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

## NEW LIFE-SAVING INVENTIONS.

In the accompanying engravings are represented a series of devices, including means of escape from a building in case of fire, and also a life preserver for shipwrecked persons. The first mentioned invention is illustrated in Figs. 1, 2, 5, 6 and 7. It consists of a stout rope, soaked in a chemical solution which renders it fireproof, and having a strong hook at one end. On this rope slides the lowering device, which is shown in Fig. 1. This consists of a box of metal, in which is a stationary disk, $A$, around which the rope is carried. The two parts of the box are hinged together at B, and, when closed, compress the rope in the grooves through which it passes downward. The degree of compression is regulated by the thumbscrew, C , which brings the parts of the box more or less tightly together. Also attached to the box is a double rope, to the end of which is secured a small hook, D, for the purpose of fastening it into the belt.
In using the device, the bed clothes are placed on the window sill to prevent chafing of the rope; the large hook on the main rope is then placed over the top crossbar of the window sash. The operator then secures around his waist a strong belt, made as shown in Fig. 7; and with the staple thereon he engages the hook, D. The screw, C, having been previously adjusted to the desired rate of speed of descent, he then launches himself off. He is sustained by the belt, so that his hands are free to govern the lowering device. In this manner as rapid a descent as is desired can be made, or the motion can be checked at any instant by tightening the screw, C. The apparatus can be used for lowering women, chil dren, invalids, or trunks, as one cool-headed person may quickly adjust the screw for each individual to be lowered,
and the latter has nothing to do but allow himself to slide quietly down. On reaching the ground, he removes the hook, the rope is hauled up, the box readjusted, and the device is then ready to be used again. Or by simply attaching the rope to the safety belt, the person to be lowered can be let down by another paying out the rope hand over hand. Fig. 6 represents a compact arrangement of water bucket and fire escape, such as might be placed in every room in a hotel. The upper portion of the vessel shown serves as a water pail and is kent filled. The lower part serves as a re water a the fire ceptacle for the fire escape above mentioned. Fig. 5 is a
blanket with two slits for the arms and one for the face. In this, after thoroughly wetting it, a person attempting to escape through the halls of a burning building envelops himself.
Figs. 3 and 4 exhibit a device which the inventor calls a traveler's safety kit. It is a handbag, shaped like a knapsack, of fire or waterproof material, containing bottles or jars which hold a supply of wine or other stimulants, and also meat in condensed form. These are protected from breakage by a packing of best phial corks, with outer walls of cork wood. Suitable receptacles are provided for valuables; and a sectional flagstaff is added, which may be quickly put together, and to which a signal flag is attached. This staff also may be used in connection with a portable umbrella and also as a walking stick. The kit may be constructed in two portions, with bottles, etc., in each, the division being made vertically through the center. Suitable straps connect the two portions, so that, when adjusted to the person, one portion is applicd to the back and the other to the breast. The apparatus is sufficiently buoy-

Fig. 4. In case of accident to a vessel at sea, the inventor tates that the person provided with this kit has not only a life preserver which will keep him afloat indefinitely, but aso a supply of food which will last for several days.
For further information, address the inventor, Mr. H. R. Houghton, 59 West 42d street, New York city.

## German vs. Sheffield Scissors

"At the annual meeting of the Sheffield Scissors Manufacturers' Association, held during the past month, an animated discussion took place on the remarkable success with which the German scissors makers are competing with those of Sheffield. Mr. Hobson, the chairman, said that a warehouse had been opened in Sheffield for the express purpose of stock ing and selling German scissors, and various other speakers were constrained to admit that the foreign articles were by o means badly made. As a matter of strict and most sur prising fact, these German scissors are made at Solingen from Sheffield steel, and, after bearing freights in both direcions, thus oust us at home. When the German scissors come here they are offered at prices 30 to 40 per cent. below the home-made goods-weavers' scissors sold by the Sheffield manufacturers at 72 cents, gold, being quoted by the importrs at 54 cents free in London, or 72 cents in Sheffield. The consequence is that the Germans are doing a very large business in the steel metropolis, because almost all the manufacurers find it necessary to keep the foreign goods in stock. -British Trade Journal.

The most northerly telegraph station in the world is established at Gjesvar, a Norwegian fishing station, near the North Cape, in latitude ' $71^{\circ} 12^{\prime}$, north.


HOUGHTON'S LIFE-SAVING DEVICES.

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e one class of these operatives who do light work on a daily
average of 3,861 grains of carbon and 157 grains of nitrogen when at hard work, this becomes 6,020 grains of carbon and 375 grains of nitrogen. As shown above, the first-mentioned quantities are no more than barely sufficient to sustain the body; and work here practically means a wearing away of the human machine. Now when the work becomes harder, 2,159 grains of carbon and 218 grains of nitrogen more are consumed; and these are the food equivalent for the extra
work performed. In the case of the prizefighter in training, the daily average in point of carbonaceous matter is less than that of the low-fed operative, but the nitrogenous matter-
flesh and muscle manufacturing material-the average is 690

## the human machine and its fuel

Dr. Joule has pointed out that not only does an anima much more nearly resemble in its functions an electromag has stated that it is a much more efficient engine-"t that is to say," says Professor Tait, "an animal, for the same amount of potential energy of food or fuel supplied to it, gives you a larger amount converted into work than any engine which we can construct physically." In other words the duty-by which we mean the percentage of the energy of the fuel which it can convert into the useful or desired form-is greater in the case of animal mechanism than in
that of any other engine in which fuel is employed. The that of any other engine in which fuel is employed. The
work we obtain in the form of heat, constructive power nervo-muscular action, mechanical motion, and the like and here the analogy between the body and a machine ends, because the food in the animal is not merely a source of energy, but it enters into the development and maintenance of the body itself. It follows, therefore, that two classes of food are necessary; first, the organic, which alone is oxidiz able or capable of generating potential energy, and secondly the inorganic, which, though not oxidizable, is essential to the metamorphosis of organic matter which takes place in the animal economy. The organic constituents of food are generally divided into nitrogenous, fatty, and saccharine compounds, and the inorganic into water and saline matters Taking up these constituents in their order, Dr. George Wilson, in his recent admirable work, "A Handbook o Hygiene," states that the nitrogenous portions of food have
for their main functions the construction and repair of for their main functions the construction and repair of
tissues, besides possessing other functions of a regulative and dynamic nature not well defined. Fatty constituents play an important part in the maintenance of animal heat and in the conversion of food into tissue. The oxidation of fat in the blood generates to a great extent the energy which besides, renders the human machine elastic, and supplies lubricating material. The saccharine constituents of hydro carbons (cellulose, starch, and sugar) are directly subservi ent to the maintenance of animal heat and the production of animal energy. Water in the animal economy dissolves and conveys food to different parts of the system, removes effete products, lubricates the tissues, equalizes the bodily tempera ture by evaporation, and regulates the chemical changes
which take place in the processes of nutrition and decay. which take place in the processes of nutrition and decay.
Saline matters, on the other hand, are the chief media for the transference of the organic constituents throughout the body They are largely concerned in the consolidation of the tissues, and are supposed to convert unabsorbable colloid into highly diffusive crystalloids.
As we have already stated, the potential energy of food is the sole source of the active energy displayed in mechanical motion or work. And consequently, up to certain limits, the diet must be increased as the work increases. The ques tion for the economist is then, first, on how much food can a man subsist and live: and second, how much more food
must be added when certain work is to be performed. Dr. must be added when ermind Smith has determined that the Lancashire operative during the cotton famine managed to live on 3,888 grains of carbon and 181 grains of nitrogen per day. This is equiva lent to about 2 lbs . of baker's bread. On the other hand, a man, who could live on this amount during idleness, while at work requires (according to Dr. Letheby) 6,823 grains of carbon and 391 grains of nitrogen. This is equivalent to 2 lbs . of beef, with 1 lb . of potatoes, 1 lb . of beer, and about
lb . of surar. 1b. of sugar.
Of course the quantity of the food required differs not mere-
ly with the amount of work done, but with its quality. Dr. ly with the amount of work done, but with its quality. Dr. Smith has prepared a table showing the weekly dietaries of
low-fed operatives. Needlewomen, for example, in London average 124 ozs. breadstuffs, 40 ozs. potatoes, $7 \cdot 3$ ozs. fats, $16 \cdot 3$ ozs. meat, $7 \cdot 0 \mathrm{ozs}$. milk, 0.5 oz. cheese, and 13 ozs . tea per week. This diet is richer in meat than that of the Eng lish farm laborer. The Macclesfield silk weavers are quoted at 3.2 ozs. meat per week. The Irish farm laborer gets but
4.5 ozs. meat weekly, but he has 326 ozs. breadstuffs and 135 ozs. milk. The Scotch farm worker eats over twice as much potatoes as the Irishman, despite the supposed fact that
the tubers constitute the principal article of diet among the peasantry of the Emerald Isle. The table compiled by Dr. Smith includes silk weavers, shoemakers, farm laborers, and needlewomen, and the average diet per day for all is 4,881 grains of carbon and 214 grains of nitrogen. We can contrast with this, data obtained by Dr. Playfair covering the diets of English railway navvies, English and French sail , soldiers in peace, prizefighters, hard-worked weavers d blacksmiths. This shows that the average is 5,837 grains carbon and 400 grains of nitrogen per individual per day. There are many suggestive comparisons to be made here. Take for example the figures relative to weavers. There is

grains, or over three times greater. The proportions of the training athlete's daily food are flesh formers 9.8 ozs., fats $3 \cdot 1$ ozs., starch and sugar $3 \cdot 27 \mathrm{ozs}$.
It will be seen from the foregoing that it is quite possible to construct dietaries, especially suited to sustaining the animal mechanism, in accordance with the work to be accom plished. This subject we shall consider in another article.

