be secured. In ordinary practice steel is at present, to a large extent, cast into ingots which are honeycombed more or less by bubbles of gas distributed through the structure; and after solidification
has taken place, it is attempted to displace these bubbles by the process of cogging, hammering, and rolling the material while in a heated state. During the earlier stages of this
procedure. In casting ingots it not unfrequently happens that the bubbles of gas are largely formed near the outer surface ; and during the processes of reheating, these bubbles are apt to be opened up by the wasting of the surface, thus affording opportunities for the entrance of dirt and the formation of scale within the bubble cells, and, as a necessary geneous mass. Under these circumstances, and inasmuch as


## SANFORD'S UNTVERSAL GRINDFR.

Fig. 1 shows the grinder arranged for acting upon vertical work; in Fig. 2 the wheel is represented inclined.
The wheel shaft is mounted in bearings in the frame, A, which, by means of a set screw passing through a slot, "is secured to a shank which enters a socket on the standard, B. The shank, by loosening the set screws which confine it in the socket, can be drawn out to tighten the belt which, acting on a pulley on the wheel mandrel, rotates the wheel, or it can be turned in the socket so as to set the latter at any angle. By means of the slot and set screw in the frame, the wheel can be adjusted nearer to or further from the table, as desired. The mandrel has several inches traverse in the frame, so that the pulley can be pressed down or lifted from the work by means of the sim. or le lever arrangement at C. The lever may ple lever arrangement at C. The lever may be set and held at any position by means of the nut shown, or the former may be counter-
weighted and operated by a treadle beneath weighted
the table.
In order to grind flat surfaces the wheel is lowered down to them. A conical wheel is used for grinding holes in stove plates, etc., an aperture being made in the table or an aux iliary platform thus provided being secured on top of the latter. For edging plates, the table can be made of sufficient size to sustain the whole weight of the plate, so that the at tendant can bring a more even pressure on the wheel with little labor and without dan ger of injuring it. The wheel can be inclined go as to grind berel edges with readiness: and so as to gind berel and by suitably formed grinders, moldings can easily be ground.
The machine is manufactured by the Tanite Company, of Stroudsburg, Pa., who may be addressed for further particulars.

## COMPRESSED STEEL

The manufacture of steel in large masses, although it has made vast strides during the past few years, is still characterized by many features requiring improvement, and especial-

## Fig. 2.



Fig. 1

it is at present scarcely possible to prevent the formation of the gas bubbles in the ingots during the process of casting, so long as the ordinary plan of teeming them in metal molds is adhered to, it is not surprising that the idea early sugges ted itself of getting the desired homogeneity by subjecting ted itself of getting the desired homogeneity by subjecting the metal to compression whe athempting to remove the buballowing it to solidify before attempting to remore the bub-
bles. Such a mode of procedure is certainly a rational one, bles. Such a mode of procedure is certainly a rational one, if we allow for the moment that the casting of perfectly solid ingots is at present unattainable in regular practice; and notwithstanding the practical difficulties attendant upon greater progress has not been made in its ge neral application.
The plan of increasing the solidity of castings by compressing the metal while in a molten state is very far from being new and as applied to copper, it has been in us in Manchester, England, for about twent years past. As regards steel, the credit of years pting its compression in the fluid stat suggen, 10 , Breser, elong, mbodied the tents; but in England it has in practic been worked out almost solely by Sir Joseph Whitworth, who for some years has been en gaged in developing the system, and of whose success we shall have to speak presently. It was in France, however, we believe, that the process was first practically carried out on a large scale, Messrs. Révollier, Biétrix \& Co. of St. Etienne, having adopted it in 1867 and having built steel works specially arranged for it in connection with furnaces for making steel by the Siemens-Martin process. According to the plans adopted by Messrs. Révollier \& Co, the metal was run from the Revolis in a from the furnace into a ladle, which, by means of a
turntable crane, was conveyed to the ingot molds, and the metal teemed into the latter The molds were placed on an ingot carriage, and after filling they were run under a hy

Fig. 3.


HYDRAULIC PRESS FOR COMPRESSING STEEL.
$\mathrm{d}_{\text {a }}$ alic press, and the metal subjected to compression until its $\mid$ pared from a photograph of this second ingot being shown $t_{\text {emperature had fallen below that at which bubbles would }}$ by Fig. 3. be reformed. We do not know whether or nor Messrs. Ré- If these two figures be compared, it will be seen that, vollier and Co. are still using the compressing process, nor whereas in the ingot represented by Fig. 3 there are a great what success has attended their latest experiments with it, number of bubbles near the outside-and in fact only probut we know that during their earlier use of it they produced some very compact sound ingots, but also many failures. Not content with treating ingots, Messrs. Révollier and Co., also compressed - with varying success-more complicated castings, such as tyres, rings for guns, etc., but in dealing with such a manufacture they had to contend against the difficulty of running the metal at a lower tem. perature than was consistent with efficient compression, the initial temperature of the metal on leaving the furnace being reduced by its transfer by the ladle, etc. The result was that, to obtain the necessary liquidity in the molds, they were compelled to resort to the use of a metal containing a higher percentage of carbon and lence a lower melting point, but this metal again was unfitted for tyres, etc., on account of its hardness and brittleness, and hence failures. One great difficulty connected with the affair thus was that by the Sie-mens-Martin process it was not possible to deliver a mild steel into the ladle at a temperature so much above its melting point as to allow of it at length reaching the molds at a temperature suitable for undergoing compression. With the Bessemer process less difficulty is experienced in this way, the initial temperature being higher; but even where Besse mer steel is compressed,as at the Neu erg Works in Austria, it is found to be very important to keep up the temperature of the steel before compressing by heating the ingot molds bafore the steel is teemed, and by getting the molds under the press as promptly as possible after they have been filled.
The arrangements for compressing steel which have for some years been in use at the Neuberg Works were planned by Herr Von Stummer-Traunfels, and they have proved very successful, while they are also very simple. At Neuberg the steel from the convertersis run into a receiver which is lifted by a po werful hydraulic crane on to a suitable carriage, and is then run on to a bridge over the press pit. At the bottom of this pit is a line of rails, so that the ingot molds mounted on carriages can be brought under the bridge to be filled with steel from the receiver and then promptly run under the press.
The ingot molds are, as usual, made for conical ingots, the section at the lower part being the ordinary one of an irregular octagon-or rather a square with the corners chamfered off-while at the upper part this section changes to circular, the upper portion of each mold being cylindrical, internally, for a length of about 6 inches, so as to form a guide for the press plunger. Externally the molds are circular, and they are turned slightly conical, while steel hoops are shrunk on them to enable them to resist the internal pressure. The conical form of the ingots would of course cause the fluid metal to exert an upward pressure, leading to separate each mold from its base, and to resist this the molds are furnished with strong flanges by which they can be secured to their bases. The mold bottoms, we may add, have a slight depression in the center, andin this is placed some fire clay on which the metal falls when teemed. This arrangement is emploged to prevent the bottom from being injured by the pouring of the metal, it being important to keep the bottom sound, as it might otherwise give way under the action of the press.
Each ingot mold is mounted on its own carriage, the latter carrying it at such a hight that, when run under the press, the top plate of the carriage, on which the bottom of the mold rests, is clear of what we may term the anvil of the press, this being a strong casting fixed on firm foundations. The pressure imposed by the press varies from 400 to 700 tuns, and it is evident that the ingot carriages could never be made to resist such a pressure. To avoid the necessity for this, the lengths of rails on which a carriage rests when under the press are balanced so that, when they are merely loaded with the weight of the ingot, mold, and carriage, they are maintained on a level with the other rails; but when the press is brought to bear on the ingot, they descend and allow the top plate of the carriage to take a solid bearing on the anvil just mentioned. On the pressure being removed, the rails rise again and the carriage can then be run on to make room for another. The general arrangement of the press and press pit at Neuberg is shown by the annexed perspective view (Fíg. 1.)
It should be mentionsd that, when an ingot is being teemed in the press pit, a kind of funnel of wrought iron plateis placed in the mouth to prevent the latter from being injured by the molten metal. When the mold has been filled, this funnel is withdrawn, and a short plunger is inserted by means of tongs specially constructed for the purpose. The mold is then run under the press and subjected to pressure for from half a minute to one minute, it being found that this period is amply sufficient to insure the desired result. We may add that no difficulty is experienced from metal endeavoring to squeeze out around the plunger. Any metal so endeavoring to escape becomes at once so cooled as to
solidify. solidify.
At the Vienna Exhibition of 1873, some excellent specimens of compressed steel were exhibited by the Neuberg Works, and amongst others the broken ingot from a photograph of which the annexed Fig. 2 has been prepared. This ingot was shown side by side with another broken ingot of the same steel, but uncompressed, an engraving pre-


RICCO'S EXPERIMENTS ON COLOR VISION.
tected by a thin skin, which might be iajured in the reheat ing furnace-in the compressed ingot, shown by Fig. 2, there is one bubble only, and that at the center of the ingot, where it would most probably be thoroughly closed during the sub sequent treatment of the ingot, or where, if it continued to exist, it could do little harm. Altogether we believe that the practice at Neuberg has been very successful.-Engi neering.

## Edward H. Tracy, C. E.

Edward H. Tracy, for several years past the Ohief Engineer of the Croton Aqueduct of this city, died recently a Carmel, N. Y. He began his engineering career as a rod man, and from that humble position rose, by industrious at tention to the duties assigned him, to be an assistant engi neer under John B Jarvis, on the Chenango canal in this State. Subsequently, under the same chief, he assisted in the construction of the main line of our great aqueduct. He was afterwards engaged in several other important works, involving dock and railway construction. For the last five years he has been Chief Engineer of the Croton aqueduct.

## Chloroform as a Preservative

At a recent session of the British Pharmaceutical Society, Mr. J. B. Barnes stated that vegetable infusions may be preserved indefinitely by the addition of a minute quantity of chloroform. A mucilage of gum acacia and a malt infusion have been satisfactorily experimented upon, and the action of the chloroform appears to be to destroy the ferments. Mr. Barnes considers that the discovery may be applied to preserving solutions of citrate of ammonia, lemon juice, and other very alterable organic substances.

## Cotreegy

## To the Editor of the Scientific American:

I can confidently recommend bee culture, as well adapted to the sphere of women both in city and councry. I speak from experience, having been engaged in this pursuit for over twejve years. In my firstattempts at bee culture, constructed fith little box hive. These hives were readily surplus honey obtained from then. The losses in such hives, from various causes, especially in winter, were very great, and profits were small at the best ; $\$ 10$ to $\$ 12$ profit great, and profits were small at the best; $\$ 10$ to $\$ 12$ profit
from the sale of surplus honey from such hives in one season was considered an extraordinary yield. I have for several years used a hive of my own invention. It is constructed with special reference to securing a good yield of surplus honey, in the most convenient marketable form. My hive is so arranged and constructed that I am able to prevent or contrive the natural swarming of bees, and, when desired, to turn their whole force to storing surplus honey in the parent stock instead of swarming out, as they often do (to their great damage) under ordinary management. It is surprising to note how much more honey will be stored by a stock that does not swarm (yet has the same increase of bees) than by one that casts one or more swarms. I often obtain from 200 to 300 lbs. honey in small glass boxes from a hive a season
There is in my opinion no pursuit which offers greater inducements to women as bee culture. There are very many whose occupation confines them indoors nearly the whole time, excluding them from the air and sunshine, to the great injury of their health; while at the same time, after this great sacrifice, they barely succeed in obtaining a livelihood. To such, bee culture offers special inducements, such as health and a greater recompense for labor performed.
I hope that ere long bee culture will receive from my sex I hope that ere long bee culture will receive from my sex the attention it deserves. I am acquainted with many who with great success.
West Gorham, Me.
Lizzie E. Cotton

## On Color Vision.

To the Editor of the Scientific American
It is known that a certain length of time is necessary to the perception of light, and that the sensation in the eye does not disappear instantaneously with the disappearance of the luminous object. It is also the opinion of physiologists that the perceptions of the different simple colors require different times; as does like wise the persistence of the sensation remaining in the eye. The laws of these phenomena have no however been yet determined, and the following ex periments, in my opinion, may serve that purpose A ray of sunlight, $f l$, is made to enter a dar room through a narrow vertical slot $f$, by means of porte lumiere. It falls in an horizontal direction and meets a lens, $e$, a flint prism, P , which disperses it and a mirror turning about on a horizontal axis, which reflects the rays in the same direction, above the prism, on a white screen placed at a convenien distance to obtain an horizontal spectrum, $R V$, we enough developed to exhibit at least the principa Fraunhofer lines. The whole apparatus should b oo arranged that, when the mirror is slowly made to oscillate, the spectrum may be displaced parallel to itself.
If now the mirror ismade to oscillate with a cer tain velocity, the spectrum will be seen to become curved in an unexpected manner, the extreme red and, still more, the violet remaining behind. On moving the mirror in the opposite direction, the pectrum oscillates with it, gliding and darting like a fish in the water. It will be noticed that the convexity of the an erior outline of the spectrum is in the yellow, which color precedes the others in the motion. On keeping the eye fixed on a point of the screen, it will be observed that the spectrum widens, and that the exoansion is greatest in the violet and decreases towards the red.
The same result is obtained by projecting the spectrum directly upon the screw and observing ics lmage in a mirro oscillating in front of it. With tha proper diaphragms, which should be black and opaque, some colors may be in orcepted, and only two allowed to pass in coincidence with the Fraunhofer lines; this renders comparisons easier.
From this experiment it follows that yellow is the colo which most quickly affects the eye; then come orange, red and green, blue, indigo, violet. The persistence of vision is greatest in the violet and successively diminishes in the indigo, blue, green, yellow, orange and red.
This may be verified also with white light. In fact, on moving a watchglass reflecting the sun before a black back ground, and keeping the eye fixed on it, the little solar image will be seen converted into an elegant colored curve, in which the following colors are usually found : yellow,green blue, indigo, violet.
Modena, Italy, August, 1875.
A. Ricco.

## PRACTICAL MECHANISM <br> by joshua rose <br> $\overline{\text { Nomber XXXI }}$

For reaming out taper holes, such as are employed to re eive taper pins, the square reamer shown in Fig. 126 is em

## -1

ployed. It is a piece of plain taper square steel. This too should be dipped endwise in hardening, and tempered to a dark brown, leaving the square end, A (on which the wrench, by which the reamer is revolved, fits), of a blue color; be cause it is at times necessary to force it into its cut by stri king it lightly with a hammer (a proceeding necessary with all reamers having appreciable taper upon them), which would breat the edpes of the square end off if they are left the be the as shown to preven the head of the square end buiging from being hammered To sharpen it, the flat sides are ground, taking care to keep To sharpen it, the flat sides are ground, taking care to keep
them straight and the thickness even on the two diameters, them straight and the thickness even on the two diameters, so that, the sides being straight and the reamer square, it
will cut taper holes whose sides will be straight. If the will cut taper holes whose sides will be straight. If the reamer is not ground square, two only of the edges will be liable to cut, causing the reamer to wabble, and so impairing its cutting power and rendering it liable to break. This de scription of reamer is sometimes used to cut out holes in boiler plates which do not come fair after being punched. The half round reamer shown in Fig. 127 will, however

work much more steadily in holes which do not come fair and will bore at all times more true, though it will not cut so rapidly as a square reamer, when employed to bore straight hole into a taper one. The method of making this tool is to turn it up and cut away half the diameter, temper ing as directed for the square reamer.

## MACHINE REAMERS.

Reamers for use in a machine or lathe are of the form hown in Fig. 128. The serrations forming the cutting edges
are made at and near one end only, and do not run to the full ing turned up, or they may be left one thirty-second of an length of the reamer. There are two and sometimes more inch too large, and ground off after hardening, by the grindflutes, A, provided to convey oil or water to the cutting edges and receive the cattings. This description of reamer is employed to take out a very light cut only, and must run very true in the machine. Fewer cutting edges and flutes, running the entire length of the reamer, may be employed for heavier duty or for brass work, being much better qualified to

Fig. 122.

carry off the cuttings; but in that case, the backing off of the teeth should be performed at a distance from the end of the reamer equal to its diameter, so that no cutting duty will be performed by the teeth beyond that distance; otherwise, from spring, play in the spindle of the machine, or from other causes, the reamer will cut the holes of a diameter larger a the end at which it entered. All reamers should be well supplied with oil for heavy cuts on steel or wrought iron, and soapy water for fine finishing cuts on those metals; oil may also be used for brass work, providing the cut is very light and the cuttings can find very free egress.

## ghell reamers

Shell reamers, such as shown in Fig. 129, are excellent tools for sizing purposes, that is, for taking a very light cut intended merely to smooth out the hole, and insure correctness in its bore or size. They are slort reamFíciv9. $\quad \begin{aligned} & \text { ers, having a conical hole run } \\ & \text { ning through the center which }\end{aligned}$ ning through the center which stock; thus three or four differont sizes of reamers may fit to one stock. Through such stocks there should always be bored a hole into which a pin may be driven, projecting at each side of the stock to nearly the diameter of the shell reamer, in which there should, on each side, be filed a semicircular groove to receive the pin. Thus the reamer will be prevented from slipping upon the mandre], as it is otherwise very apt to do.

Many attempts have been made to produce adjustable ream ers having movable cutters, so that the size of the reamer may be varied by a change of cutters, and economy in sharpening and renewing is attained. None of these efforts, however, have met with such success as to cause their universal application. Of course such a tool is only applicable to sizes above an inch in diameter, because the division of a reamer of less than that size into two or more pieces weakens it so that it would not bear the necessary strain

- The best form of adjustable reamer of which I have any knowledge is that of one I designed and made for use on cast iron work, though I have no doubt it would apply equal ly well to work in brass, wroughtiron, and steel. It proved a very serviceable tool, and is easily made, as a reference to Fig. 130 will show. A represents the stock, and D the cut

ters, C being a regulating washer, and D and E the tighten ing nut and washer. Each of the cutters, B, fits into a dove tail and taper groove in the stock, the shallow end of the groove being at the cutting end; so that, if the regulating washer, C, is reduced in width, the cutters will slide forward and enlarge in diameter. The washer, C , is thus a means of adjusting the diameter of the cutters; and when the same is once adjusted, the nut, D, will lock it always to that pre cise diameter If, therefore, several sets of cutters of differ ont hights are fitted to one stock, and turned up, while in the stock, to the requisite diameter, with the washer, C, in its
place, we have a set of standard cutters which may always place, we have a set of standard cutters which may always
be placed in position and locked up by the nut, $D$, without measurement, since their sizes cannot vary. By providing another washer, very slightly thicker than the standard, the reamer will, in the case of each setrof cutters, bore a hole to a driving fit, while a washer a trifle thinner will cause the cutters to bore a hole of an easily working fit. Thus the sizes of the cutters are regulated by the washer, C , and not by measurement by the workman; they are therefore at all timas positive and equal. The cutters are backed off on the ends only, their tops being morely lightly drawfiled after be


## ing process already described. The cutters should be of the best cast steel, and tempered to a straw color.

## BORING BARS

The boring bar is one of the most important tools to be ound in a machine shop, because the work it has to perform requires to be very accurately done; and since it is a some what expensive tool to make, and occupies a large amount of shop room, it is necessary to make one size of buring bar answer for as many sizes of hole as possible, which end can only be attained by making it thoroughly stiff and rigid. To this end, a large amount of bearing and close fitting, using cast iron as the material, are necessary, because cast iron does not spring or deflect so easily as wrought iron; but the centers into which the lathe centers fit are, if of cast iron, very liable to cutand shift their position, thus throwing the bar out of true. It is, therefore, always preferable to bore and tap the ends of such bars, and to screw in a wrought iron plug, taking care to screw it in very tightly, so that it shall not at any time become loose. The centers should be well drilled and of a comparatively large size, so as to have surface enough to suffer little from wear, and to well sustain the weight of the bar. The end surface surrounding the centers should be turned off quite true to keep the latter from wearing away from the high side, as they would do wère óne side higher than the other.
The common form of the smaller sizes of boring bar is hat shown in Fig. 131, A A being the bar, D D the lathe cen

ters, B the cutter passing through a slot or keyway in the bar, and C a key tapered (as is also the back edge of the cutter) to wedge or fasten the cutter to the bar. It is obvious that, if the cutter is turned up in the bar, and is of the exac size of the hole to be bored, it will require to stand true in the bar, and will therefore be able to cut on both ends, in which case the work may be fed up to it twice as fast as though only one edge were performing duty. To facilitate setting the cutter quite true, a flat and slightly taper surface should be filed on the bar at each end of the keyway, and the cutter should have a recess filed in it as shown in Fig. 132,

the recess being shown at A, and the edges, B B, forming the which it of the cutters. The backing off is shown at C, from by the edge, $C$ and not along the i shown by the backing off. The recess must be made taper, and to fit closely to the flat places filed on the bar. Such a cutter, if required to be adjustable, must not be provided with the recess, A, but must be left plain, so that it may be made to extend out on one side of the lar to cut any requis ite size of bore; it is far preferable, however, to employ the recess and have a sufficient number of cutters to suit any size of hole, since, as already statyd (there being in that case two cutting edges performing duty), the work may be fed up twice as fast as in the former case, in which only one cutting edge operates. This description of bar may be provided with several slots or keyways in itslength, to facilitate facing off the ends of work which requires it. Since the work is fed to the cutter, it is obvious that the bar must be at least twice the length of the work, because the work is all on one side of the cutter at the commencement, and all on the other side at the conclusion of the boring operation. The excessive length of bar, thus rendered necessary, is the principal ob spring. There should always be a keyway slit, iability to spring. There should always be a keyway, slot, or cutte way in the exact center of the length of the bar, so as to en-
able it to bore a hole as long as possible in proportion to the length of the boring bar, and a keyway or cutter way at each end of the bar, for use in facing off. If, however, a boring bar is to be used for a job which does not require to be faced off at the ends, the keyway should be placed in such a posi on in the length of the bar as will best accommodate the work, and should then be made tapering in diameter from the keyway to the ends, as shown in Fig. 133, the ond, A

## Flq. 733.

## A

oing made parallel to receive the driving clamp. A lug, however, by which to drive the bar, is sometimes cast at A This form of bar is stronger in proportion to its weight, and herefore less liable to spring from the cut or to deflect than is a parallel bar. The deflection of a bar, the length of which is excessive in proportion to its diameter, is sufficient to
length than at the ends, providing that the cutter is not re cessed and does not cut on both sides, that is to say: when the cutter has the edges, B B, in Fig. 132, bearing against the diameter of the hole, they serve to steady the bar and pre ventit from either springing away from the cut, or from de lecting in consequence of its own weight. The question of pring affects all boring bars; but in those which are used ertically, the deflection is of course obviated.
Ilere it may be mentioned that no machine using a boring bar should be allowed to stop while the finishing cut is being taken, for the following reasons: The friction, due to the severance of the metal being cut, causes it to heat to a slight degree, and to therefore expand to an appreciable extent; so hat, when the cutter makes its first revolution, it is opera ing upon metal at its normal temperature, but the heat cre ted has expanded the bore of the work, and hence the cut aken by the second revolution of the cutter will be slightly ess in diameter. This heating and expanding process con inues as the cutting proceeds, so that if (after the cutter has made any number of revolutions) the bar is stopped and the cylinder or other work being bored becomes cool, when the atter makes the nest revolution it will be operating upon the bore unexpanded by the heat, and hence will cut deepe into the metal until, the metal being reheated by the cut during the revolution, the boring proceeds upon expanded metal as before the stoppage; thus arresting the continuous proress of the cutter will have caused the cutting of a groove in the bore. Boring bars of this description, for use in bore a large diameter, are made with a head of increased di ameter, as shown in Fig. 134, A A representing a bar turned

true from end to end, and having a keyway cut along its entire len th, and B the cutter head, held in upon any point in the length of the bar by being keyed to it at D. A number of cutting tools are carried by the head, B, and fastened to it by the strap, as shown at $C$, and enlarged at $E, F$ being the slot to receive the tool. It will be observed that there is in the head a recess to receive the clamp, which recess should be made deep enough to leave a clearance between it and the shoulder of the clamp, to accommodate any variation in the thickness of the cutters. Several cutters may be provided to the head, so that the work may be fed up rapidly; in such case, however, great exactitude is required in setting them, because there is no practical method of making them with a recess to insure their even projection from the bar, since the cutters are narrow, and generally cut across the whole end face, $G$, so that each grinding affects their distance from the ar, and bence the size they bore.
A rude form of the head, B, may be made by simply cutting a slot or slots across it, and fastening the tool or tools herein, by means of wedges and packing pieces if necessa y. The only advantage possessed by this bar is that it will bore a round hole, even though the bar may run out of true y reason of either or both of the centers being misplaced or even though the bar itself may have become bent in its ength. In addition, bowever, to its disadvantage as to ex essive length, it possesses the further one that, unless a line drawn from the two centers upon which it revolves is paral el both perpendicularly and horizontally to the lathe bed, the hole bored will be oval and not round; or if the bar is not parallel horizontally with the shears, the hole will be widest perpendicularly, and vice versd. To remedy these defects, e have the boring bar with the foeding head, which is si milar to that shown in Fig. 134, save that the work remain tationary while the cutters are fed to the work by operating he head, B, along the bar, which is accomplished as follows Ether along the keyway or groove, or else through and along he center of the boring bar, thereis provided a feeding screw passing through a nut which is attached to the sliding head B. As the bar revolves upon its axis, the screw is, by mean f suitable gearing, caused to revolve upon its own axis, as well as around the axis of the bar, thus winding the head along the length of the bar, and thus feeding it to the cut. If the screw runs along the center of the bar, it is usually perated by gear wheels, the movement of the feed being continuousat all parts of the revolution; but if the screw is contained in a groove cut in the circumference of the bar, common star feed may be attached to the end of the bar, in which case the feed for the whole revolution is given to the sliding head during that portion only of the revolution in which the outer arm of the star is moved by the projecting bolt or arm which operates it. From these directions, it will be readily perceived that a bar of the latter form, but hav ing the screw in its center, is the most preferable. Caremust e taisen, however, to keop these bars running quite true or should either center run out of true, the hole bored wil e larger in diameter at that end; while on the other hand should the bar become bent so as to run out of true in the middle of its length, the hole bored will be large in the mid le if the work was chucked in the middle of the length of the bar ; and otherwise, it will be larger at one end.

NEW LOCOMOTIVE FEED WATER HEATER
The advantages arising from the use of hot instead of cold water, in feeding steam boilers, whether stationary or loco motive, are too apparent to need rehearsal, more especially where the hot water for that purpose is produced by utilizing heat which would otherwise be wasted, the most important results being the saving of fuel, prevention of the contrac tion and expansion of flues and flue plates, and the abilit to maintain steam.
In the adaptation of a locomotive engine to heat its own feed water, four difficulties have always stood in the way ; first, to use the waste or exhaust steam without lessening the draft of the chimney; second, to avoid the cumber some and complicated devices necessary for heating the water in bulk; third, to preven obstructing the smoke arch; and fourth, to so construct and arrange all parts of the ap paratus as to obviate derangement and leakage, either from contraction and expansion, or the jarring of the engine. These difficulties have been overcome by the device illustrated in the annexed engravings.
In Fig. 1, which is a detailed sectional view, it will be seen that an insulated steam chamber is constructed about the smoke stack. Into this chamber leads the feed water pipe, A which is coiled around the stack, conduct ing the water to the top of the compartmen and then down and out to the boiler, at B. The exhaust is divided, a branch pipe, C, be ing employed to conduct a part of the steam into the chamber for heating the feed water in the coiled tube, while the main exhaus discharges up the smoke pipe to promote the draft of the engine in the usual manner. A small eduction pipe, $D$, is provided near the top of the chamber, through which the waste steam passes, and there is also a drip pipe near the bottom of the chamber, for carrying off the water of condensation. There is a joint in the stack below the bonnet, to afford easy access to the top of the heater, and a second joint for like purpose at the bottom of the chamber

An improved arrangement of the water pipes which the company is now making, is to remove them from the interior of the smoke chamber and place them outside, where they pass through suitable saddles.