## WANTED-TORPEDO DEFENCES.

Mr. E. J. Reed, late Chief Naval Constructor of the British Navy, in a recent lecture before the Society of Arts, took occasion to express an opinion which, we think, ever one who has given any thought to the method of waging futare maritime wars has already more or less definitely reached. Coming from an engineer who has been so closely identified with the building of the ironclad navy of Great Britain, the views enunciated will assume greater force They could not be more radical or more direct. Mr. Reed says, in substance, simply that, until a way of protecting vessels from the effects of torpedoes is invented, ironclad ships, notwithstanding their 24 inch armor and 100 ton guns, re anachronisms, and that their construction is waste time and money. "Neither the suspension of chain nets, nor additional bulkhead divisions in ordinary forms of ships, will be a sufficient, nor anything like a sufficient, defence against this deadly submarine instrument of attack. The naval Whitehead torpedo delivers a most terrible blow; it moves for the space of some hundreds of yards with a speed double that of the fastest ironclads; its path is so sure and rue that at that distance a second torpedo can be made to pass through the hole which the first has made; and whereas has been assumed that, in ordinary conditions of weathe and naval warfare under steam, a ship could not have mor than a few feet of her depth below water attacked, the tor pedo has the whole immersed bottom of the ship exposed to ts assaults." Mr. Reed goes on to say that the days of wa ships, more or less long and narrow, and with deep bottoms of thin iron containing the steam boilers and powder magazines, are numbered. He advises his government to recon sider its intention of beginning the building of a vessel of he Agamemnon class; and finally he concludes that moder naval necessities are "first, the construction of our large hips on principles which make them as little destructible by torpedoes as by guns, which I believe to be quite possible and secondly, the building of all our other war ships of small and handy types." By the latter he means small ves sels which can be manœuvred with sufficient rapidity to avoid torpedoes.
Mr. Reed unfortunately fails to mention the plan for protecting ships against torpedoes, the knowledge of which he mplies that he possesses. It will be seen, however, that in his opinion a total reconstruction of the English navy is necessary, and that consequently the enormous sums of money which have been expended on its development are entirel thrown away. This is not cheering intelligence to th British taxpayer; and we doubt whether its purport will bo acquiesced in until inventors, the world over, confess them selves vanquished by the problem of devising an efficient system of torpedo guard. So long as enormously heavy ar tillery is to be used, vessels must be built both capable of carrying the guns and likewise capable of resisting them. Already it is contemplated to build cannon which will dwarf the 100 ton gun; and the English iron founders, on the other hand, promise 40 inch rolled plates. If war ships must carry such loads of metal as these, it is difficult to se how they can be built light enough to dodge torpedoes There is certainly little to be gained by building vessels pos sessing the latter advantage, if at the same time they are to be rendered easily vulnerable by heavy guns.
We agree with Mr. Reed in the belief that it is possible to protect large vessels against torpedoes, although we have no especial project to propose. The subject is one which we would particularly commend to the attention of inventors It is obvious that the necessary protections can be obtained in two ways: first, by devices outside or extraneous to th vessel, and second, by modification of the construction of the ship itself. The simplest outside device is the torpedo netting constantly used by our vessels during the war. Thi is simply a net work of chain or rope supported on booms a some distance around the ship and extending down into the water deep enough to guard the entire bottom. To prevent the access of torpedo launches, the ship may be surrounded by heavy spars also attached to the booms, and from these chain nets, as already described, may depend. These de vices are obviously of little use or altogether impracticable when the vessel is in motion. To avoid stationary torpedoes anchored in channels, ships have used forked catcher protruding from the cutwater, to grasp and cause the explo sion of the obstruction. Rafts pushed in front of ordinary vessels likewise serve a similar end. Under the second plan, war ships are bult in watertight compartments. The In flexible, for example, has 127 such sections. Or, as in the case of Admiral Porter's boat, the Alarm, there is a double hull with the space between divided up, while the entire hold of the ship may, through the watertight bulkheads which cross it, likewise be converted into separate sections. A torpedo, it is supposed, might injure a few compartments, while those still staunch would perhaps float the vessel With iron ships there is not much surplus of buoyancy, however, and the racking effect of a blast might cause re sults much worse than the direct injury to the compartment immediately adjacent. Probably the means of defence nearest to security, lie first in keeping the vessel constantly
under steam and under control, and second in the electric
light which reveals the approach of an enemy by night. But the circumstances of weather or of locality may prevent the rapid manœuvring of the ship, and a fog may render the electric beam useless: while there is no safeguard against the unseen approach of the su

The conditions of the pead type.
The conditions of the problem need no especial explana tion. It is simply a question of how to render a ship's bo tom invulnerable, not merely to the explosion of the ôrpedo itself but to that shock plus the energy of the ramming blow delivered by the sharp bow of a heavy torpedo boat. An invention of this kind would be immensely valuable to every naval power, and would insure fame and fortune for its originator.

## TORPEDOES.

The development of submarine warfare has been so rapid of late that it is hardly possible to foretell what potent influ ence it may have on the war now being waged in Eastern Europe. While England, France, Italy, and in fact nearly all the European naval powers, have been building huge engines of war, of a tonnage, armor, and artillery never heard of before, the torpedo has been gradually perfected, and threatens, at least under many circumstances, to neutralize them. A torpedo may be regarded as a gun which dispense with a gun carriage, and which, without the vast and expen sive agency of a great ship,
that of the heaviest artillery
The original inventor was David Bushnell, born at West brook, Connecticut, 1742. He not only devised a torpedo, but also a submarine rowing boat, intended to convey it to the bottom of the vessel to be attacked. His practical experiments, however, which he was enabled to carry out with the assistance of the private purse of George Washington, did not prove successful; and the invention sank into oblivion until the commencement of the present century, when Robert Fulton, an American sojourning in France, offered a similar one to the French Government. After considerable parleying, it was rejected, and Fulton sold his secret to the British Admiralty for $\$ 75,000$. The so-called Catamaran Expedition, an attempt to destroy the French line-of-battle ships and transports off Boulogne, turning out a failure, Fulton returned to the United States, and, during the war of 1812, tried in vain to blow up several of the English blockaders. The rage of the British commanders knew no
bounds and the proceedings were termed "unchristian," bounds and the proceedings were termed "unchristian," "the invention of a fiend," etc. Cousin John Bull has a frightfully short memory at times!
In 1829, Colonel Samuel Colt commenced experiments with a submarine torpedo exploded by a galvano-electric battery; and after many disappointments, he succeeded on October 18, 1842, in destroying the brig Volta in New York harbor, in the presence of 40,000 excited spectators. So far only vessels at anchor had been attacked; but on April 13, 1843, Colt blew up a brig of 500 tons under sail on the Potomac river, he himself being the operator, and at the time at Alexandria, five miles distant from the explosion.
The first European government to adopt the invention was Austria, who laid down a perfect electric torpedo net for the defence of Venice. Russia followed suit, and during the Crimean war protected the entrance of Cronstadt as well
as that of Sebastopol harbor by an improved system of as that of Sebastopol harbor by an improved system of
ground torpedoes, which kept the English fleet at a respectground torpedoes, which kept the English fleet at a respect-
ful distance. The American civil war for the first time clearly demonstrated the tremendous effect of the invention, and at the same time changed its character from a purely defensive to an offensive weapon. Galled by the soon-established superiority of the United States navy, which gradually sealed up all the important Southern ports, the Confederate Government organized a special torpedo service corps; and after sinking torpedoes in every available approach, they proceeded to build small steamers constructed to carry spar tor pedoes. These torpedo boats, with an easily comprehensible Biblical allusion, were called "Davids," and were in several instances used with as much pluck and perseverance as terri ble effect. The United States soon imitated the David, and in 1864 the late Commander Cushing, U.S.N., succeeded in destroying the Confederate ram Albemarle, lying at anchor in the James river. Since then the electric apparatus for
torpedoes and the torpedo itself have been vastly improved; torpedoes and the torpedo itself have been vastly improved;
and numerous new inventions have been introduced, all of which, however, may be classed under the following five heads: Ground torpedoes, spar torpedoes, Harvey (towing) torpedoes, Whitehead (fish) torpedoes, and the Lay torpedo. ground torpedoes.
The ground torpedo is a sort of sunken mine, exploding either by contact or by electricity. If these are judiciously laid down around a harbor or anchorage, the approach of hostile ships may be rendered impracticable, provided always they are protected by shore batteries or armed ships to prevent removal. Every channel may be barred by these hidden mines; and they may be made so powerful that any ship under which they explode is sure to become hopelessly disabled. They are fastened to and held in their positions either by anchors or by stockades. The bursting charge consists of gunpowder, gun cotton, or dynamite; and the case or shell is either made of iron or wood; in Charleston harbor, old steam boilers were frequently used.

## spar torpedoes.

The spar torpedo is fastened to the end of a spar from 15
to 38 feet long, carried in a boat, no matter how small, and explodes also either by electricity or contact. A most remarkable experiment was recently made at Cherbourg, the Thorneycroft , which was carried by a ted this invention on pp. 239 and 246 of our current volume. A very small part of it was above water, but it was of sufficient strength to carry engines and two lateen sails, and it was worked by a lieutenant, two engineers, and a pilot. The French Admiral had two disabled ships in succession towed out to sea at a speed of 14 knots an hour. The Thorneycroft however, was able to go at the rate of 19 knots an hour, a rate not attained by any vessel in the squadron. She very soon caught up with her prey, delivered her blow with a spar torpedo, which projected from her bow, and rebounded. A rent as big as a house was made in the side of the ship at tacked, and she sank at once. The Thorneycroft only spun round and round for a few moments, and then returned uninjured to the squadron, from which she had started. A vessel of this kind is scarcely discernible in the water; even if she were detected, she is so small that it would be difficult
to hit her; and half a dozen Thorneycrofts attacking a large to hit her; and half a dozen Thorneycrofts attacking a large vessel would be a most dangerous foe. Their expense is quite trifling compared with that of great ships of war; they can be multiplied indefinitely, and they can be carried on board other ships and be launched from them as occasion out this ide. The Italian Government has allole new ironclads Dandolo and Duilio. These vessels are fitted in their sterns with a sort of armored dry dock, harboring a small sterns with a sort of armored thy seck,
torpedo steamer. As soon as the services of the latter are torpedo steamer. As soon as the servicas of the latter are
required, the dry dock is filled with water and opened, and the little craft rushes out at the enemy, returning to her safe berth after her mission has been fulfilled. Admiral Porter's torpedo vessel Alarm, also recently illustrated by us, is
fitted with spar torpedoes, both for bow and beam; but the fitted with spar torpedoes, both for bow and beam; but the
torpedo generally supplied to all the cruisers of the United States is the
harvey (towing) torpedo.
Invented by an English officer in 1862, it was soon adopted by nearly all the other navies, and probably will be exclusively used in general actions at sea as least liable to injure a friendly vessel in the melée. The Harvey torpedo is towed upon the surface of the water by a wire rope towline from a derrick end of the yard arm over or against the enemy; and just before reaching the ship to be destroyed this tow line is slackened, and the torpedo, being heavier than water dives under it. When in this position the explosion is effected by means of a mechanical firing bolt striking down upon a pin as soon as certain levers of the torpedo come into contact with the bottom of the target. This torpedo can
also be made to explode by electricity. Two different forms are used for starboard and port.

## whitehead (fish) torpedoes.

This invention is the secret and the property of the British Admiralty, but the following details have leaked out: These torpedoes resemble in shape a cigar, pointed at both ends, and are 18 feet long by two feet in diameter. The inside is
divided in three different compartments: First, the head, which contains a charge of 350 lbs . of gun cotton and the pistol or detonator to explode it; secondly, the balance chamber, which contains a contrivance for setting it so as to remain at any depth at which it is wished to travel under the water line; and lastly, the air chamber, which contains the engines and the compressed air to drive them. The after end supports the screws-a right and a left handedwhich propel the torpedo and are made of the finest steel. The air chamber is tested to the pressure of $1,200 \mathrm{lbs}$. on the square inch, although for service it is only loaded to 800 lbs . The Whitehead torpedo can be made to go at the rate of 20 knots for 1,000 yards, and at any depth that is desired from 1 foot to 30 feet. It can be set to explode either on striking an object or at any particular distance under 1,000 yards-in artillery language, either by a percussion or a time fuse. It can also be set so that, if it misses the object aimed at, it will go to the bottom and explode at half cock or come to
the top on half cock so as to be recovered, as it has buoyancy enough just to float on the surface of the water when not in motion. It is fired from what is called an impulse tube, which, out of a frame fitted to a port, discharges the tor-
pedo into the water. It can be fired above the water but pedo into the water. It can be fired above the water, but will at once go to the depth it is set for, and then go straight to the object, no matter how fast the ship from which it is discharged is going, or how fast the object aimed at may be sailing or steaming. It fact, it seems that it can do anything
but speak. It is calculated to but speak. It is calculated to make a hole on bursting of 70
feet area, and there is no doubt that, if one of them hits a ship of any sort or description at present on the water, she must at once proceed to the bottom. It is evident that by
this means a comparatively feeble ship, if only able to approach within 1,000 yards of a large one, can discharge a deadly flight of unseen projectiles at her, and at night such an attack will probably be wholly unsuspected and scarcely open to resistance, as the vessel fired against will be posi tively unaware of the attack until she is blown up. The newly invented electric light from the tops is a great help to the party attacked; but if three or four boats of great speed
attack a vessel from different points attack a vessel from different points of the compass, and if
they are commanded by smart officers, nothing that she can do will save her from being hit by one or more of them. There is no doubt whatever that this torpedo is the mos formidable weapon of modern naval warfare.