MAGOON'S LOCOMOTIVE FEED WATER HEATER. According to certificates and testimonials submitted, it appears that the saving of coal attributed to this device, on one locomotive (the Saxon, of the Boston and Maine railroad), was about three quarters of a tun per day for foar months in succession. On a small engine on the same road, the saving was nearly half a tun per day. The most recent tests show an economy of over 35 per cent of the fuel used, the value of which must evidently reach a very large argregate in the course of a year in the case of very large aggregate in the course of a year, in the case of a road employing many locomotives. Fig. 2 gives a slightly different arrangement of the feed water pipes. The actual economy in fuel resulting from the use of this invention,coincides with the calculated economy of feed water heaters in general, as given in the Scientific American of November 7 last.
No difficulty is experienced in making the coiled pipe to withstand any necessary pressure, as proven in the cases before alluded to and in others. The coil is made at least one sixth part larger in interior diameter than the pump
plungers; and the check valve is slightly larger than th coil in order to give free passage for the water into the boil er. If constructed in this way and properly stayed to the saddle and smoke stack, the device will be as permanent as any other part of the machine. Proper allowance is made for contraction and expansion of the stays and coil. We have obtained tbe foregoing particulars as to the construction from the Magoon Heater Company, 54 Sears Building, Boston, Mass., who are the manufacturers of the invention.


MAGOON'S LOCOMOTIVE FEED WATER HEATER. Now Aniline viole
A new pigment called violet gentiana, for producing the aniline colors of Martins and Meldensohn of Berlin much cheaper than the other violets in use, has for some time been on sale. A series of trials are said to have given the following results: When dissolved in thirty times its weight of hot water, brought quickly to the boiling point, and kept boiling for five minutes, and then passed through a sieve, it eaves little residue.
To dye 25 lbs. of woolen yarn, take 1 lb . of tartaric acid and a corresponding quantity of coloring matter; boil and skim the mirture. Pass the yarn three times through the dys, and it will assume a very uniform tint. The color obtained is as solid and as brillisnt as that obtained from dearer violets.

## The Patent One-Tailed Shirt.

An illastration of the absurdity of some of the official examizations made at the Patent Offce is seen in the patent granted to J. H. Meyers for an alleged improvement in shirts. It consists of a common shirt with the sleeves and the back tail omitted. These parts, says the patentee in his specification, any person can readily supply; but the bosom, neck band, yoke and front tail, he thinks require more trouble to make; so he sews these together, and the Patent Office grants him a patent therefor "as a new article of manufacture." But there is nothing new about it. It is simply an unfinished garment, and an old pattern at that. With equal propriety the Patent Office might grant a patent for a shoe, as a new article, which consisted merely of the strings and the upper, with the sole left out. Verily, the Patent Office is a queer institution.

FURNACE WORKING WITH PETROLEUM.
Professor Henry Wurtz was recently called on to examine

and report upon the value of the system of Dr. C. J. Eames of obtaining from crude petroleum simultaneously both the heat and the power needed for metallurgical operations upon iron. We extract the following from his report The upper
engraving shows an ordinary reheating furnace for iron, such as the experiments were made with; but the form is by no means the best for developing the full merits of the new system, but answers tolerably well for the experiments made. This is an external, and the lower a sectional, view. In the latter, A B J D indicate the Eames vapor generator, called simply the generator, the main feature of the new apparatus and process. A is a cast iron vessel, with horizontal shelves projecting alternately from opposite sides, over which shelves the oil, entering at D , at the average rate-for this one furnace, when heating $3,000 \mathrm{lbs}$. of iron at a charge, and making steam for the rolls besides-of 30 gallons or 200 lbs ., as a maximum per hour, flows downward in a thin layer dripping from shelf to shelf. It thus meets a slow opposing current of steam heated to incan descence, and kept at a pressure of about 10 lbs. per inch, and which passes upwards from the superheating coil, $B$, inclosing the fire Every urase of oil is taken up and swept on to a mixing chamber which occupies the former fire space, where it meets the air blast entering at the point, E (the former ash pit). It will be observed that the former bridge wall of the furnace is built up solid to the crown, excep the space at H G , called the combustion cham ber, an important and essential part of the in ventions. This consists simply of a cellular tier of firebricks placed on end, and extending all across over the old bridge wall. Within these cells the combustion begins, and it is found that, if this combustion space has a ho rizontal thickness of more than 18 inches, the firebricks fuse down. I is intended to repre sent one of the piles of scrap iron, with its to and bottom covers, of which, however, six, and bottom covers, of which, however, six,
averaging 500 lbs. , each, are introduced at a charge, in regular working. The course of the flame under, and back through, one of the flues of the boiler above, and thence into the stack, is sufficiently indicated by the arrows

## ELECTRICAL SPEED RECORDER,

The accompanying engraving represents an electrical speed recorder, constructed by Mr. W. Groves, of London, En gland. The instrument consists of a train of clockwork, driven by a weight, and employed to move the strip of paper upon which the speeds are recorded. Two electro-magnets are attached to the frame, and opposite their poles an arbor is pivoted, carrying a soft iron armature: and in connection with each armature is a bent and pointed lever, the ends of which pass through holes in the ink trough when the arma ture is attached. These points carry on them sufficient ink to make a dot on the paper. The trough is divided into two compartments, one containing red and the other black ink. The former is used to mark half seconds, and the latter to record the speed. The holes in the trough are made so small that capillary attraction prevents the ink from flowing through.


One electro-magnet is connected with a clock beating half seconds; and as the pendulum passes over a mercury cup placed immediately under the point of suspension, the circuit with the battery is completed, and the half seconds are marked in dots at the edge of the strip. The other electromagnet is placed in connection with the contacts for marking the speed dots; and by counting the numbers of half-second marks between each black dot, the speed is given between each contact levor.

## Newspaper Circulation and advertising

George P. Rowell \& Co.'s Advertiser's Gazette, after naming some papers which have reduced their rates for advertising, adds: "There are many large weeklies which are at present demanding for advertising more than double the price to which their circulation enti + les them."
We have no doubt but that that is so. There has been a great falling off in the subscription list or a great many papers; but it is not so with others. The Scientific American has several thousand more circulation now than it had last year at this time; and it is continually increasing, but its rates for advertising have not been advanced. For machinery, tools, patents, and every want of contractors, civil and mechanical engineers, surveyors, artisans, manufacturers, and all similar industries, this paper is unequalled as an advertising medium

## swans.

The nest of the swan, says Mr. H. R. Robertson, is a thick and rather untidy mass of sticks, reeds, flags, and rushes. From the fact of the birds naturally preferring the most secluded spots by the water, we more often find a swan's nest on a small island than on either bank of the river; the osier beds are perhaps the localities most favored by them. The eggs are six or eight in number, and are hatched in five or six weeks. The young birds are termed cygnets, and are covered with a grayish brown plumage, which is not entirely lost till the beginning of the third year. Though the swan is, in general, very gentle and inoffensive, the male bird will defend the nest with great courage, and advance to the onset with ruffled pinions and every demonstration of anger; nor is it, from its muscular powers, an antagonist to be despised. While the cygnets are very young, one or two of them will sometimes climb up on to their mother's back, who never sails along more proudly than when her dusky brood is thus cradled between her snowy wings.
Swans do not breed until they are several years old, and they mate strictly in pairs; the technical terms for the male and female are cob and pen. The cob, or male, has a thicker neck and a larger berry at the base of the bill than the pen, or female; he also swims more buoyantly, from having more volume of lungs. Maturity in both cob and pen is shown by the size of the berry and the depth of the orange color of the bill.
Taking swan's eggs from the nest, and certain other birds', was an offence severely with in England in old times. We find, in an act of Henry VII., that "no manner of person, of what condition or degree be bee, take or cause to be taken, be it upon his owne ground or any other mans, the egges of any fawcon, goshawk, laners, or swans, out of the nest, upon paine of imprisonment of a yere and a day, and fine at the kings wil, the one halfe thereof to the king and the other half unto the owner of the ground where the egges were so taken."
The swan feeds on aquatic weeds, the spawn of fish, and coarse grass growing by the sides of the water; it is furnished with a gizzard of extraordinary muscular power, which enables it to grind the weeds, however fibrous, to a pulp.
All writers on the subject agree that the swan is very long lived, some saying that it attains thirty years, while others assert that it sometimes survives a century

## Man comes ann tills the earth and ies beneasth, And after many a a summer dee the swan."

The particular species that is the subject of the present article is often s em i-domesticated on lakes and ornamental waters, and is known as the tame or mute swan-cygnus olor of the nus olor of the ornithologists. It
is said not to have is said not to have
been originally a been originally a native of the British islands, but is found in the eastern portions of Europe and the adjacent parts of Asia, where in land seas, vast lakes, and extensive morasses afford it a congenial home. In Siberia and some parts of Russia it parts of Russia it
is common, and is common, and it abounds on the shores of the Caspian Sea. It is doubtful when
this most elegant this most elegant
bird was intro. bird was intro-
duced into Great Britain, where it is such a univer. sal favorite.
Wild swans may be often observed flying in a wedgelike form high in air, but they very rarely settle. This species, cygnus ferus, is neither so large nor so graceful as the tame swan. For its value as an article of food, the swan is now almost entirely disregarded. Two or three are still fattened every Christmas time for Windsor Castle, where, in accordance with old usage, they make their regular appearance on the royal table. On only oue occasion have we ourselves ever
had the opportunity of proving the taste of our ancestors in had the opportunity of proving the taste of our ancestors in
the matter, and we are inclined to class the royal bird along with the royal fish, the sturgeon. as really inferior in flavor to many a plebeian dish. In color the flesh is extremely dark, and if we may speak from our solitary experience, we should describe it as somewhat dry and decidedly coarse in fiber;
the bird in question was a young one, which had been carefully fattened, and kept till tender after being killed.

## Wilful Ignorance of Common Things.

A little knowledge may be a dangerous thing, but a knowledge of little things is useful and therefore desirable. At the recent meeting of St. Saviour's District Board of Works, Dr. Albert J. Bernays submitted his report as public analyst. In the course of his remarks he described the results of his various analyses of food, chiefly of milk, the adulteration of


## SWANS

which he believed was on the increase. He had also analy zed several samples of bread and butter, and had generally found them to be pure. In conclusion, he suggested that a nuseum of common things should be attached to every board school, so that the rising generation might acquire a knowledge of them, and the uses for which they are intended. Dr. Bernays deserves great credit for his admirable suggestion. It is wonderful how ignorant the commoner class of people are of things in every day use. For them not to be able to distinguish between a hawk and a hernshaw is excusable per haps. But there are many who hardly know a mangold or a swede when they see it, who would fancy oilcake was a larger and perhaps a coarser kind of toffee, and who might be at a loss to tell a field of potatoes from a field of turnips. Again, there are those who, following some mechanical oc cupation, are content with the knowledge of that only, and prefer to remain ignorant of kindred occupations. A glazier, for instance, will have nothing to do with carpentering. T'he


## THE SWAN'S NEST.

carpenter will tell you that the setting of a grate or bell hanging is no business of his. The ironmonger is utterly careless about bricklaying, and the bricklayer returns the compliment. Each of those classes of mechanics advisedly emains or professes to remain in utter darkness as to the occupations of his fellows. True, a jack of all trades may be master of none, but there is no earthly reason why a mechanic should not be able to adapt his manual talents to more than one kind of work. The hand that can use a saw or plane, that can adjust beams and joists with the greatest nicety, is surely able to fix a grate, to hang a bell, to use spade and trowel,pick of level. The ironmonger must know
something of brickwork, and the bellhanger of ironmongery. We are aware that the selfish spirit of trades unionism steps in here, and lays it down imperatively, ne sutor ultra crepidam. As the cobbler to his last, so the carpenter to his bench, the blacksmith to his forge, and so on through the category of mechanical workmen. But what an advantage it is to men to be what is generally called handy! As the al'-round cricketer of fair average merit is more successful in the long run than the brilliant bat who is a poor field and an indiffer ent bowler, or the unerring bowler who neither bats well nor fields well, so the workman, who is a fair average carpenter, bricklayer, ironmonger, bellhanger, etc.,may be more useful generally than the one who purposely confines his knowledge to one particular class of work. Put such a gener ally useful man down in the backwoods of Canada and we think the puint of our case will be illustrated at once. Now if, in these museums which Dr. Bernays proposes to attach to board schools -why not to all schools?-there were specimens not only of comestibles, but of ordinary imple ments in everyday use; if, further, one or more paid instructors were attached to everv such museum-such instructors would very soon become self-supporting-whose business it was to teach our rising generation the uses of these im plements and the characteristic features of this or that food, it is no great evidence of wisdom to foretel that the said rising generation of Englishmen would be infinitely less ignorant and in finitely more handy and self-reliant than is the present. The man who tells you he cannot do thisor that kind of work, and does not tr to do it, is little short of a fool.-Land and Water.

## Preservation of wood Telegraph Poles.

Tar is employed, but it is necessary to apply it hot, and to avoid boiling it too long, lest it should lose the essential oils, which alone aid it to penetrate the wood. The latter should be first considerably heated to remove humidity and to open the pores; the tar is then applied, and, penetrating it, form a strongly resisting covering. One thick coating produces a very bad effect; it is necessary to apply several light coats, a process somewhat difficult and requiring practice. If this mode is not adopted a covering will be simply laid over the surface of the wood, which will be separated by damp and being brittle will be easily broken a way. The fungus fila being brittle, will be easily broken away. The fungus fila tion westruc tion would take place almost as rapidly as if the tar bad not
been laid on. The process above described can hardly be been laid on. The process above described can hardly be
carried out without special appliances. The best mode is, first to heat the wood, then to im merse in a bath of tar the whole of that portion to be placed in the ground, and to leave it in the bath for 24 hours at least. The ta should be heate to boiling point to boiling point. has also been on plied with very good results. By raising the wood to a sufficient tem perature, coagula tion takes place and any dangerou spores are con sumed. But it i better to burn the wood imperfectly than to carbonize it to such an ex tent as is usually done. When th burnt portion i too thick, it lose its cohesion, and hecomes broken during transport so that the wood is again exposed to the air. It is better to obtain thin and uniform covering by soak ing the wood in acidulated wate (five parts of wa er and one of sulphuric acid) and heating it lightly without exposing it to the flames. The more acid is added to the water, the less heating will be required, and it is preferable to obtain a thoroughly solid coating, by hearing it for a long $r$ time, at a less elevated temperature. This method is all the more worthy of attention because the sulphuric acid pe netrates the wood to a certain depth, and partially preserve it from the attacks of the fungus.