## the lay torpedo

Properly speaking, the invention of Mr. Lay, purchased by the United States Government, is not a torpedo, but a very ingeniously devised submarine torpedo boat fitted with spar torpedo. This boat has the advantage of not requir ng any crew on board, but in other particulars is capable of great improvements. The motive power consists of an engine driven by carbonic acid gas and a screw propeller. The boat is entirely submerged, and is steered and in all other espects controlled by means of an electric battery on shore
onnected with her by a cable which is coiled up in her hold nd pays out he she moves away which is coiled up in her hote above the surface of the water by a flag, so as to enable the operator to direct her course. The greatest defect of the Lay torpedo is want of speed. The United States Govern nent stipulated for a speed of 9 statute miles per hour, but he maximum speed actually attained at the late trial trip when it was steered by Lieutenant R. B. Bradford, U.S.N., howed only an average of 6.60 miles per hour, so that hip attacked would only have to lower her boats and let hem row between the approaching torpedo and the shore, and cut the cable, which would leave the torpedo at thei mercy. The defence of ships against torpedo attacks of al kinds is at present very imperfectly developed, principally owing to the fact that the offensive qualities of any weapon must first be learned before effectual means of defence can be devised; and as actual warfare only can give a correct dea of the former, we are, no doubt, on the eve of ver tartling events, which may entirely revolutionize and change very recognized principle of naval tactics.
The great anxiety felt in England for the future safety and efficiency of the British navy, on account of torpedoes is shown by the attempted formation of an International Torpedo Association, which Lieutenant Colonel Martin, of Boxgrove, Guildford, late commanding 4th (the King's own) Royals, is about to set on foot. He says in his programme " When explosive bullets and chain shot were invented and actually used in war, nations unanimously agreed to discon tinue their use and prohibit their manufacture; yet explo sive bullets and chain shot, it must be admitted, are harmless as compared with torpedoes. Poisoning is prohibited in war. Why not prohibit torpedoes, which are actually more subtle and deadly than poison, there being no antidote to escape from them? For instance, were I allowed to fire (from a mortar) gutta percha bags filled with strychnine and charged with a burster and time fuse to cause the bag to burst and scatter its diabolical contents over some obstinate city or fort which would not capitulate, this visitation would be far more merciful in its way towards the people of that city or fort than torpedoes would be against crews of ships because the strychnine could be seen and avoided by flight whereas, on the other hand, torpedoes secretly moored, or even fish torpedoes, insure complete, sudden, unexpected, and unavoidable destruction. Several clever artisans hav already been killed by merely pumping compressed air into the tails of unloaded fish torpedoes. Had these torpedoe been loaded with gun cotton tor service on board ship, and even if one of them exploded from careless handling during action while compressed air was being supplied to start it, or if by chance a shot or shell struck the ship at the time of start ing a fish torpedo on its death track, the fearful consequences may be easily imagined. As a proof that governments appreciate the danger they incur by the use of torpedoes, may here state that it is well known that, after the Austro Italian war, all the picked-up torpedoes proved to be dum mies. It is our bounden duty to keep pace with other coun tries, but every one will admit that the sooner the "Inter
national Anti-Torpedo Association has accomplished its task, national Anti-Torpedo Association has accomplished its task, the better for the cause of humanity!"
It is much to be feared that other nations will prefer to ake a different view of the case, and continue to conside orpedoes a cheap and effective counterpoise to the costly and powerful English ironclads.

## American Silk Manufacture.

A recent report of Mr. F. Allen, Secretary of the Silk As sociation of America, states that the total manufactures of silk in this country for 1876 were valued at $\$ 24,593,103$. The business of last year is not considered satisfactory, al though the raw silk consumed was within 150,000 lbs. of the largest amount used in any previous year. This unsatisfac tory condition is ascribed to the use in the price of raw material, amounting on the average to 100 per cent; to the pressure brought to bear on our markets for goods by oreign manufacturers who had injured their market abroad by excessive adulteration, in some cases reaching more than threefold the weight of the silk; and to the great extent of frauds by undervaluation at the Custom House. The estimate of loss to the revenue from the last named cause alone is placed at $\$ 4,000,000$.

Titanic Iron from the Ural.
J. Popov has recently published analyses made by him of two titanium minerals from the Ural. The first is an or dinary titanic iron ore, containing magnesia; the other a perimorphose of the same in which the iron seems to be re placed by lime, only half a per cent of protoxide of iron remaining. The iron ore contained: Titanic oxide 56.81 per ent., sesquioxide of iron $4 \cdot 02$, protoxide of iron $19 \cdot 65$, pro toxide of manganese $1 \cdot 73$, protoxide of magnesia $17 \cdot 18$; to tal $99 \cdot 39$. The perimorph contained: Titanic oxide 58.85 , lime 40.83 , protoxide of iron 0.58 ; total, $100 \cdot 26$.

## improved friction hoisting engines.

We illustrate herewith a series of improved hoisting en gines, adapted for the removal of cargoes from vessels and stone from quarries, and for pile driving, and all the various uses to which such machinery is usually applied.
Fig. 1 represents a double drum and double cylinder. The engines are each of 8 horse power, and work independently of each other. The apparatus allows of work being carried on at both hatches in a vessel at once. It is also especially adapted for use in the erection of large buildings where there are two hod clevators, operated at one time, for hoisting building material. The apparatus is mounted on wheels so that it can easily be moved from place to place. The engines have plain slide valves, worked by an eccentric direct from the main shaft. There are locomotive slides and crosshead of simple construction. Both engines are supplied with steam from the same boiler, which, in common with other cenerators used on these machines, is made of the best charcoal hammered iron $\frac{5}{\frac{5}{6}}$ inch thick, with longitudinal seams double riveted, heads $\frac{3}{8}$ inch thick, with best fire box and flange iron in the fur nace. The boiler is supplied with water by a steam pump attached to it on one side, and an injector on the other. We are informed that, by this machine, 1,980 tons of merchandise, consisting of bag sugar, linseed, jute, etc., were discharred from a vessel in 31 hours, and that 400 horsheads sugar were hoisted out in 3 hours' time Fig. 2 represents an improved double cylinder and double drum pile-driving machine for dock builders' and contrac tors' use. Both engines are connected to the same shaft at right angles. The steam cylinders are $7 \times 12$ inches, one drum being used for running the hammer, the other for hoisting the piles There is also a winch on the end of the
lower drum shaft, for the purpose of handling the mackin or timber, or for any extra work needed. This engine, it is claimed, will strike, with a 2,500 lbs. hammer, from 15 to 20 blows per minute, lifting the hammer from 12 to 20 feet high at every blow. It is also useful in working a boom derrick when the load is to be raised by one drum, and the boom raised or lowered and swung by the other. The weight is held by the improved ratchet on the end of the drum, as shown in the engraving.
These machines can be seen at work in various localities in New 'York and Philadelphia. The manufacturer states that one of the 40 horse power double cylinders, $10 \times 16$ inches, has raised a weight of 30 tons over 22 feet high, and lowered it successsully by the friction gearing, at the marble
the steam pipe and taking power from the flywheel by belt. At the same time it may be used for any kind of hoist ing, the weight being held by a brake band, applied to the drum when the engine is in motion. The manufacturer also
any other colors without alteration at the point of contact; method for volumetric determination of commercial glyce ine; a solid blue coloring matter, applicable like indigo but cheaper; new process for fixing indigo blue by steaming; new method of fixing aniline colors; a new thickening mat ter to replace Senegal gum; production of ozone in the concentrated state; new application of ozone; industrial pro duction of oxygen; rapid and exact means of determining the reducing power of a coal or any carbon; utilization, in metallurgical or ceramic arts, of iron pyrites, desulphurized by roasting; process of concentration or precipitation of n trogen and phosphoric acid in fecal matters, urines, an sewage waters, yielding a manure of at least 5 per cent ni trogen, and 20 per cent phosphoric acid.

The Mathematics of Light
At the recent mecting of the National Academy of Sci ences, Professor O. N. Rood, of Columbia College, de scribed his experiments in testing mathematically the effect of mixing white light with light of different colors. He used brilliantly colored disks made to revolve rapidly, and substituted in part of each disk white for color mcasuring the amount of substitution and its specific effects. Thus mingled with white, the lighter shades of vermilion became purplish; of orange more red of yellow, more orance; greenish yellow, unclanged; of yellow ish green, more green; of green, blue of cyanogen blue, less greenish and more bluish; of cobalt blue, more vio let; of ultramarine, violet; of violet unchanged; of purple, less red and more violet. Exactly the same result followed when violet was used instea of white to reduce the colors. Hence mixture with white has an effect simi lar to moving all the colors towards the
builds a special mining engine, with large grooved drum for using wire rope; also an improved self-propelling boom ngine, for hoisting stone or marble on the walls of high buildings, a mast 100 feet high being carried on the end of he engine, for the purpose described.
For further particulars, address the patentee, J. S. Mundy 7 Railroad avenue, Newark, N. J.

## New Ocean Steamer.

The Niagara, a new iron steamer for the Havana trade built for J. E. Ward \& Co., New York city, was lately aunched from the yard of John Roach \& Co., Chester, Pa. The model of this ship is said to be very fine, and she is to The model of this ship is said to be very fine, and she is to
be engined with powerful machinery, so as to make an ex-
violet end of the spectrum. Professor Rood regards thes and other experiments of a qualitative nature, as indicating that violet is one of the primary colors. The mathematical results attained were laid before Mr. Charles S. Pierce, wh subjected them to further analysis, and found that they con firmed Fechner's law, that " the sensation is proportional to the logarithm of the excitation." A diagram has been made showing the effect upon any of the spectrum colors of ad mixture with white ; the diagram is constructed on the mathe matical theory; the observed results in practice correspond.

## Electro-Magnetic Plant.

A curious plant, called the phytologice electrica, and pos essing strong electro-magnetic qualities, has been recentl


Fig. 2.-MUNDY'S DOUBLE PILE-DRIVING MACHINE.


Fig. 3.- - Nundy's friction drum. pected speed of thirteen knots. The following are her dimensions: Length, 294 feet; breadth of beam 38 feet 8 inches; depth from hurricanc deck, 31 feet, and from main deck, 23 feet 9 inches, with a displacement of 2,400 tons. She is furnished with one compound ensine of 1,650 horse power, the cylinders being 34 and 60 inches in diamcter, with 54 inches stroke, driving. four-bladed screw of Hirsch's patent, calculated to give the vesel a speed of 13 knots an hour. Ho boilers, four in number, are of the cylindrical tubular pattern, 10 feet in length by 11 feet 10 inches in diameter, tested to a working pressure of 80 lbs . to the square inch. She will be brigantine rigged, and spread about 2,500 yards of canvas spread about 2,500 yards of canvas.
The steering apparatus, and the
yards at the foot of Corlears street, East river, in this city. Fig. 3 shows a section of the friction drum, patented through the Scientific American Patent Agency, January 19,1875 . The drum is cast in one piece. The large gear is made with holes or pockets in the side to receive plugs of hard wood, that are fitted in and turned off to receive the cone flange of the drum. The spiral spring between the gear and drum forces the drum off the wood when relieved by the screw and pin at the other end. This can be used separate from the engine by the application of a belt on the pulley on the lower shaft, for hoisting in warehouses, stores, coal yards, or in any place where there can be power attached. The friction gearing serves as a brake in lowering fast or slow, at the option of the operator.
Fig. 4 represents a single machine mounted on trucks, and adapted to all kinds of light or heavy hoisting. The engine can be run as a stationary engine, by applying a governor to
capstan for heaving up the anchor and warping the vesse will be operated by steam. The saloon and staterooms will be elaborately finished. The vessel is divided into five water compartments and three decks. Cost upon completion, $\$ 350,000$. A sister ship to the Niagara, the Saratoga, is in course of construction at the same yard, and will be ready for launching about July 1.