Paint skins, boiled with linseed oil, and having, while hot a quantity of sand and lime stirred in until the requisite thickness is obtained, make a durable cement for leaky roofs.

## MAGNETISM.

In ordinary observation, magnetism is scarcely known ex cept as existing in iron, and especially in steel, and as related in some obscure manner to the earth. But there is reason to believe that it is one of the most extensively diffused agents in Nature. It can be traced not only in iron, but also in every substance into which iron enters into composition. It is found in nickel, cobalt, chromium, and other substances, and even in some gases. Wherever a gal vanic current exists in Nature, whether produced by chemical acon, or appearing in the thermo-electric form as originating from the effects of heat at the place of union of different substances, magnetic effects can be elicited. On the larger scale, it is certain that the whole earth acts as a combination of magnets, and there is reason to think that the sun and the moon also act as magnets.
The laws of magnetic force, however, have been experimentally examined with philosophical accuracy, only in their connection with iron and steel, and, by inferences bearing considerable probability, in the influences exer ced by the earth as a whole. The ferruginous minerals of the formula $\mathrm{Fe}_{3} \mathrm{O}_{4}$ possess the property of attracting iron and its filings, and are called natural magnets or lodestones.
Experience has demonstrated that the attractive action of magnets takes place in a vacuum and through all bodies, whether gaseous, liquid, or solid, when they are not themselves magnetic. All the properties of natural magnets may be permanently communicated to needles or to bars of steel properly tempered, which are then said to be magnetized, and take the name of artificial magnets.
If a small iron ball, A (Fig. 1), be suspended by a flexible

thread, and succes sively presented to various points of the surface of a magnetized bar, although it may be kept at the same distance from the bar in every case, the deviation of the ball, A, will undergo considerable varia-
tion as it is changed from point to point. In the section, M N , perpendicular to the middle of the axis of the figure, $P P^{\prime}$, the attractive action is zero; in either direction from this position the pendulum is more deviated from the vertical as it is placed nearer to the ends of the bar.

The same fact may be demonstrated by roll ing a magnetized bar in iron filings (Fig. 2); or better still, (Fig. 3), by covering a magnet with a thin cardboard which is lightly tapped with the fingers, while iron filings are scatered
over its surface from a sieve. The directions which the lines of filings take prove that the middle section, M N, produces no action whatever, and that, towards the ends of the bar, in the axis of the figure there are two points, $\mathrm{P}^{\prime} \mathrm{P}^{\prime}$, which are centers of the strongest attraction.


The middle section, where there is no reaction, is desig nated as the neutral line, and the centers of attraction, $\mathrm{P}^{\prime}$, are called the poles of the bar. Every magnet, whether natural or artificial, possesses at least two poles. When the magnetization is regular, the magnet has but two poles, which are situated in the axis of the figure and near its ends. When the minerals containing iron, or the steel bars, have more than two poles, they are said to be irregularly magnetized, or that they have consequent points. In every oase, however, two consecutive poles are separated by a neutral line or a line in which there is no action.

If a magnetized bar is suspended horizontally by means of
$\qquad$ the stirrup, C (Fig, 4) means of paper or copper, and supported by a thread without torsion, the whole system partakes of a movement se up by the magnetic influence of the earth. After a certain number of oscillations, the bar becomes quiet in such a position that its axis is directed from north to south. If the same bar is used several times in succession, it always comes to rest in the same position, and the same end always turns toward
the north. Several bars suspended in the same manner, and at a certain distance from one another, always place themselves in parallel directions. The vertical plane which passes through the axis of a bar freely suspended, when in its position of equilibrium, is called the magnetic meridian. The magnetic meridian does not coincide with the terrestrial meridian; the angle comprised between these two planes in a given place is called the declination. The declination is said to be east or west, as the half of the bar turned toward the north places itself east or west of the terrestrial meridian. The declination also changes in value and even in sign, according to the place of observation; and it undergoes, besides, continual variations at the same place.
The end of the magnet which turns toward the north is The end of the magnet which turns toward the no
called its north pole, the opposite end its south pole.
called its north pole, the opposite end its south pole.
If the poles of a fre sively brought near the poles of another bar, the suspended magnet will be turned out of the magnetic meridian. The direction in which it is displaced in each case shows that poles of like names repel each other, while, on the contrary, poles of unlike names are mutually attractive.
If we place a string bar, $M$ (Fig. 5), in any position whatever below a bar, $\mathrm{M}^{\prime}$, whose suspension is without torsion,

the latter bar immediately turns in a horizontal plane, and, after a few oscillations, comes to rest. In this position the after a few oscillations, comes to rest. In this position the
axes of the two bars are parallel, and the poles of unlike axes of the two bars are parallel, and the poles of unlike
names are placed one above the other, on the same side of names are placed one
The terrestrial globe may therefore be considered as a great magnet, with one of its magnetic poles placed in its northern, the other in its southern hemisphere. The two hemispheres of the earth are thus like the two halves of a bar magnet-the northern hemisphere possessing the mag. netic properties of the south pole, and the southern hemi sphere exercising the same action as the north pole of a natural or artificial magnet.
If a magnetized needle is supported on a metallic point by an agate cup, M, placed on its center (Fig. 6), the needle is then free to turn in a horizontal plane. When left to itself, it oscillates under the influence of terrestrial force, and finally comes to rest in such a position that the line joining its ly comes to rest in such a position that the line joining its
poles, which corresponds with its center of figure, is in the magnetic meridian of the place
By placing (Fig. 7) a bar of soft iron which presents no Fig. 7.

trace of magnetism in the neighborhood of the poles of a bar magnet, the former, under the influence of the magnet, ac quires the property of attracting fron filings, and becomes itself a real magnet, with its two poles and its neutral line. In soft iron, magnetized by induction, the poles stand in a direction opposite to those of the bar; and its neutral line, instead of occupying the middle position, is placed in the neighborhood of the end which is opposite the bar.

Fig. 8.


This magnetization, or inductive polarization, is only tem porary, and completely disappears the moment the bar and he soft iron prism are separated some distance from each other. The phenomena are the same when a soft iron prism (Fig. 8) remains suspended by the attraction of one of the poles of a bar magnet.
This temporary induced magnetism of soft iron prisms may be shown in another manner. If a soft iron prism is suspended from the north pole of a strong magnet (Fig. 9) it
 becomes capable of supporting a second prism ; the second prism is in turn in ductively magnetized and will support third, and so on. In this magnetic chain the indirectly magnet ized prisms always touch each other with podes of contrary names, and the action becomes weaker But now, if the ba
is detached from the first soft iron prism, all traces of polar ization disappear in the several prisms, and they immedi ately separate from each other.
We have seen that a prism of soft iron, presented to the north pole of a magnet, becomes itself a real magnet by induction, the contrary poles attracting each other, and the soft iron remaining suspended against the force of gravita tion. If, when a prism is suspended in this manner, the south pole of a second bar (Fig. 10) is brought near it, all

Fig. 10.
 magnetic adherence ceases; the soft iron prism deta
and falls.
In this experiment, the second bar tends to develope in the prism a magnetization whose polarity is opposite to that developed by the first bar. The soft iron being thus submitted to the two contrary influences, resumes its natural state, loses all trace of polarization, and should necessarily obey the action of gravitation. Experience has demonstrated that when a bar magnet is broken, each of its parts, whatever may be their number, forms a complete magnet, with its two poles and neutral line. The magnetization induced in a piece of soft iron is less as the distance through which the bar acts is greater. From the preceding facts it appears that the action of a magnetic pole, on a series of soft iron cylinders submitted to its influence, very much resembles the induction exercised by an electrifled sphere on a series of insulated conercised
ductors. Under the influence of the magnetic pole, the soft ductors. Under the influence of the magnetic pole, the soft
iron cylinders are polarized, and the polarization endures iron cylinders are polarized, and the polarization endures
while the influence lasts. In the same way, the ends of the while the influence lasts. In the same way, the ends of the
insulated conductors, placed in the vicinity of an electrified insulated conductors, placed in the vicinity of an electrified sphere, are charged with electricity of contrary names; this polarization lasts as long as the inductive action of the
sphere is maintained, and completely disappears when the sphere is removed or discharged.
There is, however, a great difference between a magnetized bar and an electrified sphere. The contact of the soft iron by no means enfeebles the magnetic properties of the bar; but the magnetism, whatever its nature may be, does not, by apparent contact, pass from the bar to the piece of soft iron. On the contrary, when an electrified sphere is soft iron. On the contrary, when an electrified sphere is
touched with an insulated conductor, a part of the electricity touched with an insulated conductor, a part of the electricity
of the sphere is spread over the conductor, and the electric of the sphere is spread over the condu
properties of the sphere are enfeebled.

## Plants and Animals found in the Human Mouth.

 According to Dr. C. N. Peirce, in an essay in Dental Cos mos, the following variety of organisms is found in the oral cavity, as shown by the microscope: 1. Oidium albicans. 2. Cryptococcus cerevisiæ. 3. Leptothrix buccalis. 4. Lepto mitus. 5. Bacteria, vibrios, and monads. 6. Paramecia 7. Heterogeneous mass.oidium albicans, or white plant.
As revealed to the observer, it seems to consist of thick ened epithelial cells, mingled with numerous minute spor ules or seeds, from the midst of which long, thread-like, jointed and branching plants arise, mycelium, intertwining winted and branching plants arise, mycelium, intertwining wrowth is the origin or sequence of disease has not yet been growth is the origin or sequence of disease has not yet been
settled. So far as I can learn of its prevalence or predisposettled. So far as I can learn of its prevalence or predispo-
sition, it occurs most frequently in the mouths of persons sition, it occurs most frequently in the mouths of persons
living in situations where the air is impure and diet unliving in situations where the air is impure and diet un
wholesome, or where previous gastric or intestinal disorder wholesome, or where previous gastric or intestinal disord It is found alone or simultaneously on the inner edge of the lips, where the mucous membrane legins, on the inner side of the cheek, on the gums and palate, on the upper and lower surface of the tongue, in the throat, and in the cosoph agus, down as far as the cardia, or upper opening of the stomach.
oryptococcus cerevisie-Cell or Capsule.
This plant is composed of round or oval cells, which pre sent in their interior one or two little corpuscles resembling somewhat an oil globule. They are propagated with grea rapidity when in contact with decomposing substances at a favorable temperature, This cryptococcus is so similar to that found in yeast, beer, ale, and sour milk that it may be considered practically identical, the principal difference noticed being a variation in the size; while in shape, manner of propagation, and apparent globule within, the modifica of propagation, and apparent globule within, the modifica
tions are but slight. It is developed in the morbid secretions are but slight. It is developed in the morbid secre-
tions of the mouth, the œophagus, and stomach; it is also tions of the mouth, the œsophagus, and stomach; it is
introduced into these situations by the drinking of beer.
introduced into these situations by the drinking of beer.
In the black fur of the tongue of persons laboring unde In the black fur of the tongue of persons laboring under
typhus, or in the oral secretions where persons have been typhus, or in the oral secretions where persons have been
long sufferers from organic disease, it is also found. Vogel thinks it of great importance to regard this plant only as an accompaniment and not as the cause of disease.

Leptothrix buccalis-Slender hairs in the mouth.
This consists of slender structureless fibers, of various lengths, and straight or curved as the fiber is long or short One end is free, the other is planted in or projecting from a fine granular mass, though a limited number are always no ticed floating in the secretions, detached from any substance They are found singly or in bundles, and multiply with great rapidity. Scarcely any portion of the mouth is free from them. They appear on the surface of the tongue, in depressions of the teeth, and cavities of decay, on the neck
and surfaces of the teeth; indeed, everywhere within the and surfaces of the teeth; indeed, everywhere within the
oral cavity that lodgment can be found for a particle of food.
They are found also growing from the surface of accumulations of tartar, whether such accretions be upon the necks of the teeth, in the cavities of decay, or on artificial dentares. There is probably no situation where they grow with greater rapidity than on the surfaces of the plate, either up. per or under. The soft cheese-like substance that so quickly accumulates there is most prolific in their production,though from this situation they are neither so long nor attenuated as those taken from an inflamed mucous membrane. While great care in cleanliness limits their number, it is impossi ble to entirely eradicate them or prevent their development

## Leptomitus-Slender Threads

This growth, as the name indicates, is neither so long nor so slender as the leptothrix. It also has occasional branches, and marked transverse strix, which complete its morpholog. ical difference from the plant just described. It is found upon the tongue and in the pharynx of persons suffering from pneumonia, pleuresia, phthisis, apoplexia, and chronic gastritis.

## bacteria and vibrios.

These organisms form some of the most minute object which the microscopist has the opportunity of examining, and it is with the greatest difficulty their structure can be accurately determined. They are both found in the fluids of the moutb, but the profusion in which they exist is modified by the care exercised in keeping the fluids of the oral cavity free from decomposing substances. In the fangs of teeth where the pulps are devitalized, they are found to rapidly develop. Nor is their presence in this locality confined to such teeth as have defective crowns giving communication with the fluids of the mouth; but in a number that were ex a mined where there was devitalization of the pulp without any loss of the hard tissues from caries or otherwise, their presence was readily detected. Upon opening into such cavities, they were, as usual, very offensive from the degenera ted pulp, and on examining this putrid material these living organisms were observed in abundance.