## Industrial Prizes.

Among various subjects, in connection with which the In dustrial Society of Rouen has just offered prizes, are the fol lowing: A substance capable of replacing albumen of eggs in all its applications to printing of tissues, and considerably cheaper; new source of albumen, either in natural products containing it, or by transformation of other proteic matters a new dark color as intense and solid as aniline black, but not weakening the cloth, and capable of being printed with


Fig. 4.-MUNDY'S PORTABLE HOISTING MACHINE.
discovered in Nicaragua, according to the New York Herald. The hand is lamed by touching it, and the magnetic influ ence is felt to a distance of eight feet. The magnetic needle is disturbed, and the nearer the middle of the plant is ap proached the stronger becomes the agitation, until finally it assumes a circular movement. The intensity of the phenomenon varies according to the time of day, and at night is scarcely perceptible. It reaches its highest point about two o'clock in the day. Stormy weather increases its ac tivity. No insects or birds are known to approach it.

The Rev. S. S. Whitmee, of Australia, in an extremely able and interesting lecture on "the Ethnology and Philolo gy of Polynesia," contended that over all Polynesia there are two distinct types of people, a brown race connected with the Malays, and a negro race, with the Papuans. There is a third much mixed race, name and origin unknown.

TWO NEW UTILIZATIONS OF PAPER PULP. making paper pulp into either small vessels or barrels. for by serving as supports for the rings, $d^{2}$. One of the sections, first, illustrated in Fig. 1. is an improved machine for depos b, has its edges beveled the reverse of the others, by which iting paper pulp upon moulds in order to form bottles, pitchers, and other vessels of papier mache. A is an upright frame, to which is attached a trough, B. To the end parts of the frame, B, are pivoted two rollers, C, around which passes an endless belt, D, made of wire cloth. 'To the forward part an endless belt, D , made of wire cloth. 'To the forward part pins, $p$ of the frame, B, is pivoted a third
the carricr, D, passes, so that the distributing fingers can only come in contact with its forward part. A drum, $F$, has rows of spring fingers, G, of such a length that their ends will come in contact with the forward end of the carrier, D, to take particles of pulp from said carrier, and project them upon the object to be coated, in front of the machine, and slowly revolved. The particles of pulp are dirceted more accurately against the article to be coated by the blast from a fan blower, H. In this way bottles, pitchers, and other vessels may be quickly and evenly coated with pulp, or coatings of pulp may be deposited upon forms, from which they may be withdrawn, when dry, by slitting them. The pager pulp coatings, when dry, may be polished, varnished, and otherwise finished.

Patented through the Scientific American Patent Agency, March 13 1877, by Mr. Isaac Jennings, of Fairfield, Conn.
The second invention, illustrated herewith in Fig. 2, has for its object the production of a barrel or other similar article of any convenient size, and composed of ordinary straw pulp, made of straw or other suitable raw material. To this end, therefore, the invention consists of a mould or form in which to compress the pulp into proper shape.
A represents a number of staves, preferably of metal, their interior surface having the form desired for the exterior of the barrel. B B are tions, which, when set up inside the staves staves or sec cone having an exterior form corresponding to that desired for the interior of the barrel. C C are rings, which are passed over the ends of the staves, $A \Lambda$, in the manner of hoops upon a barrel, and by their pressure preserve the external form of the mould. The stave, $\Lambda$, is perforated, as shown, and on its inside over the perforations is secured in


HUBBARD'S PAPER BARREL MOULD.-Fig. 2.
any suitable manner a wire gauze or similar device, $a$. Upon the inner edge of one side of the stave is secured a strip of thin metal forming a rabbet, $a^{2}$. This rabbet prevents the pulp from being forced out between the staves as the pressure increases, before the edges of the staves form a tight joint Upon the back of the stave are three ribs, two of which form the edge of the stave, A , and one is a central rib, $b$. Each end of the sections, B, is formed into an offset for giv ing a croze or some similar formation to the ends of the bar rel when pressed into shape, and said sections are perforated and covered on their extcrior surface with wire gauze in the same manner as is the interior surface of the staves, $A$. The steady the sections and assist in holding them together when flame is produced. staves, A, by screw power, when the pulp will be com pressed, as the rings approach each other, into the desired shape, the water contained in the pulp at the same time be ing forced out through the perforations in the staves and gauze. The shaped pulp, still under pressure, may now be subjected to any suitable drying process, the heat reaching it through the wire gauze and the perforations in the staves, both from the inside and outside. When the shaped barrel is considered dry enough, the rings, C C, are removed from the staves, A A. The staves thus released from pressure can readily be withdrawn, as above described, from contact with the barrel, and the barrel, as a completed article, is ready to be headed in any desired manner.
This invention was patented February 1, 1876, by Mr. Ebe Hubbard, of Medina, N. Y.

## THE NEW GODEFROY BURNER.

M. Godefroy's new burner, which is represented in the an nexed illustration, is composed of four concentric sheet iron cylinders. The first and third are pierced with lateral hole at the base. The intervals between the cylinders communicate, some with the pipes, $t^{1}$ and $t_{2}$, joining the exterior ga tube, T , and others with the tubes, $t_{3}, t_{4}$, which unite with

the tube, $\mathrm{T}_{2}$. Wire gauze placed at the base of the appara tus prevents the flame from flickering, while it regulates th be used if desired, in which case a high and regular whit

We illustrate herewith two new sets of apparang them up before pressure is brought upon the mould

## THE ELECTRIC CANDLE

The Jablochkoff electric candle, which we briefly de scribed some months ago, on the occasion of its introduc ion to the French Academy of Sciences by its inventors, is now being used in Paris for the illumination of large stores, As the matter of lighting the streets of large cities by the electric light has of late been somewhat discussed, this in vention is of timely interest, more especially as it appears to afford a new and simple means for employing that most afford a new and simple mean
powerful source of illumination.

The electric light, as all ar aware, is now produced by mean of two rods of carbon placed end to end, the extremities separated by a distance of some hundredths of an incl. Through the carbons a powerful electric current is passed, which, if the rods touch, simply heats them; but if they are sepa rated, as above mentioned, it causes the production between the ends of the intensely luminous voltaic arc As the rods become consumed, the arc elongates; and, finally, when the distance becomes too great, it ceases. Consequently, unless machinery is provided which compensates for this consumption by maintaining the ends of the rods always at the proper distance, the arc cannot be kept for longer than a few minutes Electric lamps therefore are pro vided usually with clockwork or electro-magnetic devices for this purpose. When the source of the electricity is a battery or a continu ous-current electric machine, suc as the Gramme, the two rods ar unequally consumed, that at the positive pole disappearing about twice as fast as the other With other machines, whereby the cur rent is alternately reversed, the con sumption is about uniform for both
The disadvantages attending even the most improved lamps, such a the Scrrin apparatus, for example lic in the care and attention re quired by the delicate mechanism the difficulty of regulation, the cast
JENNINGS' PAPER PULP DISTRIBUTER.-Fig. 1.
understood. The staves and sections being all set up, as ing of a shadow by the massabove the arc, the necessity of above described, and the annular space between them filled renewing the carbons at intervals of three hours, the consewith any suitable pulp, the rings, C C, are forced over the quent extinction of the light, and finally the high cost. It

is simply necessary to point out that M. Jablochkoff's candle ims to do away with all of these difficulties to show the mportance of the invention
The device is represented in its full dimensions in the an nexed engraving, for which we are indebted to La Nature.

It is an asbestos ferrule, sustaining the two gas carbon rods, C, which are also held in copper tubes, T. At I is insulating material placed between the rods, and at $F$ the conduct ing wires. This arrangement may of course be modified to suit differing circumstances. The insulating material is kaolin or other refractory substance which does not extend to the ends of the rods. When the current passes, the arc is produced between the extremities of the carbons; and as these become consumed, the light is gradually brought near to the refractory substance. This by the great heat is vaporized, in proportion as the rods burn away, so that protruding ends of the latter are always left, while they are always maintained at exactly the proper distance apart to which they are in the beginning adjusted. If a continuous current is used, the double consumption of the positive rod is provided for by making that carbon of double the area of section as compared with others: but the candle works better with alternating currents, in which case the carbons are of the same size. It is easy to reverse the apparatus so that the arc is produced at the lower ends of the rods. The candle may then be employed for an overhead light.
One of the principal advantages of the Perrin lamp is that it may be set in operation from a distance by merely establishing the current, the carbons having been previously prepared. M. Jablochkoff accomplishes this by placing a bit of carbon between his points. When the current passes, this becomes hot, reddens, and finally consumes. Continuity is then broken, and the arc appears. A bit of lead, or fine metallic wire, which melts easily, answers the same purpose.
The gradual fusion of the insulating material presents an other advantage, namely, that it becomes conductive on at taining the liquid state, and admits of an elongation of the arc, which increases the light. This conductibility, moreover, admits of the candle being extinguished by the breaking of the circuit and then re-ignited, provided the interval is not longer than a couple of seconds. By this means, it is suggested, the candle might be employed as a means of transmitting signals by flashes, using the Morse telegraphic alphabet. This idea has already been adopted by the Russian army, and trials are soon to be made at the headquarters at Kischenew.
With the ordinary electric lamp, it is not possible to place more than one pair of carbons in the same circuit. This is owing to the necessity of regulation in apparatus where the movement of the rods is accomplished by electromagnetic machinery, which itself is dependent upon the variations of the resistance of the circuit produced by the changes of length of the voltaic arc. If the arc elongates, the resistance augments; the electromagnet weakens, and allows of the relative approach of the carbons. Consequently, if two lamps were placed in the circuit, and one arc elongated, both electromagnets would be affected, and hence both arcs would be shortened. So that the inter-relation of the two machines would constantly produce improper regulations, which would amount to no regulation at all. With the candle, however, it is immaterial how many are placed in the same circuit, provided the current has sufficient tension to pass through all. In Paris, three and four lights have been maintained from a single electric machine.
M. Jablochkoff is at work on further improvements, some of which he has perfected, and will shortly lay before the French Academy of Sciences, when we shall present them to our readers. It will be seen, however, that the invention is one calculated greatly to extend the usefulness of electric illumination.

## Communadians.

## Our Washington Correspondence.

To the Editor of the Scientific American
An application having been made by S. D. Locke to Secretary Schurz for an order directing the Commissioner of Patents to rehear the case of Withington vs. Locke, on the ground that the case was heard by the Assistant Commissioner at a time when the Commissioner of Patents was present and attending to his official duties, the Secretary has made a decision, denying the application, reviewing and reaffirming the decision of Secretary Delano in the quadruplex telegraph case, as to the right of the Secretary to interfere with the acts of the Commissioner of Patents, when honestly performed. There is no complaint made on this score; and the attorneys of both parties appeared before the Assistant Commissioner and fully argued the case, thereby tacitly admitting his competence to decide the case. No objection was made by either party until the matter was decided, when the defeated contestant made this application. After referring to the long-continued practice of the Office for the Assistant Commissioner to act on cases when the Commissioner is otherwise engaged, the Secretary says: "The duties of the Assistant Commissioner have been, and are, such as the title of his office supposes; and I am of the opinion that where parties, as in this case, submit their proofs and arguments to that officer, with a full understanding of the practice so long established, they must abide by his decision or seek their remedy in the courts."
An appeal from the Board of Examiners-in-Chief having been taken by John N. Swift, an applicant for the registration of a trade mark which had been previously registered by Winfield Peters, February 29, 1876, the Assistant Commissioner affirms the decision of the Interference Examiner
" The John C. Ragsdale Ammoniated Dissolved Bone.' The name of Ragsdale is that of a gentleman who was presi dent of an agricultural society in Georgia, and his name wa taken, by his consent, to popularize the article in that locality. Swift, having been appointed to negotiate with manufacturers for the introduction of this and other brands of fertilizers, made a contract with the firm of Snowden \& Peters to furnish the article under this name, which firm afterwards dissolved, and Peters registered the trade mark in his own name. Unlike applications for patents, priority of conception of the idea has no weight in the registration of a trade mark, and Swift not only fails to show that he ever used the trade mark, but he sold the manufactured article of Snowden \& Peters on their account. The rights of Snowden or of the agricultural society are not at issue in this case, and are therefore not considered. The Board of Appeals decided the case in Peters' favor, which this decision affirms on the ground that Swift had never adopted or owned the trade mark at all in the sense contemplated by the trad mark law.
Mr. T. C. Connolly, for many years a Primary Examiner has been reduced to First Assistant Examiner-cause said to be old age.
As a result of the competitive examination for the position made vacant by the appointment of Mr. Wilber as Examine of Interferences, Mr. H. C. Townsend has been appointed Primary Examiner.
The exploration of our Western territories will be continued during the coming summer under Lieutenant Wheeler Professor Hayden, and Major Powell, though the field of operations is not fully determined upon. Major Powell will probably continue the geological survey of the Colorado river country, in which his party has already made extensive explorations. Professor Hayden's exploring party last year completed the survey of Colorado, and will make during the summer an exploration north of the Union Pacific Railroad. The main party under Professor Hayden will make Cheyenne their headquarters, and the different divisions will reach the principal points of their fields of operations by the Union Pacific road. The northeast division will be under Mr. G B. Chittenden, and operate in the Sweet Water and Mud river countries. The southwest division, in charge of Mr . Henry Gunnett, will examine a section of about 10,000 square miles in area on the western slope of the main Rocky Mountain range. The northwestern division, under Mr. Bechler, will survey an equal amount north of that already referred to. This part of the country is of more rugged character than the other sections, embracing within its limits features of surpassing interest. Its topography geology, and natural history are more remarkable than any of the other sections. The various parties are made up, and will probably have left for their field of operations ere this is published.
Secretary Evarts is represented as expressing regret at the postponement of the extra session of Congress, as it may prevent the representation of the United States at the ap proaching exposition at Paris. He thinks, however, that a Commission may be appointed which would in part recipro cate the French representation at the Centennial Exhibition. It is probable that a formal communication will be addressed to the French Government explaining the situation. The Secretary thinks, however, that, if Congress when they meet should act promptly in the premises, there would still be sufficient time to organize a respectable representation of our products and manufactures
The Bureau of Statistics has published a statement show ing that the exports of "oleomargarine" or "butterine," from New York, during the seven months ending March 31, amounted to $3,549,629$ lbs., of the value of $\$ 481,747$, of which $2,352,250$ lbs. were shipped to France and 991,329 to Great Britain. This probably accounts for a discovery that the English people have lately made that a large quantity of very nice-looking butter, said to have been imported from the island of Jersey, had never been made in Jersey at all and they were puzzling their brains to find out where it had come from-having very strong suspicions that it was not really butter but oleomargarine.
Our Board of Health has condemned a thousand barrels of an article sold in this market by a Chicago firm for vinegar which, when tested by the chemist, was found not to be vinegar, but a compound containing $54 \frac{54}{100}$ grains per gallon of anhydrous sulphuric acid combined with lime to form sulphate of lime (equivalent to $117_{1}^{2 \frac{6}{100}}$ grains of gypsum per gallon) and 5 grains free sulphuric acid per gallon. This stuff is probably shipped all over the country, because it can be made so much cheaper than pure vinegar; and the people should therefore be warned to notice whether they are buy ing vinegar or diluted sulphuric acid.
Washington, D. C.
Occasional.

## A Practical Method of Determining the Friction of slide Valves.

To the Editor of the Scientific American
There has recently been considerable discussion of late concerning the friction of slide valves, from which it appears that there is a wide difference of opinion among mechanical engineers on this subject. I propose to show a method by which the friction of a slide valve may be measured; and for that purpose I have designed the instrument shown in the engraving. It is intended for taking diagrams which will indicate the frictional resistance of a steam en-
gine valve at every part of its stroke. In the engraving, $\mathbf{E}$ gine valve at every part of its stroke. In the engraving, E
the steam chest, A. Attached to the end of this valve stem is a cylinder, F , which is provided with a nicely fitting piston B. The stem of this piston, B, is joincd to the eccentric rod of the engine. A common steam engine indicator, D, is connected with the upper part of the cylinder, F. If the cylinder chamber is filled with water, and the piston, $B$, is

driven forward by the eccentric (the water in the chambe being confined and inelastic), the motion of the piston wil be communicated to the valve stem, and all the parts wil move forward together as if they were rigidly connected The cylinder, F, has an external nut by which the valve is drawn back in the opposite direction, and which prevents the piston, B , from being withdrawn from the cylinder The thrust of the eccentric on the piston, B, will produce a pressure in the cylinder which will cause the pencil, $p$, of the indicator to rise and fall as the pressure increases or di minishes. The card, C , on which the diagram is drawn, is placed flat and stationary (instead of being mounted on a cylinder), while the indicator is carried back and forth with he valve. When the pencil, $p$, is brought in contact with the card, and the valve is moving forward, a diagram will be drawn, with a length equal to the stroke of the valve, which will indicate the pressure at every part of the stroke. The mean resistance of valve and power absorbed in foot lbs. can be determined by the usual method of working out steam diagrams.
If we wish to know the percentage of power of the engine which is absorbed in moving the valve, let a diagram be taken from the cylinder of the engine, and during the same stroke let a valve diagram be taken; then the foot lbs. of work developed by the engine may be compared with that absorbed by the valve. It may be said that the upward move ment of the indicator piston would reduce the travel of the valve; but if the piston, B , is made sufficiently large, this re duction would not be of practical importance.
Indianapolis, Ind.
John C. Dean.

## The Origin of Petroleum

To the Editor of the Scientific American:
On page 294 of your current volume, I notice an article on a "New Theory of the Origin of Petroleum." The idea may e new in print; but $I$ heard it advanced during the winte of $1865-66$ by a Mr. Smith, then a resident of Enterprise, Pa. He said: "By volcanic action, the earth's crust was broken, leaving crevices through which the ever-present water poured, which, coming into contact with the heated matter near the center of our globe, formed a gas which, in seeking outlets through the earth's crust, became more or less pent up, and necessarily would condense, forming our petroleum." He did not, as our friend in Russia has done ell the nature of the matter with which the water comes i contact, but gave the idea generally. I think he wrote on his subject either to a Titusville (Pa.) or an Erie (Pa.) paper but as to that, I am not certain. I remember, however, that e had a number of pretty sharp arguments with oil men on this theory. Mr. Smith went further, accounting for the gas that escaped the condenser by saying that " it passes into the air, forming into globe-like shapes, which in passing upward gather around them a moisture which of course con fines them until, by gradually gathering this moisture (thereby gathering weight), they settle little by little until they mingle with the clouds, which generate electricity, or at least contains it, and are exploded by a spark, causing th flash and explosion-thunder and lightning." The latter part of his theory may be a little "airy;" but we must in some way dispose of this gas, and why not in this way as well as any other?
I think this will prove that we as a people are not so far behind the old world as such "credits" make us appear. Buffalo, N. Y.
L. E. Porter.

## Poisonous Enameled Ware.

Much consternation has lately been caused by the an nouncement in certain Boston papers that the enamels on the so-called marbleized and granite ware, which have for the past year or more found ready and extensive sale in our markets, have been found to contain lead and arsenic. The ware is quite handsome, of a mottled gray and white color resembling somewhat certain varieties of marble in appear ance. The vessels (principally culinary utensils) are in gen eral enameled both inside and out. It will be seen from th letter given below that the statements as to the objection able character of these enamels are not wholly withou foundation in fact. The manufacture of the " marbleized ware were awarded a medal in the Centennial Exhibition last year; and in the report of the judges, we find the state
ment that the marbleized ware "differs from all other en amels in that it contains no poisonous or injurious sub stances whatever," and that "it is unaffected by excessive heat, or acids of any description."

We have received the following from Professor S. D. Hayes, the State Assayer of Massachusetts:
To the Editor of the Scientific American:
It will be replying to many inquiries about enameled ware if you will kindly give this note a place in your columns. I have recently analyzed various specimens obtained in the
open market, from dealers, kitchens, agents, and directly open market, from dealers, kitchens, agents, and directly
from the makers of these wares, and I have seen them manufactured. The wares to which I refer now are known re spectively as "marbleized" and " granite" iron wares, re sembling each other so much in their mottled gray color that they are not easily distinguishable by persons unfamiliar with them.
The marbleized ware, as hitherto manufactured, contains considcrable lead in a soluble form, with a little arsenic, and there is no objection to it for other purposes. Oxide of lead adds to the clasticity and fusibility of the enamel, so that there is a temptation to use it on the part of the workmen in the factories. But serviceable enamel ware can be produced without it, and I have analyzed pieces made within a few days, by the manufacturers of the
free from deleterious ingredients.