## monads.

With these two low forms of life we must associate what are known as monads, or, as Bastian calls them, plastide par ticles. These are invariably found in the same solutions with the former, and are supposed by some observers to result either by direct growth and development, or by aggregation and coalescence into bacteria and vibrios.
" Naturalists have been in doubt as to whether they should be regarded as independent living things of the lowest grade, having an individuality of their own, or whether, rather, they should be looked upon as developmental forms of some higher organisms, either animal or vegetable.'
The discovery of these low forms of life in the mouth is not of modern origin, as we shall see from the following by Leuwenhoek. In 1682, at the age of fifty years, he wrote respecting his teeth: "It is my custom every morning to rub my teeth with salt, and afterwards to wash my mouth, and, after eating, I always clean my large teeth with a toothpick, and sometimes rub them very hard with a cloth. By these means my teeth are so clean and white that few persons o my age can show so good a set; nor do my gums ever bleed although I rub them very hard with salt; and yet I cannet keep my teeth so clean but that, upon examining them with a magnifying glass, I have observed a kind of white substance collected between them, in consistence like a mixture of flour and water. In reflecting on this substance, I thought it probable (though I could not observe any motion in it) that it might contain some living creatures. Having there fore mixed it with rain water, which I knew was perfectly pure, I found, to my great surprise, that it contained many very small animalcules, the motions of which were very pleasing to behold. The largest sort of them had the great-
est and quickest motion, leaping about in the fluid like the est and quickest motion, leaping about in the fluid like the
fish called a jack: the number of these was very small. The fish called a jack: the number of these was very small. The second sort had a kind of whirling motion, and sometimes moved in the direction of a spiral, and undulated; these were more in number. Of the third sort I could not well ascertain the figure, for sometimes they seemed roundish but oblong, and sometimes perfectly round. These were so
small that they did not appear larger than a speck. The motion of these little creatures, one among another, may be imagined like that of a great number of gnats or flies sporting in the air. From the appearance of these to me, I judged that I saw some thousands of them in a portion of liquid no larger than a grain of sand, and this liquid consisted of eight parts water and one part only of the before-mentioned sub stance taken from the teeth.
' With the point of a needle I took some of the same kind of substance from the teeth of two ladies who I knew were very punctual in cleaning them every day, and therein I observed as many of these animalcules as I have just mentioned. I also saw the same in a white substance taken from the teeth of a boy about eight years old; and upon examining in like manner the same substance taken from the teeth of an old gentleman, who was very careless about keeping them clean, I found an incredible number of living animalcules, swim ming about more rapidly than any I had before seen, and in such numbers that the water which contained them (thnugh but a small portion of the material taken from the teeth was mixed in it) seemed to be alive."

## parameora.

Having now considered all the growths deemed vegetable found in the mouth, I have still one other organism to de-
division of sentiment, it belonging undoubtedly to the ani mal kingdom. I allude to the paramecia, a genus of infuso ria. They are only found in the oral cavity in cases of ex treme uncleanliness; and though increasing rapidly in infu sions adapted to their growth, they are somewhat limited in this situation, owing to the constant changing of the secretions. About fifteen varieties have been dessribed. The have a soft flexible body, variable in form, though usually oblong or oval, and more or less depressed. In most of them, numerous rows of vibratile cilia are noticeable, projectin rom their integument.

## Useful Recipes for the Shop, the Household,

Vienna bread and Vienna beer are said to be the best in the world. Both owe their superiority to the yeast used, which is prepared in the following manner: Indian corn barley, and rye (all sprouting) are powdered and mixed, and hen macerated in water at a temperature of from $149^{\circ}$ to $167^{\circ}$ Fah. Saccharification takes place in a few hours, when be liquor is racked off and allowed to clear, and fermentatio is set up by the help of a minute quantity of any ordinary
yeast. Carbonic acid is disengaged during the process with yeast. Carbonic acid is disengaged during the process with so much rapidity that the globules of yeast are thrown up by the gas, and remain floating on the surface, where they form a thick scum. The latter is carefully removed, and constitutes the best and purest yeast, which, when drained nd compressed in a hydraulic press, csn be kept from ight to fifteen days, according to the season
By drawing up the earth over the potato in sloping idges, the plant is deprived of its due supply of moisture by rains, for when they fall the water is cast into the ditches. Further, in regard to the idea that, hy thus earth ing up, the number of tubers is increased, the effect is quite the reverse; for experience proves that a potato, placed an inch only under the surface of the earth, will produce mor bers than one planted at the depth of a foot.
Brown bronze dip, for coating hat hooks and similar small hardware articles, is made of iron scales, 1 lb . ; arsenic, z. ; muriatic acid, 1 lb . ; zinc, solid, 10 ozs. The zinc should be kept in only when the bath is used. The castings must be perfectly free from sand and grease.
A good test for gold or silver is a piece of lunar caustic to be tested, pointed stick of with the caustic. If gold silver, the mark will be faint ; but if an inferior metal, it will be quite black.
Cider may be purified by isinglass, about 1 oz . of th
atter to the gallon. Dissolve in warm water, stir gently latter to the gallon. Dissolve in warm water,
into the cider, let it settle, and draw off the liquor
The solvent power of glycerin upon several substances ommonly used in medicine and the arts is as follows: 1 par of sulphur requires 2,000 parts of glycerin; iodine, 100
parts; red iodide of mercury, 340 parts; corrosive sublimate parts; red iodide of mercury, 340 parts; corrosive sublimate,
14 parts; sulphate of quinine, 48 parts; tannin, 6 parts 14 parts; sulphate of quinine, 48 parts; tannin, 6 parts
veratria, 96 parts; atropia, 50 parts; hydrochlorate of mor phia, 19 parts; tartar emetic, 50 parts; iodide of sulphur, 60 parts; iodide of potassium, 3 parts; sulphide of potassium, 10 parts.
Some weeds can be killed and prevented from growing in garden paths by watering the ground with a weak solution f carbolic acid, 1 part pure crystallized acid to 2,000 part water. Sprinkle frcm a watering pot.
A screen or blower of wire gauze, from
A scres from 36 to 40 wires t he inch, placed in front of range or stove fires, will prevent, is said, smoke coming in to the room when the chimne ails to draw well
To prevent condensation in a steam pipe laid under ground, place it inside another larger pipe, filling the intervenin paces with pulverized charcoal. The outside pipe should o watertight.
Tar water may be employed for dyeing silk or wool ashen ray. The stuff is first mordanted with weak perchloride of ron, by soaking in the solution some hours. It is $t$ lin rained and passed through the bath of tar water. The oxsphenate of iron, which is thus precipitated on the fabric fives a very solid color.
A cement, impermeable by air and steam, and especially well adapted to use for steam or gas pipes, is made of powdered graphite 6 parts, slaked lime 3 parts, sulphate of powdered graphite 6 parts, slaked lime 3 parts,
ime 8 parts, and boiled oil 7 parts, well kneaded.
Cider may be preserved sweet for years, by putting it up airtight cans, after the manner of preserving fruit. Th iquor should be first settled and racked off from the dregs, but fermenta'ion should not be allowed to commence befor canning.
The mordants used for dyeing with sumac are either tin acetate of iron, or sulphate of zinc. The first gives yellow,
the second gray or black, according to strength, and the the second gray or black, according to strength, and the hird grepnish yellow.
When boilers are ordinarily fed with hard water, it is worth while to save the drippings of the exhaust pipe, the condensation of the safety valve blow-off, and that from the cylinder and use the water thus obtained to fill the boiler after blow ing off. The result will be surprising in effect in loosening cale.
The evaporative efficiency of American anthracite and merican bituminous coals is in the propor ion of 8.9 to 9.9 Glossed shirt bosoms: Take two ounces of fine white gum arabic powder, put it in a pitcher and pour on a pint or more
of water, and then, having covered it, let it stand all night In the morning, pour it carefully from the dregs into a clean bottle, cork, and keep it for use. A teaspoonful of gum wa ter stirred in a pint of starch, made in the usual way, will give to lawns, white or printed, a look of newness, when nothing else can restore them, after they have been washed.

A cheap fertilizer consists of sulphate of ammonia 00 lbs . nitrate of soda, 40 lbs . ; ground bone, 250 lbs . ; plas ler, 250 lbs. ; satt, 40 lbs . ; ground bone, 250 los.; plas ter, 250 lbs. ; salt, $\frac{1}{2}$ bushel; wood ashes, 3 bushels; stable
manure, 20 bushels. Apply the above amount to six acres. manure, 20 bushels. Apply the above amount to six acres.
Labor in preparing included, it costs about $\$ 15$. It is said Labor in preparing included, it costs about $\$ 15$. It is said
to give as good results as most of the commercial fertilizers to give as good resu
costing $\$ 50$ per ton.

## osting $\$ 50$ per ton.

To make a handy paint, break an egg into a dish and beat slightly. Use the white only, if for white paint; then stir in coloring matter to suit. Red lead makes a good red paint To thin it, use a little skimmed milk. Eggs that are a little too old to eat will do for this very well.

## Magnetism of Iron Filings.

" De Haldat published, "during 1836, in Memoircs de l'Acadmie of Stanislas, that he had put iron filogs into a brass tube (closed by two screw plates), which he magnetized by the ordinary process, and that he succeeded in obtaining two contrary poles. The polarity slowly decreased when varying quantities of river sand were mixed with the filings, while in every case it was very weak, and disappeared when the metal grains were displaced in position by shaking the tube I repeated this experiment by firmly ramming down the iron filings into the tube, by means of a small hydraulic press I found that when the filings begin to aggregate the polarity considerably augments, and continu's to increase with press ure. I now lay before your Academy some tubes, $3 \%$ to 4 inches long and 12 inches in diameter, which attract at least as powerfully as those made from broken pieces of good steel of the samedimensions. As the iron filings which I used were of unknown origin, I had some prepared under my own eses, from good soft iron, perfectly reduced, and without appreciable coercive for has no coercive force when it is entire acquires it in as considerable a degree as that of steel when it bas been reduced and compressed by pressure. Is it not to this fragmentary character that we must attribute the observed polarity? and is it not, also, this same cause which explains the coercive force of steel? One cannot explain the distribution in a magnet without considering it as composed of rows of very small magnetic elements of opposite poles, reacting between themselves at a distance; and it is proved that the quantities of separate magnetism in each of them increase, by this reaction, from the extremity to the middle line. Until now it seemed admissible that these elements are the molecules themselves; but the preceding experiment appears to show they are formed of either compacted iron fragments or small agglomerated crystals, as in steel. When, before pressing the filings, materials which render the mass more homogeneous are put with them, the same polarity can no longer be given to them as before the mixture. For example, if we make a paste of chloride of ron and filings, and press it, we obtain, after several days, a subchloride of iron of continued appearance, which may be filed and polished like pure iron, but which can scarcely be magnetized. Iron reduced by hydrogen and oxygen from scales behaves like iron filings; but magnetic or diamagnetic bodies mixed with the filings notably change its faculty of becoming magnetized. It is probable that, in very powerfully ramming home the powders. the coercive force would be found to increase to a maximum, and that it will after wards decrease when the compactness of the fragments will in Comptes Rendus.

Concrete for Walks, etc.
John Turner, in the London Agricultural Gazette, gives his experience in making and using asphalt as follows: "I have done a great deal successfully in walks and some kinds of floors such as the floor of a pig house, but have never at tempted it for heavy traffic. It is neither difficult nor expen ive. Of course a great deal dep $n$ nds upon the cost of mate ial ; the labor is tr.fling. I have used screenings of grave I don't like it clean, but mised with sand); I have used sand lone (when I could not get anything better), blacksmiths ashes, and ashes from my engine. The last I did was for ou churchyard walks; for those I go the screenings of Leices ershire granite, which made a splendid path, but of course more expensive-the granite cost $\$ 2.50$ per tun. It is quite an unnecessary expense and trouble to boil the tar. Ge your material dry, mix it with tar, turn it over twice, and et it lie a couple of days, then turn it again, and mix a little lime with it, about a tentb, let it lie another day, and then on a fine sunny day lay it on, rake it even, and roll well as soon as it will roll, in an hour or two's time; if the roll does not work well (it ought to if the stuff is not mixed with two much tar), scatter a little dry sand over it. Every summer I brush my walks over with cold tar, and give a good sprink ling of sand, and they are as good now as when first pu down, fifteen years since. Any laborer can do it, only take are, before laying it down, it is of proper consistence. Whe eady it ought not to show the least tar, but should be a dull dead black, and, when moved with a shovel, ought to e lively, exactly like a mass of mites in a cheese. The stuff will keep a long time in a heap if covered up or other wise kept dry

## Boiler Explosion

Mr. R. Nickerson, of Harlem, Ga., informs us that a boiler at Sawdust. Ga., ex ploded on August 7. It was in a sawmill and the building was torn to pitces. Paris of the boiler were thrown to a distance of several hundred yards. One man was blown to pieces, and two seriously injured. Mr. Nick erson states that the pressure gage showed 45 lbs.; but the gage was defective, as the practice (indulged in by the person in charge) of hanging car couplings on to the safety valve did not appear to form any increased pressure in the boiler.

Gerent American and fortign equtents.
Improved Stone Crusher.

Joshua Comly, Philadelphia, Pa.-This stone crusher has one stationary and one vibrating jaw. There is a toggle-bar contrivance in combination with the crank shaft and the rod connecting it with also another device for giving vertical or endwise motion to the movable jaw, to be used or not, as may be found desirable Improved Wire Barb Pinchers.
John Dobbs and Benjamin F. Booth, Victor, Iowa.-This invention consists in the pinchers made with curved and notched jaws, and provided with projections upon the inner sides of said jaws, to
adapt it for use in applying barbs to fence wires. In using the adapt it for use in applying barbs to fence wires. In using the
pinchers, an ordinary wire staple is placed in the space between its pinchers, an ordinary wire staple is placed in the space between of the faces of said jaws. The jaws of the pinchers and the arms of the ers are closed. This forces the arms of the staple past each other until they rest upon stops and project in opposite directions, and until they rest upon stops and project
the formation of the barb is completed.
improved Comblnation cotton Press.
John F. Taylor, Charleston, S. C.-The object of this invention is
to produce a press of great power, especially adapted to compressto produce a press of great power, especially adapted to compress-
ing cotton bales to the smallest possible dimensions for shipment, ing cotton bales to the smallest possible dimensions for shipment,
and that with the greatest possible speed, and with the least possible consumption of fuel. It consists in the particular construction hydraulic press, the steam in the cylinder that operates the water piston being used a second time in a cylinder which operates the toggle lever through the instrumentality of an equalizing part in
the slide valve of the first steam cylinder.