## Some of the picces of granite

small proportion of at iminy (about one per cent) which a not a dangerous olement in the enamel; and as there is nothing clse present that is injurious, it is safe for use in the kitchen or elsewherc. The other pieces of granite ware con tained no soluble metals whatever, excepting iron, and they are entircly harmless in composition
Boston, Mass.
S. Dana Hayes,

State Assayer and Chemist

## PROJECTION OF INTERFERENCE COLORS FROM SOAP

## FILMS

## gy heviby morton, phd

Among all the phenomena of light, none are of such fundamental interest as those of interference; for none have a closer relation to the first principles of our theory as to the nature of light, or are so constantly coming up in all parts of the subject in connection with the most beautiful developments of color, as for example in the diffraction spectrum and in chromatic polarization. Yet until recently no means has been at command for exhibiting directly by projection this phenomenon in its characteristic beauty. Now, how ever, in the simple arrangement which I am about to de scribe, we have all that could be asked in this connection.
The arrangement is as follows: We place the electric light, E , in the lantern and remove the front element of the condensers so that the light comes out in a nearly parallel beam. The lantern is then turned obliquely towards the screen, and at the distance of about six inches from the condensers, $C$,

is set the soap film ring, $R$, with the soap film on its face. In such a position as to receive the light reflected from this film, is placed a plano-convex lens of about 12 inches focus, and about 4 inches diameter, which is adjusted back and forth by trial until the best effect is obtained on the screen. This effect is to begin with a gradually changing field of the most brilliant color, with occasional irregularities, but essentially passing through the tints of the spectrum to a deep violet blue.
When this point is reached, the ring, $R$, is to be rotated in its own plane a half revolution, so as to bring the lower part of the soap film to the top. The result of this is the flowing down over the film of various thicknesses of solution from the accumulation of its lower edge, now suddenly brought to the top. These varying thicknesses produce the most brilliant colors, and, by reason of this and the graccful cloudlike forms which are assumed, develop a spectacle with which I know of nothing comparable, unless it be one of the most gorgeous sunsets I have ever seen. Purple, crimson, gold, blue, and green, exquisitely blended and of interse brightness, are some of the tints.
The idea of making the ring rotate, so as to secure this effect from the flowing of the soap solution, originated with my friend, Professor George F. Barker, of the University of Pennsylvania, and rings of a very satisfactory character, in-

volving several little matters of detail, are manufactured by
Messrs. George Wale \& Co., of Hoboken, N.J. The solution for the soap film is best made as follows: a. Take olive oil soap (white Castile soap), cut it into shavings with a plane, and dry thoroughly. Dissolve these shav ings in alcohol until the alcohol is saturated. The solution should show a specific gravity of 0.880 b. Mix glycerin with water until it shows $17 \cdot 1$ Baume. T $b$, add 1.52 cubic inches of solution $a$, and boil until the
alcohol is all expelled. This is obtained when the boiling point rises above $212^{\circ}$ Fah. Cool, and turn into a graduated flask, and add water until the volume is again $6 \cdot 102$ cubi inches. Filter, if nccessary, to remove oleate of lime.
Some of this solution being poured into a small plate or shallow dish larger than the soap film ring, bring the latter, face downwards, upon its surface, until the edge is just immersed, and then, keeping the face horizontal, raise gently and turn into an upright position. Should there be drafts in the room, an ordinary glass shade may be placed over the soap film ring, without interfering with the experiment, and the film will then be more persistent and safe.

## ASTRONOMICAL NOTES.

Observatory of Vassar College. The computations and some of the observations in the following notes are from students in the astronomical department. The times of risings and settings of planets are approximate, but sufficiently accurate to enable an ordinar observer to find the object mentioned.

Positions of Planets for June, 1877 Mercury.
Mercury rises on June 1 at 4h. 19m. A.M., and sets at 6 h . 29 m . P.M. On the 30 th , Mercury rises at 3 h .17 m . A.M. and sets at 6 P.M.
The best time for seeing the planet is on the morning of the 20th, when it is furthest from the sun and rises an hour be fore it.

Venus.
On June 1, Venus rises at 4h. 57 m . A.M., and sets at 7 h 57 m . P.M. On the 30th, Venus rises at 5 h . 41 m . A.M., and sets at 8h. 35ัm. P.M.
Venus is small, but bright; and after the middle of the month it can be seen for nearly an hour after sunset, following almost exactly the path of the sun.

## Mars.

On June 1, Mars rises a little after midnight and sets a 10 h .25 m . in the morning. On June 30, Mars rises at 11 P.M., and sets at 9 h .38 m . the next morning. Mars is in southern declination among the small stars of Capricornus and Aquarius, but is moving toward the north, coming into better position and increasing in apparent size.

## Jupiter.

Jupiter is brilliant now in the southern sky, and will be in its best position about the middle of June. On the 1st, Jupiter rises at 8 h .50 m. P.M., and sets at 5 h .51 m . the next morning. On the 30 th, Jupiter rises at 6 h .41 m . P.M., and sets at 3h. 41m. A.M. the next day. Jupiter souths at mid night on the 20 th at an altitude of $25^{\circ} 10^{\prime}$ in this latitude.
The various changes of Jupiter's four moons can be scen with a smail telescope, and many of the most interesting occur in June. On the 12th, Jupiter will be seen with only three moons until after 9 P.M., when the 1st moon will re appear from behind the planet. On the 19th, the 1 st satellite will disappear between 8 P.M. and 9 P.M., by passing behind the planet; and between 10 P.M. and 11 P.M. the largest will disappear by coming in front of the planet. On June 26, Jupiter will be seen when it rises, with all four moons; but a little after 10 P.M. the first will disappear by the planet passing between us and the moon and hiding its light; this satellite will reappear in 2 h . and 24 m . ; and for a little over an hour the four moons are still scen. But the 3 d or largest is very near the planet, and a little after 2 A.M. comes in front of and is lost in the light of Jupiter. The small stars around Jupiter are those of the constellation Sagittarius.

Saturn.
Saturn rises on June 1 at 1h. 5m. A.M., and sets at 0 h 23 m. P.M. On the 30th, Saturn rises at 11h. 10m. P.M., and sets at 10 h .29 m . A.M. of the next day.
Mars and Saturn rise at nearly the same time on the 30th, but Saturn is $5^{\circ}$ further north.

## Uranus.

On the 1st, Uranus rises at 9 h .57 m . A.M., and sets at 11 h 49 m . P.M. On the 30th, Uranus rises at 8 h .9 m . A.M., and sets at 9 h .57 m . P.M. Uranus is still among the stars of Leo.

## Sun Spots

The report is from April 17 to May 16 inclusive. In the photograph of April 17, there appears on the western limb the group of large spots mentioned in the last report; but from this date to April 21 clouds prevented observations, and during that time the group disappeared. On April 21, a pair of small spots was seen far advanced on the eastern limb. On April 22, this pair was followed by a pair of very mall ones. During the passage across the disk, there was a spots in these two groups. Before April 30, both had disappeared. In the picture of this date, a small group was seen on the eastern limb; but after May 5 it could not be found. When last seen, it was near the center of its course, but very faint. The observation of May 5 showed a small spot, followed by a very faint one. On May 4, these spots had not been seen, and were first visible on the western limb. On May 8, a large spot was seen coming on. From May 8 to May 12, no observation could be made. On May 12, two large spots were seen near the center; one of these was seen before May 8, the other had burst out between May 8 and May 12. The one first seen on May 8 disappeared between May 13 and May 14 at about the center of its course; the other is still visible (May 16), and is at present preceded by a small spot not seen on May 15,

## GRANT'S IMPROVED HORSE HAY FORK

We illustrate herewith a new and ingenious apparatus for unloading hay and like material by means of horse power. The advantages claimed are simplicity and strength, and the adaptability of the device to unloading barley or any like ubstance, either long or short, ordinarily difficult to handle by appliances of this kind. Fig. 1 is an exterior view, and


Fig. 2 exhibits a section of the central tubular tine, A. Into his tinc fits a tubular plunger, B, which is provided at it upper end with a hook, and is plugged at its lower extremity, where are affixed ears to which the barbs, C , are pivoted. The spring, D , is clamped to the tine by a band and screw, and has a catch pin which passes through the disengaging lever, E , and the side of the tine, and enters a hole in the plunger, B. The lever, E, encircles the tine, and rests under the spring, and is held in place by the catch pin. The end of this lever is bent upward, and is provided with a small pulley. At F, is a key, which passes through mortise in the tine and through a slot in the plunger, thus serving to limit the motion of the latter. The end of the key is bent over the front of the tine, and is formed into an eye, to which the disengaging cord, which passes upward over the pulley, is attached. At $G$ are lateral tines, which are detachably secured to the central tine, so that, when a ight fork is desired, the latter may be used alone.
In using the apparatus, the plunger, $B$, is drawn upward until caught by the catch pin. In this position, the barbs, C , are retracted. The fork is then lowered into the hay or grain until well buried. The lever cord is then pulled, when the catch pin is withdrawn from the plunger and the latter descends, throwing out the barbs. These as they extend press and pack the material up into the crotchets of the tines. In this position, the plunger is again caught by the catch pin; and as the bottom of said plunger rests on the barbs, the weight thereon is taken off their pivots and brought to bear on the key, F. The load is then lifted. When it is to be discharged, the lever is again moved, the catch pin withdrawn, and the weight causes the fork to descend, the plunger remaining stationary. This causes the retraction of the barbs and consequent release of the hay. The invention received an award and commendatory report at the Centennial Exposition.
Patented through the Scientific American Patent Agency, April 3, 1877. For further information relative to sale of territory, etc., address Peter Grant, Clinton, Ontario, Canada.

## A Large Passenger steamer.

The new steamboat, the Massachusetts, of the New York and Providence line, was built by Mr. Steers, of Greenpoint N. Y. Her dimensions are as follows: Length, 325 feet beam, 46 feet; beam, over all, 76 feet; depth of hold, 16 feet inches. The frames are of white oak and locust and cedar the floor timbers of white oak, and the top timbers of locust and cedar. The deck is of white pine. The launching weight of the Massachusetts, without the machinery or joiner work, was 1,000 tons. The engine is of the vertical beam type, with ll the recent improvements. There is a 90 -inch cylinder with a stroke of 14 feet. The wheels measure 39 feet 7 inche in diameter. There are two smoke pipes. The boat will be steered by steam. The interior arrangements are very hand some.
The dreaded hemileia vastatrix, which has hitherto been confined to coffce plantations of Ceylon and Southern India has at last made its appearance in Sumatra, and in all proba bility will find its way llefore long to the neighboring island where coffee is grown.

## A WONDERFUL WATCH.

In the accompanying engravings we present the remarkable watch which that able scientist, Mr.Mark Twain, says "knows considerably more than the average voter," and "comes nearer to being a human being than any piece of mechanism I ever saw before." Mr. Twain probably did not have in his mind the modern reaper, which picks up grain, makes it up in bundles, cords it, and ties a knot in the cord, or the Jacquard loom, which weaves por traits, or the talking machine, or the perfecting Hoe and Walter print ing presses, all of which are very much more human-like in their per formances than this watch, when he ventured the above opinion; so that we cannot fully indorse his thoughtful remark, but it is none the less true that the timepicce is an exceedingly ingenious specimen of horological skill.
We are not going to explain the machinery, because we want to print something else in this issue, and our readers might not enjoy reading about nothing but this watch, as would be the case if we described it in detail. Therefore we give several beautiful engrav ings of the works, and a general description of what they accomplish. In Fi . 1 is riven a view of the face
of the timepiece, showing four small dials. There is of course, first, the usual dial for noting the time. Beside the two hands necessary for the latter purpose, are two long hands which point to a graduated scale which, divided in 60 parts and subdivided to fifths of a part, surrounds the circumference of the dial. These two hands normally both point to twelve. Suppose we are timing two horses starting

at different times. The instant the first horse is off, we press a stop on the side; then hand No. 1 starts marking seconds. When the second horse starts, we press the stop again, and hand No. 2 begins its movement in the same direction. A any desired moment the stop is pressed a third time, and

Fig. 4.