Self-Discharging and Re-Setting Lumber Car.
James L. Ridgely, Jr., Harrisonville, Md.-This invention relates James L. Ridgely, Jr., Harrisonville, Md.-This invention relates
to cars or trucks whose wheels run upon a track to transfer lumber to cars or trucks whose wheels run upon a track to transfer lumber
out of the way, after it has been sawn, to a convenient place for out of the way, after it has been sawn, to a convenient place for
piling it up; a ad it consists in the combination of a truck running that form the bearing of the load, and pivoted on a medion oxis to said truck, whereby the lumber may be dumped by its own weight. Improved Candiestick.
John B. Gribble Grass Valley, Cal.-The core or shuttle has a screw thread cut on it. On the movable part of a tube, threads of a screw are made, which fit the pitch of the screw on the shuttle.
The candlestick rests upon the upper end of the shuttle, and the latter is made fast in the stationary part of the tube. By this candle, and the end of the shuttle prevents the tallow from runcandle, and
ning down.

Improved Self-Acting Blowpipe.
John Martin Hancock, Lansing, Iowa.-This is a self-acting blow pipe for hard and soft soldering, by which the flame would be fully
and instantly controlled, and the power of the same regulated withand instantly controlled, and the power of the same regulated with-
out interrupting the working of the blowpipe. The invention consists of a pipe attached sidewise and projecting to some distance from the alcohol vessel, which is exposed to the heat of a small flame, being about the same distance from the main flame of the
lamp as the bottom of the alcohol vessel is from the outermost end lamp as the botto

Improved Buffer for Steam Rock Drills. Joseph C. Githens, New York city.-As the piston in its upyer
movement strikes the movement strikes the upper head, it forces the said head upward against the packing, and the blow is tnally sustained by long boits,
which draw against the lower head. As the piston, in its downward
movement, strikes against the lower head, the said head moves movement, strikes against the lower head, the said head moves
downward a little, and, through the long bolts, draws a plate down downward a little, and, through the long bolts, draws a plate down
upon the packing, relieving the head from the force of the blow. upon the packing, relieving the head from the force of the blow. cylinder.

Improved Wagon Rack.
Joseph Bolt, Warsaw, Ill.-The object of this invention is to so under date of February 10, 1874, that the loading, conveying, and unloading of corn may be accomplisbed by one person in an easy,
quick, and secure manner. The invention consists of separate tiltquick, and secure manner. The invention consists of separate tilt-
ing frames, which are arranged on the supporting rack frame to swing to opposite sides, and carried back and retained with the load
by cords with hooks and pulley blockspassing over pulless to wind-ing-up rollers, and ratchets operated by a hook lever. The rack ing-up rollers, and ratchets operated by a hook lever. The rack
frame is braced in rigid position by inclined bars extending from seat blocks at opposite sides through lateral guide pieces of the rack to the ground.

Lmproved Harrow.
Isaac W. Hutchin, Clinton, Ill.-Each of the two triangular sec-
tions of the harrow is composed of converging bars connected by tions of the harrow is composed of converging bars connected by
transverse straps. The teeth are in suitable manner fastened in the bars. The two sections are hinged together so that their inner
bars are parallel. The hinges are raised above the surface of the bars are parallel. The hinges are raised above the surface of the
sections, and their connecting pivot is thereby brought high enough from the ground to clear corn of ten or twelve inches in hight.
Each section has a projecting handle, and the two handles are united by a chain, which can be shortened so as to slightly raise the outer sides of the sections. This will cause the harrow to cut more in the center when harrowing corn stalks. By slackening the chain the sections will be brought flat upon the ground.

Improved Vehicle Spring
Christen Nielsen, South Brooklyn, N. Y.-The rear springs are attached to the rear axle, and their forward ends are pivoted to
brackets attached to the wagon body. To the rear ends of th springs are pivoted links, the upper ends of which are pivoted $t$ bracket. The shackles allow the springs to expand as they are
brought under the pressure of the load. 'The couplings are kept brought under the pressure of the load. 'The couplings are kept
parallel with each other to keep the springs from being twisted by brace bars. The forward springs are connected with the forward axle, and the forward ends are pivoted to brackets attached to the
platform. The rear ends are connected by a bar, the middle tart which is bent upward, and has a hole to receive a bolt, which also passes through the bent down middle part of a bar pivoted to the
ends of the bars of the platform and to the ends of bars which are ends of the bars of the
pivoted to the springs.

## Improved Device for Destroying Bugs upon Plants

Robert M. Clark, Nisbet, Pa.-In using the device, Paris green or other suitable poison is put into a vessel suspended from the shoulders of the operator, either by taking off the cover or by pouring it
n through a funnel in the same. A suitable quantity of water then poured into the vessel through the funnel, in which may b placed a filter in case the water be so dirty that it would clog the
perforated nozzle, which is attached to a faucet by a flexible tube The poison and water are mixed by operating a perforated dasher ane poison and water are mixed by operating a perforated dasher,
faucet enables the escape of onanally operating said dasher. The
faison to be prevented when charging the vessel and when carrying it from place to place. The mixture is directed upon the plants from the nozzle.

Improved Apparatus for Destroying the Cutting Ant Ferdinand A. Fenner and John H. Power, Mission Valley, Tex.In using this apparatus, the main cell of the ants' nest is found by means of an iroop probe of suitable length, and a hole about eight
inches in diameter is sunk to such a depth that its lower end may be inches in diameter is sunk to such a depth that its lower end may be
a litue below the lowest cell. The perforated and covered iron a litlle below the lowest cell. The perforated and covered iron
cylinder is then lowered into it, the collar of said cylinder resting cylinder is is then lowered into it, the coliar of said cylinder resting
upon the surface of the ground and closing the mouth of said hole. A fire is then built in the cylinder, and a blast of air is forced into it by a bellows connected with the end of a pipe which enters the side of the cylinder near the bottom pipe. When the fire is fully kindled, six or eight pounds of sulphur are poured into the cylinder,
and the cover is put on. The bellows is then worked for from thirty and the cover is put on. The bellows is then worked for from thirty
to forty-five minutes,which forces the fumes of the sulphur through to forty-five minutes, which fores the fumes of the sulphur through
all the cells and passages of the ant nest and kills all the ants of the all the cel
colony.

Improved Cotton, Corn, and Pea Planter. Dwight W. Bristol and John F. B. Searcy, Pleasant Hill, Miss.volves in bearings attached to the side bars of the frame. Within the drum is secured a smaller drum, in the middle part of which is secured a wheel, from which six radial tubes lead out through the
faces of the drums. In the wheel, at the inner ends of tubes, are faces of the drums. In the wheel, at the inner ends of tubes, are
formed recesses, into which the seed passes through holes in the formed recesses, into which the seed passes through holes in the
side plates attached to the sides of the said wheel and forming a part thereof. Upon the opposite sides of the wheel are placed circular plates, in which are holes corresponding in position with the the size of the holes leading into the recesses in the wheel may be adjusted to allow more or less seed to enter the said recesses and pass out throurb the tube

Improved Vehicle Hub.
Joseph H. Lindsay, Freehold (Woodside P. O.), Pa.-The inner part of the hub has a ring flange to project over the collar of the flange part sere formed wedge-sh. Upon the outer side of the ring flange part are formed wedge-shaped projections, the spaces be-
tween which are dovetailed in form, so as to prevent the spokes, the inner ends of which are fitted into said spaces, from being segments of a ring flange, which enter a ring groove in the outer part of the hub, and thus strengthen the connection between the part of the hub. In the body of the hub is formed a chamber to
receive the oil, from which chamber a hole leads into the bore. The hole is surrounded with a recessed projection, in which is placed a ball to act as a valve to prevent the oil from flowing through the From the oil chamber a hole leads out through the hub, through which the oil is poured into said chamber.

Improved Earth Auger.
Oscar Rust, Macon City, Mo.-The body of the auger is made elliptical in its cross section, and in two parts, the plane of division
passing through the longer axis of the ellipse. To the lower end of each part is secured a jaw. The jaws project downward and forward, and are slightly concaved, and their lower ends pass each
ther. To the forward ends of the jaws are secured the bits, the other. To the forward ends of the jaws are secured the bits, the
edges of which are made oval, and have their corners rounded off. The outer ends of the bits are curved upward, and project outward a little beyond the walls of the pods, so as to cut a bore a little larger than the bucket, so that the said bucket can be readily
raised and lowered through said bore. Braces are attached to the turned up outer ends of the bits. The parts are further secured together near their lower ends by hasps.

Improved Trace Carrier
William H. Townsend, Goodland, Ind.-This is a frame adapted for attachment of harness straps, having rigid trace-supporting the side bars, and spring arms pivoted to a transverse bridge piece and coinciding with the arms. The trace-connecting strap are in this manner quickly applied and taken off.

Improved Wind Power.
Austin Lowe, Salina, Kan.-The invention relates to a portable wind power, which is designed for propelling wheeled carriages
used for transporting loads and for furnishing a prime motor for perating thrashing machines, churns, plows, and other agricultura machines. The principal feature of the invention consists in the
provision or relative arrangement to each other of a pair of wind wheels, which are of such a construction that both are brought into or transmultaneously, and caused to r nected with the machinery to be operated.
mproved Plow Attachment.
Almerrin P. Allen, Denmark, Iowa.- The invention consists in the soil which has been turned by the plow, in such manner as to reduce, level, or pulverize the same, or plant it with seed, the side
draft of the machine being opposed to the tendency of the plow to crowd in the opposite direction (laterally) against the vertical land
side portion of the furrow, so that the power which would be other de portion of the furrow, so that the power which would be other the landside of the plow and the contiguous wall of the furrow will be all, or nearly all, neutralized and utilized in completing the
operation of preparing the soil for reception of seed. The invenoperation of preparing the soil for reception of seed. The invenhopper, harrow, and roller, to form a plow attachment of light draft hopper, harrow, and

Improved Vise.
George W. Millner, Charlottetown, P. E. I.-This invention relates rpipes; and it consists in a screw bolt having a T-shaped head and handle nut, in combination with the extended handles of a pair of pipe tongs, constructed respectively with an oblong hole and an pen slat.

Improved Animal Poke.
Samuel N. Gustin, Mexico, N. Y.-This invention relates to cer tain improvements in animal pokes, which, as usually constructed end of which is a breast block provided with points, the whole being attached to the necks of unruly animals to prevent them from
jumping fences, and to keep them within bounds generally. It consists in the improved construction of the pivot plate that at aches the yoke to the crosshead, the said plate being made. with apering eye to facilitate the connecting of the said devices. It
also consists in the means of attaching the crosshead to the tongue

Improved Bottle Stopper.
George E. Reed, Brooklyn, N. Y.-The lower part of the stoppe which comes in contact with the mouth of the bottle. Around the upper part of the stopper is a metal band, in the upper edge of the opposite parts of which are inclines, the shoulders of which serve cines are slots to receive a loop, to allow the stopper to be removed sides of the bottle's neck by a wire band passed around the said neck. The stopper is fastened, when pressed into the mouth of the bottle, by turning the band, so that the inclines may press against
the bend of the loop.

Improved Seed Cotton Cleaner Manassah C. Cheek, Mansfield, Tenn.-This invention consists of ods, in combination with the and open concaves formed of wire ounteract the air blast from the first cylinder, and direct it down hrough the open concaves, and also to detach the cotton from saic ylinder and pass it along to the discharge opening through the nary cleaners will. It also consists of a suction fan in the dust chamber below the spiked fan cylinders, to increase the draft through the dust chamber.

## Improved Chair.

Henry Reupke, Chicago, Ill., assignor to himself and Frederick the chair back by a tenon, and are fastened therein by keys. Th ower ends of these uprights are toed into the rear legs, thus brac
ng the back securely. Stretchers pass through the legs (front and ing the back securely. Stretchers pass through the legs (front and
rear) by means of tenons, are secured by keys, and are connected ear) by means of tenons, are secured by keys, and are connected their upper a cents, and bar. The front and rear legs are slotted a nd leps fit chair is filled in by an upright bar and a cross bar. The head piece is let into slots in the upper ends of the side pieces, and is fastened by screws, while tenons on the cross bar pass through the side pieces and are secured by keys. This chair may be taken to pieces by re-
moving the keys and screws, so that it may be packed in a small moving the keys and screws, so tha
space for storage or transportation.
Improved Die for Forming the Eyes for Tools. John R. Thomas, Hamilton, Ohio.-This is an improved adjustable punch and die for forming the eyes of agricultural and other tools, the eyes may be varied without the necessity of having a corres onding number and variety of dies and punches for the purpose The stock of the punch is slitted transversely, and the divided parts may be expanded or spread more or less by means of a tapering in. A tapering nut screws on the stock or body of the punch, and constitutes the punch proper. The punch
the size of aperture of which is adjustable

Improved Machine for Rolling Nail Plates
Hiram Woods, Newcastle, Pa., assignor to himself and William F the roughing rolls, and presents it to a self-feeding roll, above th oper roll, to be carried over the roller's side and on to an incline feeding table. Besides taking the plate from the movable table without the aid of the hooker-up, the roll delivers the plate withou aid of che

Improved Washing Machine.
John W. McQuillin and John A. Knepper, Delta, Ohio.-By suitae construction, as either end of a lever is pressed downward, a orsing the water out of them, which water copon the clothes, rough a grate upward through the presser, and laterally through the other part of the clothes, which are relieved from pressure by the upward movement of a second presser, and so on. One of th pressers always moves downward as
washing the clothes in a short time.

## improved straw Cutter

Leopold Schellinger, Mishawaka, Ind.-The invention is an im rovement in the class of straw cutters in which the rollers fo feeding the straw and the bar for clamping the same whie being
cut are operated from the shaft of the hand wheel, to which the knives are attached. By suitable construction a saddle, at each revolution of the eccentric, will be drawn upon the substance in th feed box and then raised. The fly wheel and the eccentric wheel
are so arranged that the saddle will be drawn down as the knife beins to cut, and will be raised as the cut is completed. By othe devices the rapidity of the feed may be regulated as may be re quired. The feed rollers revolve toward each other to feed the
substance forward, and the upper roller moves up and down to djust itself to the thickness of the substance without being thrown out of gear. The feed mechanism is so arranged as to stand still when the saddle is pressed down, and to operate when the said sadWhen the sad.
Improved apparatus for Measuring Liquids, etc. Emile E. P. Clausolles, Barcelona, Spain.-This apparatus consists of bellows, formed of annular disks, which are in communication with the ingress and egress passages formed in the foundation plate wich vibrates in a spherical recess in a fixed stand, and the lowe nd of the axis of this compound lever on to a ces closes the ingress an egress ports. The upper end of the axis gives motion to the index dials or to a rotary sbaft for transmitting power or to pumps. The
bellows are made to contain a certain fixed quantity of liquid, and the pressure on the liquid to be measured the sald to xpand and collapse alternately.

Improved Gas Regulator.
Joseph Adams, Washington, D. C.-This invention relates to cer
ain improvements upon the gas regulator for which letters paten ere granted to the inventor May 5, 18\%4; and it consits in the 0 , truction of the valve, which is of a funnel shape and provide with an outer covering of flexible material secured by a nut and funnel-shaped clamp upon the inner and lower side of the valve.
It also consists in the particular construction and arrangement of the hollow valve stem with the flexible diaphragm and the bal oon.

Improved Heating and Ventilating Register. John B. Oldershaw, Baltimore, Md.-This invention relates to that cass of heating and ventilating registers that are inserted in the the hot air. It consists in an extensible flue stopper, adapted to be inserted in the chimney flues of different sizes, to deflect the cur rent through the register, and in the particular construction of th egister frame having openings for giving access to the flue, either
above or below the flue stopper plate, for cleaning off soot and ex bove or below the flue stopper plate, for cleaning off soot and ex

Improved Horseshoe.
Joseph H. Dorgan, Plattsburg, N. Y.-A strap is made in three parts. A piece laps on the central part on each side, and is fastened
thereto by bolts. A series of holes is made through the central part, which allows the pieces to be adjusted, so as to make the stra fit hoofs of different sizes. A bolt passes up through the shoe, and through a hole in the front part of the strap. The ends of the flexi-
bre plate or band may be expanded or contracted to accurately fit ble plate or band may be expanded or contracted to accurately fit hoofs of different widtbs, while the

## Improved Water Elevato

Jesse Chandler, Barry, Ill.-This invention relates to endless chain nd bucket elevators. The buckets have a block on the under sid throw up the bottom, when passing over the one upper wheel little lower than the first, also to tilt the buckets so as to empty reahe wheel, to conduct the water first emptying from the bucket over sufficiently to run into the trough.

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A. K. will find a recipe for water glass on p.22j, vol. 23.-A. F. will find directions for ma-
king a sun dial on p. 409 , rol. 29.-F. J. C. will find directions for making colored glass on p. 390, vol 30.-J. N. will fina a recipe for black booard compo-
sition on p. 91 vol. 31 - J. N. can utilize the tin o tinned plat.
319 , vol. 31.
(1) J. H. asks: How can I make pure chlo States gold coin? A. Dissolve the coin in a limite quantity of a warm (not hot) mixture consisting of one part nitric and three parts hydrochloric acid. When solution is complete, filter from the
white residue of chloride of silver; dilute largely with distilled water, and add a filtered aqueous so lution of common sulphate of iron ( 6 parts to 1 o Eolad); collect the precipitated gold, which is no
free from frst, and evaporate to dryness on a water bath Paree the filter paper containing the chloride of
silver, along with a quantity of borax, in a smal silver, along with a quantity of borax, in a smal
Hessian crucible, and heatstrongly until the silver is separated and rests as a small button on the bot tom of the crucible; remove from the fire, cove and allow to cool. Then separate the silver from
the borax by means of holling water ; dissolve in nitric
What chemicals will act as a bleaching agent when exposed to sunlight? A. Moisture, chlorin
(2) M. H. K. asks: What is the green sub stance that gathers on the outside of a porou earthenware drinking vessel? Does it come from es off readily, and resembles the green slime of stagnant waters. A. It is probably due to the which, on evaporating, leavesit behind in the form you mention. Test a little of the clear water by coloring it slightly with permanganate of potash if, after standing for some time, the color disa,
pears, the water is unfit for drinking purposes.
(3) S. D. G. says: I have a steam whistle which sounds well at 100 libs. steam. If I no the whistle? Can it be heard so much farther, will it fail to sound at all? A. It is problematica whether the expansion of the metal would not together alter both the tone and effectiveness of (4) W. M. J. says: The boiler of a thrash ing machine engine recently exploded at Lexing-
ton, Md. On examination it was found that the ton, Md. On examination it was found that the
safety valve was stuck fast in the guide, it being a light globe valve with a stem about $31 /$ inches long. off, being a close ift II sm ander the impressio that the hand had gone once clear around and up to the 65 lbs., as the sheets do not show any signs of having been over heared. A. The safety valve stem being fast totally impaired the efficiency of the boiler, and it is possible that the needle of the
pressure gage (if the construction of the gage would permit) had made more than an entire revolution. The pressure in such case is an unknown quantity ; hence the explosion.
(5) J. C. asks: Is it possible to plane a piece
of hardened steel? A. It is impracticable would be, if it could be done, disadyantageous.
(6) C. W. M. asks: 1. If I make an engine color change if I plate it with nickel? A. No. 2. now large a copper boner shouma thick should the shell be? A. Size of boiler about 8 inches diame er and 15 inches long; shell $1 /$ inch thick for mod erate pressure. 8. Should it be brazed or riveted
A. It should be brazed and riveted. 4. Will ports $1 / 6 \mathrm{x}^{3} / 8$ inches be large enough for a $11 / 2 \times 3$ inch cylinder? A. You will find a rule for size of ports in No. 16, etc., of Practical Mechanism.
(7) W. E. S. says: A friend of mine asserts that, in a eommon bucket pump the only water
ifted by the bucket is that which is above the bucket. Is he right? A. Yes.
(8) A. D. T. says: In my daily experience in the use of twist drills, I have remarked one im-
provement which a manufacturer might make. provement which a manufacturer might make.
It is this: Flatten three sides of the shank; this will do a way with all slipping. Also put a good
center in the shank. All this can be done very little expense and cannot fail to give great satio
faction. A. Twist drills $\frac{1}{4}$ inch and over in diame ter usualy have a tapor shank, and a feather on
the end which effectually holds them. Those be Tow that size, and those having parallel shanks,
may be held sufficiently frm in an ordinary chuck nay be held sufficiently irm in an orinarlachuck thwould be dificic
chucks run true.
(9) A. C. T. says:I have seen an article in elation to a certan anloy of metals, which whe melted was of thc required degree of heat fo ompering edge toos. that purpose We know ead is sometimes used, the work being grease before immersion.
(13) L. H. R. asks: 1. I have two shaft belt 66 inches long. H center. 1 have an endless of two pulleys, both to be the same size, on which this belt will fit tight? A. Subtract twice the dis-
tance betweenthe centers of the shafts from the length of the belt, and divide the remainder by $f$ each pulle 2 U the size of one pulley being given, how can I as certain the correct diameter of the second? A To twice the distance between the centers of the shafts, add balf the circumference of the give pulley, and subtract ther sum from the length vided by 3 will give the diameter of the secon dile.
(11) G. D.-It is likely that the law of you State, forbidding the sale of goods manufacture be enforced; but by a number of judicial dec sions, you are at liberty to travel in any state o Territory and sell rights to manufacture under
your patent, and no State legislation can legally your patent, and no state legislation can legally (12) H. M. says: We are putting up a hori zontal engine. Please give us your method of get
ting out the template and the lines and right angle ting out the template, and the lines and right angle
ine for back box, distance, etc. A. The cylinder ne crosshead guides are set true horizontally and parallel with the bed frame. The erank sha is set by running a line, true with the bore of the cylinder, the full length of the bed, and setting th crank shaft at a right angle to it, keeping all part evel with a spirit level.
(13) A. M. B. asks: What kind of stee hall I use for making a gun barrel? A. Forge ne a quality.
(14) J. N. P. asks: What is the rule fo calculating the strength of boilers, steam pipes,
etc.? A. "For calculating the strength of a singly riveted steam boiler, multiply the internal diame ter of the boiler in inches by the pressure of stea in lbs. per square inch, and divide the product by oiler platein inches."-Bourne
(15) A. H. D. says: We turn our axle nuts n soda and quinine, and put them away without cleaning or oiling, and they rust. Is there a way or labor? A. Coat them with boiled oil and white lead, mixed to a thick paint.
(16) C. P. asks: 1. Is the temperature in purposes, enough to make steam? used for heating 2. My house is heated by steam, but not satisfa torily, and Ithought of putting in a furnace wit a boiler inclosed in the air chamber, believing tha I should get the heat of the furnace for the lowe fioors, and make steam enough for the upper stor
ies. Would it work? A. This plan will answer it perly constructed
(17) J. G. asks: 1. Could I have a bras cylinder, $2 \times 4$ inches, mude, that would be equal to
one half horse power? Yes.
2. Would it be $\begin{array}{lll}\begin{array}{l}\text { one half horse power? } \\ \text { high pressure engine? }\end{array} & \text { A. Yes. } & \text { Yes. Would it be a } \\ \text { 3. Could a smal }\end{array}$ boat be fixed so that the wheel can be propelled with one oylinder? A. Yes.
(18) W. S. S. says: If I place two cylinders 10x 3 inches, side by side, and connect them with engine, cylinder $2 \times 2$ inches, and if I fill cylinde No. 1 with compressed air, 200 lbs . to the square inch, and cylinder No. 2 is empty, and if the air from No. 1 is liberated through pipe and engine to
No. 2, and I keep the pressure to a minimum of 200 bs. per square inch until all the air is forced into No. 2: What power will I obtain, and how long will it take to empty No. 1 into No. 2, and so on, alternately? A. Your power will depend upon the point of cut-off and the speed of the engine, and would gradually decrease, as the air entering. cylback pressure upon the engine which would pre back pressure upon the engine weconing empts.
vent cylinder No. 1 from ever becon The time necessary to bring the engine to a standstill in consequence of the above back pressure of course depends upon the size of cylinder No. 1.
(19) C. E. K. Jr. asks: For vulcanizing rub ber plates I have a small boiler, $41 / 2 \times 53 / 2$ inches
which $I$ heat up to 320
I Which I heat up to $320^{\circ}$ I fill it about 14 full of
water, and then put in the flask, which makes the boiler about half full. Is all the water converted into steam at a temperature of $320^{\circ}$ ? If not, what steam, and what amount of pressure should I have? A. Only a small portion of the water 1 converted into steam, and it would not be practicable, with an ordinary apparatus, to evaporate it in the closed space.
(20) J. T. says: I send you a piece of scale
from a boiler. What is in the water to make such scale, and what will take it off? A. A good feed water reater will probably be efficacious in pre-
venting further deposit; and it is probable that annate of soda will loosen what is already formed
( 21 T T. McG. asks: What welding mixture used on vises to weld the faces on the
or welding steel to iron, borax will do.
(22) F. M. asks: Please tell me of a remedy or cold feet. A. A fast walk of $21 / 2$ miles,
(23) H. L. S. says: 1 . I have an engine $1 \frac{1}{2} \mathrm{x}:$ nches, with a tily wheel 10 inches in diameter ound it be large enough to run a skiff 10 fee long and 2 feet wide, with a pressure of 40 or 5
bs. of steam A. It would be better to use What spessure of 100 or 125 lbs. per square inch What size of boiler would it take? A. Make
boiler with from 20 to 25 square feet of effectiver boiler with from 20 to 25 square feet of effective
heating surface. 3. Could a boiler be made to oive hat amount of power, using gasoline as fuel? Unless you have had experience in the use of gas-
line as fuel, it would be better to depend upo oline as fuel, it would be better to depend upo
(24) H. M. N. asks: Which will be the most conomical way of feeding a boiler, by a steam pump driven by an engine, or by an injector ? A
The pump driven by the engine will be the economical in general, but not the most convenior desirable in all respects.
(25) W. J. N. says: I have a small boiler 8 nches in diameter and 2 feet long, and propose to enlarge it by having a double shell of $\frac{3}{16}$ iron made kins. The shell is to be 3 feet high, with an out side diameter of 16 inches and an inside diamete of 12 inches. Inside of this, $I$ intend to suspen my old boiler, connecting the walls and steam spaces by $1 / 2$ inch pipes. I will make the lower
part of the shell act as a firebox, fitting a door one side and putting in four cross tubes througb he furnace one inch in diameter. Is this a pract able plan 1 you mation, there is no reaso why the arrangement will not prove satisfactory
(26) J. W. S. asks : How can I melt German tis full of scales. A. Do not add the zinc until he copper and nickel are fused together, and put a little borax with the zinc.
(27) J. B. R. says: Your paper of August contained an article refering to paper suitable for copying purposes. I enclose a sample of an ii I saw the originated by me a few years ago. © ested my new paper for copsing purposes. hink I have reason to be satisfied with the result. You will see that the copyirg is as distinct as
done with the best Japanese tissue paper ; and thit has been accomplished with paper that was man factured for ordinary newepaper printing. The
trength of this paper is such as to adapt it fo strength of this paper is such as to adapt it for copying important documents, legal papers, etc.,
while there is no doubt that the paper may be wbile there is no doubt that the paper may be
made still heavier (if desired) and yet answer for made stu heavier (ifiestr) ant yor which this paper would be well adapted would be in the manufacture of vegetable parchment. A. The paper you send is a fine specimen of exceedsized paper we have ever seen. It is an acmirable oopying paper, and would
(28) F. C. W. asks: What is the best metal (29) M. R. says: 1 I send a sample of stuff (29) M. R. says: 1 . I send a sample of stuff ongine. We run steam through 650 feet of pipe (the last 100 feet of which is perpendicular) to steam pump, the cylinder of which is $8 x 10$.
have found the same material in between the engine and the pump, making it necessary to clean it out every six months. There has not been any grease in the pipe. I should llike to know what it is. A. . resembles the material
produced by the action of impure grease on the piston. Examine the piston of your engine and see whether or not it is changed in places into a
charcoal-like substance, that can be readily cut with a knife. 2. I have had a discussion about the distance that water can be raiscd with a siphon. distancet tastater can be raisca whita a siphon.
One claims it could be raised any distance, provided the discharge end was low enough, while I
claimed that it could not be raised more than 34 claimed that it could not be raised
feet. Which is right? A. You are
(30) M. W.asks: Will you explain in your run around a curve, the outside rail of the track on the curve being longer than the inside rall, and axle at both ends? A. Under the circumstances,
and the wheels would slide on one of the tracke.
(31) W. P. asks: 1 . Is there more pressure or is there the same pressure upon every square inch in the boiler? A. There is a little more at the bottom. 2. What is the rule for calculating the
(32) R. M. says: We want some black paint ar smoke stacks that are heated nearly red hot.
theresuch a paint? A. We know of nothing hat will stand such a temperature
(33) R. F. H. says: I have a coarse half round file, 6 inches long, which bas been in use
for some time. It hasbecome netized, with the south pole at the tip and the north pole at the tang. Is not this unusual? A. Such an example as you notice is interesting, and
not at all usual. Perhaps some of our readers may have observed similar instances.
(34) G. W. I. asks: 1. What practical gain would result from the use of a feathering wheel
instead of the ordinary padde wheel in the instead of the ordinary paddle wheel, in the pro-
pulsion of steamboats?
A. Increase of speed diminution of power required. 2. Does the float or paddle exert the most force as it enters the
wateror as it leaves it?
difference.
(35) J. W. W. asks: Will paraffin in nitric and sulphuric acids act the same as nitro-gly
A. Paraffin is not suitable for this purpose.
(36) W. A. says, in reply to W. H. P., who
asked how a solution of ammonio-sulphate of copper may be rendered colorless and still retain all the copper in solution: Add potassic cyanide. The
composition of the solution is altered, but the copcomposition of the solution is altered, but the copper is all there. It may appear dark brown when
fresh, but this is due to a little iron in the copper fresh, but this is due to a little iron in
sulphate, aud will subside on standing.
(37) M. W. W. says, in answer to the question : Shall we attach a horse to his load at a high point or a low? If the load is light and is to be but little difference. Possibly it might be adran tageous to put it level with the point of draft, as (see your reply to K. C. \& Co., No. 40, July 10, 1875 would seem to be your opinion. But if the load is propel it,it will be, as experience has demonstrated fully, not ouly advantageous, but frequently abolutely necessary to make the attachment so lo propelling force; and the rationale of this is that the animal has not weight enough to keep him from pushing his feet backwards instead of pulling his load forward, and he requires to be supplied with it from some other source. I have seen
a horse pull a load with a man on his back that he was unab e to move without ; and any person whe has not tried it will be surprised to see how light a load will stall a toam when the attachment is such that it is required to exert some downward pulling force. This consideration is also implica ted seriously in the practical operation of tractiv engiaes, and their ellciency would be greaty in creased by any device by which the engine could hold it to the ground or track, preventing slipping and carrying unnecessary weight.
(38) M. W. W. says, in reply to several in quiries in regard to the draft of high and low drawn over any small a wheel will be more easily as a stone or stick?, or out of a rut, or throug mud; but whether this is the case on an ascend ing grade is a question not easily determiced. It has been asserted that a man will draw a beavier ban on a large wheeled one, and the theory for it is that a perpendicular line drawn from the center of the axle falis nearer to the point of contact between the wheel and floor; this is equivalent to the short end of a lever, the distance from the axle to the point of contact being the long end. A first this might seem plausible, but an examina-
tion of the accompanying engraving will show

that the long ends of the levers, A C, are length ened or shortened in the same proportion as th gained by that means. We must, therefore, look for some other explanation, and perhaps the read ers of the
difficul:y.
trong infusion of quassia with W. would mix a have no more trouble with flies eating his inked

Minerals, etc.-Specimens have been re ceived from the following correspondents,and examined, with the results stated
E. G. A.-No. 1 is magnetic oxide of iron. No. 2 ple is too small for a decisive report. No. 3 is a va riety of bituminous coal containing considerable percentage of ash.-J. M. B. Jr.-It is a poor va riety of porcelain clay.-M. S.-It is a poor pig
iron, containing an unusual amount of earthy material.-C. G.-It is quartz, inclosing particle of iron pyrites. It is of no value as an ore.-R. L -It consists of felspar and calcite, inclosing mica and a few crystals of garnet.-S. G. R.- 1 t is refined was undoubtedly left there as you found it, and H. T. -It is a formation of variegated clay upon hale. It has been hardened by exposure-W. B H.-No. 1 consists principally of antimony. No. 2 is galena. No. 3 is impure galena. No. 4 is a fine
conglomerate.-D. W. W.-To determine the value of an ore, it is necessary to have a quantitativ analysis made.

## HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Edito always be given.
Enquiries relating to patents, or to the patent bility of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as th would fill half of our paper to print them all, by mail, if the writer's address is given. by mail, if the writer's address is given. re sent. "Who sells nitro-glycerin? who mate canvas tents? Who buys corundum in lump Who sells al minum in sheetand wire?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to Almost any desired information can in this was be expeditiously obtalned.
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index of inventions
Letre Eatont of the United stater wore ranted in the ondin August 17, 1875.
and gach hearing that datm Tnose marked ( $\mathbf{r}$ ) are relssued patents.

Alarm, burglar, E. Hand
Alarm, electric, w. What
Animal poke, H. Wat
AnImal poke, H. Watton...........
Auger for flour packerss. s . Taggar
Babl jumper. R.
Rale tie, J. M. A
Barrel heads, sawing, E. and B. Holmes Bed, spring. J. Johnson..
Bedstead, knock down, w. Bed $t$ ad, sofa, J. Petry....
Boats propelling, w. Ascou
Body weight and hand power, a power, C. Van de Mark Boiler heads, turning flanges on, R. C. Nugent. Boot toe blank, N. R. Packard
Boot heel trimmer, Gliddon and Simmons
3reast cup for females, T. E. Daniels
Bronzing machine, D. A. Wa Bronzing machine, D. A. Wagner.
Bush, M. Letner.................. Brush, paint. Schuster and Driscoll
Buckle, L. Loeser........ Butter, tempering. J

## Canal lock, C. G. Force

Car brake, A. T. Riley
Car coupling, W. Lannan.
Car coupling, G. R. Owen
Car seat, rallway, N. N. Hort
Car, sleeping, C. E. Lucas...
Car wheel, A. Schrock........
Carrlage, child's, J. P. Staub
Carriages, shiriting rail for, E. P. Stedman
Casting pulleys, J Murdo
Chair, folding rockini, A. W. Stewart
Chair, folding rocking, o. E. Vall
hair stand, Chimney top and ventilator, P. H. Shine
Chinch bugs, destroying, H. F. Rice......
Churn, J. Butler..
Claw bar, A Shaw..
Coal hod, J. Cochran.......
Corn sheller, Creekmore and McMillin
Corn sheller, Hall and Yin
Corn sheller, S. Williams
ryptography, A. L. Flamm.
Cryptography, A. L. Flamm.... .. ......
Cishion cleaning machine, J. R. Barry. Dental engine, electro-magnetic, J. Bishop. Dental pluggers, automatic. G. W. Levin. 166, 009
Drill holes, charging, R. G. Bald win............ Eaves trough hanger, H. K. .n. T. F. Stohler Electric light, S. A. Kosloff..........
Elevators, gearing of, E. Schlenker Engine cylinder port. w. C. Chureh...............
Engine hydrant, steam fire. R. T. H. Stileman. Engine. rectprocating, G. B. Dixwell.
Englne, steam, E. D. Leavitt, Jr.... Engine, steam, E. D.
Excavator, T. Z. Cole
Explosive compound, R.
Fare box, w. C. McGill
Fare register, D. Eldridge
Faucet, E. Willson...
Feed rack, M. Ralph
elting machine, Hooperand Cra
Fence, portable. T. L. Davidson
File, J. Haptonstall............
Fuel, apparatus for economizing, L. c.
Furnace for brick kilns, w. S. Colwell Furnace for burning edgings, etc.. I. o. Smith Furnace for melting metals, W. E. C. Eustis.
Game board, A. Herzog. Garden trellis, I. Goodspe
Gas apparatus, A. Glatchet...
Gear cutting attachment, w. Krutzsch
Generator, steam, J. Goulding.
Glass cutter, steel, H. H. Clark
Grain drill, w. Aldrich....
Grain arill tooth, G. L Ives.
Hair picker, C. A. Teal
Hame fastener, S. Spic
Harness saddle tree, A. Tea
Harness trace carrier, E. A. C
Harrow, L. Francisco...
Hatchway guara, J. C. Foster
Heating and ventilating device, A. H. Thorp
Heel attaching machine, Mck.
Heelling machine, Elliott et al.
Hoisting apparatus, J. Hofman (r)..........
Holsting macnine or elevator, E. Schlenker
Hook, hat and coat, C. Schoen betn
Horseshoe, A. C. Snowden
Horseshoe, A. C. Snowde
Hose nozzle, C. Oyy
Hose nozzle, C. Oyston.... ........
Hosiery seams, sewing.
Hub boring machine, J. Lee......... ...........
Hy drant, steam fire engine, R. T. H. stileman
Ice manufacture, Negley \& Cunning ha
Ingot mold, J. Illingsworth.
Inhaler, C. R. Sykes,
Injocting board, o. s. Pride
Ladder, A. S. Miller...........
Lanp, nursery, C. I. Gorham
Latch, locking, G. J. Dickso
Latch, locking, A. Worster...
Lathe tool holder. W. Krutsch
Leather board, etc , stripping. E. Andrews.
Leather, waterproofing, J. Clunan.
Lock face plate, E. M. \& J. E. Mis
Locomotives, steam brake for, L. B. ..........
Loom for weaving hair cloth, J. Turple...

## Meat-stoppping mechanis

Mechanical movement, P. Broadbrooks.
Medical co
Medical composition, L. Corfman
cal punching machine, J. R. Lindsay
Millstone, counterbalanclng, H. Kilnkermann.
Mirrors, amalgam silvering for, J. J. E. Lenotr
Mop head, J. K. Clark.
Motion, traverse, C. L. Noe.
Nall-feeding device, L. A. D....
Nalls, making cut. G. Stacy.....
Nozzle, exhaust, White \& Levy
Nursing bottle, J. J. Christie ...........
Ore crusher, wet and dry, H. Bolthofr. Packing box, H. N. Hart.
Padlock, W. H. Andrw.
Padlock, W. H. Andrews ...
Paper stock grinder, O. Abell
Paper weight
Paver weight, J. T. Adams.
Pavement. brick, S. Strong..
Photographs, washing, J. L. Caylor...
Pins to brooches, attaching, C
ipes, etc., connecting steam, C. C. Walworth
Propelling mechanism for boats, w. Ascough...
Pump, A. \& M. K necht.
Punehes, holding conductors', T. B. Dooiltti
PuriAer, middlings, R. w. Gunter
Radator, steam, W. B. Snow.
Rallway frog, J. Cumming............
Rallway rall joint fastening, J. Corson.
Rake, horse hay. C. E. Lipe.... ....
Refrigerator, beer, J. N. Bohart....
Rope halter. L. C. Chase..........
Rope halter, L. C. Chase......
Rone strectcher, C. C. Cartis..
Sash fastener, B
Sash fastener, B. A. Berryman
Sash holder, S. M. Pratt.........
aw, cylinder, Peirce \& Kinsman
Saxing machnne, A. T. Nichols.
Scaffold clamp, W.
S iraper. J. Megill
screw cutting die, R. C. Nugen
Separator, grain, w. E. Torley
Separator, sand and gravel, N. J. Keller (r).
Sewing machine, T. J. Harper....
Sewing machine, C. Hodgking (r)
Sewing button holes, w. Randel..
Sewing machine corder, w. Willon (r)....
Sewing machine treadie, R. F. Wilcox (r) Shade holder, T. Moran...
Sharpening machine, A.
Sheep sheers, P. Harlow................. Sheet metal smoothing mallet,
Shingle machine,J. J. Kendall.
Shirt,
Shrt, J. W. Hutchinson..............
Shoe tip or protector, C. T. Griley
Shut char fastener, J. Shedd...
Sheve, O. Bond...........
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Skylight, Querner \& Burke............
Soap slabblng machine, J. C. Ralston ¡pader, rotary, W. C. B. RIchardson
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Spinning frames, ring for, J. W. W spinning frames, ring for, J. W. Wattle
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Stone crushing machine, c. H. Scheermesser. Stove, lamp, M. F. Rathbun..
Stove, onl, A. Q. Allilis.
S.
Sugar, cooling and draining, J. H. Hynson
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Table, extension, J. W. Bent.
Telegraph key, compound, M. L. M. Hussey
Telegraph, printing, A. Wirsching..
Telegraph transmitter, H. Mdddleton.............
Telegraphs,chemical, T. A. Edison, 166,869, 166,860,
Then
Thill coupling, S. A. Hathawa
Toy store, E. Durlach..
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Trap, animal, E. Ollver.. .....
Valve, balanced, W. C. Church
Valve, rotary balanced, C. M.Farrar...
Vehicle king bolt, E. Freeman....
Vehicle lubricating axie, A.
Vehicle spring,. . Jeffrey.
Venicle top, J. F. Heger .
Vernier, A. Young.......
Vise, bench, A. Vellleux.
Wagon jack, C. T. Drake............
Walls, construction of, G. H. Field.
Warming apparatus, J. F. Relly
Washngg machine, G. W. Holmes.
W ashing machine, J. H. Mudgett.
Washing machine, Palmer \& Brigg
Washing machine, O. S. Thayer....
Washing machine boller, Everson
Watch, safety pinion, Bacon \& Brown
Watch, etc., stem winding, L. Kahn.
Watercooler. L. B. Woolfolk...
Water cooler stand, C. B. Porter.
Welding compound, J., Jr. \& A.S. Scott....
Whalebone, etc., splitting, F. E. Merriman.
Whip socket clasp, E. W. Scott.
Wind wheel, H. J. Brimhall, Jr.
Window frame, J. F. Ebert...
designs patented.
8,563.-HEATING STOVE.-W. C. Davis,CIncinnati, Ohio
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8,568.-RANGES.-W. Whitman, Bangor, Me.

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