both hands are instantly arrested. Finally a fourth pressure on the stop sends the two hands back to twelve. Just under the XII mark is a small dial which shows the day of the week; another dial on the right exhibits the day of the month, another on the left the name of the month, the
fourth below has a hand which beats fifths of seconds and also an open face through which a golden moon on a blue enameled sky can be seen. This moon follows ex actly the phases of our satellite; so that the time of new or full moon is instantly seen. The moon besides has a stop of her own, so that she can be set a day or more ahead in ad justing the watch, and another stop serves to reculate the month and day dial. The wat besides
rom the perpendicular, causes that force to react upon th est piece and produce distortion and fracture. The angular position assumed by the pendulum is a measure of that force. A pencil is secured to the pendulum and is moved when the atter is thrust forward in a direction perpendicular to the plane of rotation, by its contact with a guide curve, $F$, fast ned to the frame of the machine A cylinder $G$ is cylinder, $G$, is secure and the paril The cylinder and the pencil have precisely the relative movements of the two end of the test piece, so that the length of the curve, automatically described by the pencil upon a paper wrapped about the cylinder, be comes a measure of the degree of distortion or of the ductility, and its height measures the resistance offered by the material. The material thus tells its own story, these elements recording themselves si multaneously and continuously from the initial point to the point of final rupture. The diagrams made by the machine show to the eye at glance the nature of the material tested, and are very characteristic The strength of the material i measured on the diagram with pocket rule or a pair of dividers. Any bright boy can make the test and interpret the diagrams.
on pressing still another stop, it sounds first the hour, the a certain number of times to indicate the quarter, half, or hree quarters past, and then the requisite number of scparate trokes to tell the minutes elapsed since the quarter. Leap year and February 29 are fully provided for. There is a litthe wheel, D, Fig. 2, which makes one quarter revolution per year. In four years it completes its turn, and the hand on the February mark of the month dial stays there for one day longer.
Fig. 2 represents the works just beneath the dial plate. A is the wheel for the month hand, B that for the date hand C that for the week day hand, and E is the moon wheel Underneath this mechanism, the machinery looks as represented in Fig. 3. The principal portion of the works that operate the repeater device is here. On turning the watch over and opening the back, intricate mechanism is shown, as in Fig. 4, which exhibits the annular bells, the hammers, and the double winding apparatus.
M. H. L. Matile, of Locle, Switzerland, made this remark able timepiece, and exhibited it at the Centennial. The me chanism is so perfectly and accurately executed that it re quires comparatively little power to be exercised by the main train to accomplish all this work, and this without interfer ing with the notation of exact time. It should be mentioned that a first-class rating and certificate from the observatory of Neufchatel accompanies the watch, setting forth its sur prisingly accurate running qualities. We are indebted to Messrs. Mathey, of 119 Fulton street, this city, for our information.

## Where to Buy Sportsmen's Tackie, etc.

Mr. W. Holberton, dealer in sportsmen's goods, of 102 Nassau street, this city, has issued a neatlittle illustrated pamphlet, giving full descriptions of all the novel and ingenious inventions which increase the comforts and lessen the hard work incident to camping out. Particulars are also given relative to the best guns and fishing tackle, and of the numberless appliances which go to make a sportsman's outfit complete. What with portable stoves, portable tents, port able boats, and portable beds, life in the woods need now involve few of the hardships which go to alloy its pleasures while if the modern hunter grows in destructiveness with the multitudinous devices, invented for his benefit and here illustrated, certainly more piscicultural societies and more game law makers will find renewed fields for their endcavors. We cannot particularize as to the best things noted in Mr. Holberton's catalogue, although there is one "fly book" which will especially commend itself to anglers, and is, we think, one of the best arranged books we have ever seen. A full description is given of the new glass ball trap for pigeon shooters, which is an excellent apparatus, which we -and Mr. Bergh we are sure will cordially join us-can com-
mend to the notice of amateur shots. Persons dealing with Mr.Holberton have the satisfaction of knowing that his advice as to flies, etc., can be relied upon, as he is a practical sportsman himself. The price of the pamphlet is 10 cents.

## PROFESSOR R. H. THURSTON'S AUTOGRAPHIC TESTING MACHINE.

We illustrate herewith the latest and most complete form of Professor Thurston's machine for testing the strength, elasticity, ductility, shock-resisting power or resilience, and the homogeneousness of metal. The material is tested by twisting, by which is obtained a great range of distortion, and the most favorable treatment for revealing all the characteristics of the test piece. The latter is placed between two independent jaws, one of which is rotated by means of an arm in the simpler styles, and in the one here illustrated by a worm, L, and gear, M. The force thus applied is trans mitted through the test piece to the other jaw, from which depends a weighted arm or pendulum, B. The resistance offered by this pendulum to the force tending to deflect it

These machines offer facilities for a study of the physical properties of the materials of construction, and of the man her in which molecular changes are induced by the various processes of manufacture and of usc. They are in constan use for the tests and researches carried on in the Mcchanical Laboratory of the Stevens Institute of Technology, and have been supplied to the United States Navy Yard at Washington, to the Russian and Japanese Governments, and to some of our leading railroads, iron manufacturers, and scientific institutions. The apparatus is especially valuable in testing such metals as cast iron, as it measures extensions which other machines cannot detect to the hundred millionth of an inch. It has been used with success in testing car whee irons, showing their relative value with accuracy. The pur chaser of the machine is supplied with tables by which he obtains accurately the percentages of elongation, and with instructions giving the methods of deducing the strength, elasticity, homogeneousness, and other qualities.


The machine illustrated was designed and made entirely by the students of the class of 1876 of the Stevens Institute of Technology, and was exhibited by them at the Centennial Exhibition. It received the award of the judges. The earlier forms received the cold medal, the highest award a the Exhibition of the American Institute, 1874 and 1875, and the medal of the Cincinnati Exhibition of 1875. The machine is manufactured in the workshop of the Mechanical Labora tory of the Stevens Institute of Technology, Hoboken, N. J., and by Messrs. William II. Bailey \& Co., of Salford, near Manchester, England.

The Speaking Telephone in New York.
Professor A. Graham Bell recently exhibited his telephone at Chickering Hall, in this city. Wire communication was established with New Brunswick, N. J., a distance of 32 miles. The lecturer in his first discourse explained the laws of sound, and afterwards the members of the audience were afforded opportunities to converse with Mr. Watson at the other end of the line. Small instruments were used, and the soundproduced was not generally audible throughout the hall.

## Fall of a Court House.

A new court house, nearly completed in Rockford, Ill. recently fell down, killing ten men and wounding fourteen. The dome was 119 feet from the ground, and was supported by iron columns, which in turn rested on a brick wall. The latter was not constructed of sufficient strength to hold up the superincumbent weight. It accordingly gave way, and was followed by the entire dome and roof, leaving little more than the four walls of the edifice standing.

THE FOUNTAINS AT ARANJUEZ
About thirty miles to the south of Madrid, the capital of Spain, lies a princely domain surrounding a magnificent country mansion. This is Aranjucz, the summer residence of the King. It was designed and constructed under the directions of Philip the Second, and is reached by a well directions of Philip the Second, and is reached by a wel constructed roa
by the Madrid and Alicant railway. The palace of Aran many noble works of art but the chief at traction to natives as well as visitors is the park, with it ornamental gar dens and fountains. Our engraving repre sents the Triton fountain, which fountain, which stands in a shady and secluded spot. The ar rangement of
the water jets and of the bronze and marble sculpture is exceedingly artistic and effective. Broad double avenues of elms traverse the park, leading to the center; and the walks are lined with box and laurel hedges. The purple buds of the cactus and aloc stand out against the green of the are shrubs; and rare shrubs; an orange blossom.

## CALIFORNIAN SEA LIONS.

Of the family of phocide or seals, the otaria, comprising the so-called sea lions and sea bears, are especially interesting. Like most members of the seal family, they are easily tamed, and are affectionate and docile; they can be taught to sit
up, to bow, to kiss the hand, and to perform many tricks. and their eyes are large, full, and expressivc. The jaw Many of our readers have probably seen the southern sea display, when open, formidable tecth. Their snouts are fur lions (otaria jubata) in the Zoölogical Gardens in Lon- nished with long drooping, silver-white bristles. They ar don, and also the northern or California sea lions (otaria found along the coasts on the Northern Pacific Ocean, from Stelleri) in the Thiercarten at Hambursh, Germany. The Behring's Straits to California and to Japan and ar sea lions in Central Park, and at the Aquarium in this hunted for their fur, as well as for their flesh, which i ity, are of the latter species; and the intelligence and affec
hu
readers will at

THE TRITON FOUNTAIN IN THE PARK AT ARANJUEZ.
 once notice the comparativ smallness of the heads and length of the necks, the latterbeing elongated at will. The prominence o blades give them a hump backed appear ance. They are much more agile than would be supposed from their size and
weight, and the weight, and the move 1 ightly
and gracefully through the wa ter. Their bodies are very flexible and they can scratch thei heads, as dogs do, with thei hind paws Their bellowin can be heard a a great distance and the male are fond of ex hibiting thei vocal powers the sound is dis agreeable, re cry of a child tion for their keepers which they manifest, and their efforts in distress, although, of course, it is much louder to raise themselves out of the tanks of water in which they are kept, in order to reach their master, are very amusing. Our illustration shows the specimens in the Hamburgh collec tion above mentioned, the animals being quite young. The males of this genus are about 5 feet long when fully grown, and the females about 4 feet. They yield fur of a golde brown color. Their ears are small, pointed, and pendent

In a recent lecture on heat, delivered at the Royal Institu tion, Professor Tyndall described an invention of Mr. Sie mens to detect the oxidation of telegraph cables. It indi ates the heat that the oxidation occasions, and thus show o what extent the rust is forming. It is chiefly of service with cables coiled in tanks.


CALIFORNIA SEA LIONS IN THE HAMBURGH ZOOLOGICAL GARDENS
been cut out and replaced by wire gauze. This gave a chance for the air to draw through, and as the locusts worked to-
ward the rear end they made toward the light shining ward the rear end they made toward the light shining
through the wire. This machine was rigged on cart wheels and the only expense was in getting three long poles from the woods, and in purchasing about forty yards of cotton muslin.

Major J. G. Thompson, of Garden City, Minn., has used with satisfaction a net made as follows:
'Twopieces of common batten about 16 feet long were used as framework for the mouth of the net, one for the bot tom and one or the top. From the end of the bottom piece steady the trap and serve as a runner. To the rear end of Sthis shoe a similar peiece was fastened by a hinge, and ran
forward and was fastened to the top piece of the frame so forward and was fastened to the top piece of the frame, so
that the mouth of the trap would open and shut like a jaw. that the mouth of the trap would open and shot like a jaw.
To hold the mouth open, two short upright posts were fast To hold the mouth open, two short upright posts were fast
ened to the top piece by hinge, and rested upright upon the bedpiece. and the top was made of mosquito netting The bottom, and the top was made of mosquito netting. The
mouth of the net extended 16 feet from one side of the trap mo the other, and the net ran back about 6 feet to a point with a hole at the end to let out the insects collected. A boy ten
years old can draw one end of this net and by the use of it years cld can draw one end of this net, and
Major Thompson saved one piece of wheat,

Similar machines have been of wheat
'Similar machines have been drawn by horses hitched to each side of the trap, being 12 to 16 feet apart. The horses serve the purpose of driving the locusts inward toward the mouth of the net. There have been many forms of these machines, but all on the same general principle. In Colorado, also, machines have been used to good advantage, most of them having for their object the burning of the young in sects. Mr. J. Hetzel, of Longmont, uses a burner drawn by horses. It is 12 feet long, 2 to $2 \frac{1}{2}$ feet wide, and made of iron, set on runners 4 inches high. An open grate on the top of the runners is filled with pitch pine wood, and a sheet covers the grate to keep the heat down. The grate is generally made with a network of heavy wire, such as telegraph wire. Two men and a team will burn 10 to 12 acres a day, and kill two thirds of the insects, but it requires a hot fire. Mr. C. C. Horner gives in the Colorado Farmer the following more detailed description of a machine which works on the same principle:

It consists of three runners made of $2 \times 4$ scantling 3 fee in length, to be placed 6 feet apart, making the machine 12 feet wide, runners to be bound together by two flat straps or
bars of iron (the base being 12 feet long). Across the top bars of iron hold the runners fiemly together and form a frame across which wire can be worked, to makea grate to
hold fire. The upper part of the runners should be hol hold fire. The upper part of the runners should be hol-
lowed out so that the grate may glide along within 2 inches lowed out so that the grate may glide along within 2 inches
of the ground. A sheet iron arch should be set over this grate to drive the heat downward. This machine is very light, and can be worked with one horse. Pitchwood is best adapted to burning, and can be chopped the right length and
size and left in piles where most convenient when needed. size and left in piles where most convenient when needed.
This machine is intended to be used when the little 'hoppers This machine is intended to be used when the little 'hoppers
just make their appearance along the edge of the grain, just make their appearance along the edge of the grain,
going over the ground once or twice each day, or as often as going over the ground once or twice each day, or as of ten as
neecessary to keep them killed off. The scorching does not necessary to keep them killed off. The scorching does not
kill the grain, but makes it a few days later. This is certain-
ly the cheapest manner of getting rid of this pest, as well as the most effectual.
"Mr. Rufus Clark, of Denver, according to the same paper, uses a piece of oilcloth 9 to 12 feet long and 6 feet wide. One side and each end are secured to light wooden strips by common carpet tacks, and the corners strengthened by braces. The oilcloth is smeared with coal tar, purchased at the Denver gas works at $\$ 7.50$ per barrel, and the trap is dragged over the ground by two men, a cord about 10 feet long being fastened to the front corners for that purpose. The entire expense of the 'trap' is about $\$ 3.50$; and as it is light and easily handled, it will be found serviceable on smal as well as large farms. Zinc, instead of oilcloth, has also
been used for the same purpose. When the insects are fambeen used for the same purpose. When the insects are fam ishing, it is useless to try and protect plants by any applica tion whatever, though spraying them with a mixture of kero sene and warm water is the best protection we and will measurably
merous or ravenous.

The best means of protecting fruit and shade trees de serve separate consideration. Where the trunks are smooth and perpendicular they may be protected by whitewashing. The lime crumbles under the feet of the insects as they at tempt to climb, and prevents their getting up. By their persistent efforts, however, they gradually wear off the lime
and reach a higher point each day, so that the whitewashing must be often repeated. Trees with short, rough trunks, or which lean, are not very well protected in this way. A strip of smooth, bright tin answers even better for the same pur pose. A strip 3 or 4 inches wide brought around and tacked to a smooth tree will protect it, while on rougher trees a piece of old rope may first be tacked around the tree and the tin tacked to it, so as to leave a portion both above and below. Passages between the tin and rope or the rope and tree can then be blocked by filling the upper area between tin and tree with earth. The tin must be high enough from the ground to prevent the 'hoppers from jumping from the latter beyond it; and the trunk below the tin, where the insects collect, should be covered with some greasy or poisonous substances to prevent girdling. This is more especially necessary with small trees, at hill hasene on Paris green mixed with it will answer as such preventives.
One of the cheapest and simplest modes is to encircle the tree with cotton batting, in which the insects will entangle their feet, and thus be more or less obstructed. Strips of paper covered with tar, stiff paper tied on so as to slope roof
fashion, strips of glazed wall paper, and thick coatings of fashion, strips of glazed wall paper, and thick coatings of
soft soap, have been used with varying success; but no es
toppel equals the bright tin. The others require constant watching and renewal, and in all cases coming under out observation some insects would get into the trees, so as to require the daily shaking of these morning and evening. This will sometimes have to be done, when the bulk of the insects have become fledged, even where tin is used, for a certain proportion of the insects will then fly into the trees. They do most damage during the night, and care should be had that the trees be unloaded of their voracious freight just before dark. Most cultivated plants may be measurably protected from the ravages of these young by good cultiva tion and a constant stirring of the soil. The young have an antipathy to a loose and friable surface, which incommodes them and hinders their progress, and they will often leave such a surface for one more hard and firm. Finally, though insisting on ditching and the digging of pits, as, all things considered, the best and most reliable insurance against the ravages of the young locusts, we would urge our farmers to rely not on these means alone, but to employ all the other means recommended, according as convenience and opportunitysuggest. Another method of destroying the young has been proposed and to a certain extent adopted. It prom ises, if carried out effectually, to be of much advantage. It is to protect the prairie grass from fires until spring, and, after the bulk of the eggs are hatched, to simultaneously burn over the entire neighborhood, township, or county, or as far as the combination may extend. This requires concerted action and considerable watchfulness, but if carried out rigidly will destroy a very large number of insects, and has the advantage of being inexpensive. It is inapplicable on the cultivated grounds, but applies to the areas where the other measures are least effective.
One of the most effectual means of destroying the young locusts, and one which is too often overlooked because
its effects are not so directly apparent, is the preservation and multiplication of the native birds. Without undertak ing at this time to specify the species which should be espe cially protected, and about which there is yet some difference of opinion, we feel warranted in stating that until the use less species in this respect are distinguished from those that are beneficial, it is best to protect all insect-eating birds; and if the laws of the State are insufficient for this purpose, le communities, townships, and counties use all their lawful powers therefor. Chickens, turkeys, and hogs devour locusts in immense quantities, and thrive during years of lo cust invasion or whenever these insects abound. Prairie chickens and quails devour them with avidity, and even hunt for their eggs; swallows and blackbirds pursue them unre lentingly; the little snow birds devour great quantities of eggs when these are brought to the surface by the freezing and thawing of the ground, and the same may be said of almost all birds inhabiting the western country in winter The good offices of birds were everywhere noticed in 1875 Professor F. H. Snow, of Lawrence, Kan., found the young locusts in the gizzards of the red-headed woodpecker (meian erpes erythrocephalus), yellow-billed cuckoo (coccyzus Ameri canus), cat bird (mimus Carolinensis), red-eyed vireo (vireo olivaceus), great-crested fly-catcher (myiarchus crinitus), and crow blackbird (quiscalus versicolor), species that had not been noticed to feed on them before. The shrike or butcher bird impales them on to thorns and other pointed substances; and a number of other birds, as well as reptiles, such as toads, frogs, and snakes, feed upon them. We therefore strongly recommend the raising of as large a number as possible of hogs and poultry, both as a means of utilizing and of destroying the young locusts."
The States of Missouri, Kansas, and Minnesota have passed laws granting bounties for capturing and destroying,
or otherwise preventing the increase and ravages of the or otherwise preventing the increase and ravages of the sshopper.

The Effect of Tobacco on the Human System. In the fourth annual report of the Michigan State Board of Health, Dr. Scott relates something new in the influence of tobacco on the human system, as follows:

There has come under my notice for several years, but more particularly during the last two years, a kind of rheu matic condition of the walls of the chest. The patien complains of a dull heavy pain in the chest walls. The dis ease in a large majority of cases is confincd to the left side. The pain is circumscribed and limited to a space of not more han two inches in diameter, just below and a little to the eft of the left nipple. At times the pain is very severe, and lways constant day and night, when the patient is awake Ihave investigated the disease to some extent, and find it to be more common among tobacco users, especially those who se the weed to excess. Patients suffering from this com plaint invariably come to their physician with the belief that they have heart trouble. I have not found signs of or ganic lesion in any of the cases that I have examined, but here does exist in some of them what might be called ' irritable heart.' I am convinced that the greater number of these cases are the result of intemperance either in the use of obacco or other stimulants, for the reason that, when the paient abstains from the use of them for a short time, his pain ceases and his condition improves. In one case, where the atient abstained from the use of tobacco for thirteen months he pain entirely ceased; but at the end of this period the entleman recommenced the use of tobacco, and after thre weeks' use the old pain returned with all its severity. I am certain that quite a number in this vicinity are receiving treatment for heart disease, when, if they would reform in tobacco using, they would speedily recover.

## NEW YORK ACADEMY OF SCIENCES.

The chemical section of the Academy of Sciences held their regular monthly meeting at 64 Madison avenue, Monday evening, May 14, 1877, Dr. J. S. Newberry, President, in the chair
Mr. Henry Newton, E.M., exhibited some plates illustrat ing the palæontology of the Black Hills. The President spoke of the failure on the part of Congress to appropriate sufficient funds to pay the cost of their publication, thus throwing much of the expense of this very useful and practical survey upon Mr. Newton and his colleagues. Mr. Newton will soon return to the Black Hills to finish the sur vey begun by him and Mr. W. P. Jenney last season.
Mr. C. Chamberlain exhibited a specimen of the new min-eral-astrophyllite-from El Pasoz county, Colorado. This mineral contains 13 ingredients, including titanium, tantalum, copper, etc. It is micaceous, but the lamine are not flexible; it is of a yellowish color, and in powder looks like Mosaic gold. Also specimens of analcite with apophyllite, from Lake Superior.

## The first paper of the evening was entitled

the relation between malaria and vegetation,
as shown in the vicinity of New York, by General Egbert L. Viele. The speaker began by stating that in his plan of Central Park, which hemade twenty years ago, he made a botanical garden one of the features of the Park. It was thrown out then, but now it is proposed to do what he then proposed. He next spoke of the drainage of the city, and exhibited a map showing the ancient watercourses. Many of these streams, he said, were supplied from perpetual springs, which will continue to flow until the end of time, yet no provision has been made to carry off the water o these springs; the city is absolutely without drainage. He had hoped that a botanical garden in the Park would develop certain plants that have the power of neutralizing the injurious effects arising from want of drainage. At that time 70,000 species of flowers and trees were growing in the Park, most of them being kept browsed down to 6 inches or a foot. The relation between plants and animals was next referred to; and much credit given to the researches of Tyndall, Huxley, Darwin, Pasteur, Bastian, and Haeckel. The opposite views of these investigators had promoted research and had been of great benefit, but much still remains unknown. The microscopist knows how close is the resemblance of plants to animals in the lower forms of life, how they seem to pass from one to the other. In higher forms of life, the refuse of one is the food of the other, so that they mutually sustain each other. An equilibrium of the two is a necessity for a wholesome state of the atmosphere. The tendency of civilization and the gravitation of people to gether into large cities is upsetting the equilibrium of nat ural forces. There is not enough vegetable life here to consume the refuse of the animal life. What are these surplus elements? They are everything that is offensive to any of the senses, whether in air, earth or water, indoors or out of doors, by day or by night. One of the results of this surplus of animal refuse is malaria. It has been established that there are present everywhere certain destructive principles which may at times and under favorable circumstances develop into malaria. We owe this word mal aria to the Romans, and it meant with them "bad air," which is recognized the world over as the cause of disease. The Greeks called it miasma, and built temples to Æsculapius to void off its evils. We wonder at their idolatry and ignora ce, but our own ignorance is almost as great in regard to its true character. Malaria implies bad air; miasm, infection floating in the air. Under what circumstances does air become an agent in propagating such diseases as plague, cholera, yellow fever, and smallpox, which have destroyed millions, and are still at their deadly work? The speaker then spoke of the usual classification of diseases for statistical purposes, under "malarial," "zymotic," etc., in which malarial embraces all those which distinguish one country from another, one year from another, and which have at times decimated cities and countries. He stated that three fifths of all the deaths in the world result from miasmatic diseases. These have gone on from age to age almost unchecked and unrestrained, the average death rate increasing. He then spoke
of the plague, cholera, smallpox, yellow fever, and their of the plague, cholera, smallpox, yellow fever, and their ravages in historical times; and said that an erroneous impression prevailed that malarial diseases are restricted to in-
termittent fever, chills, and fever and ague, which prevail wherever drainage is defective or the soil has been disturbed. People think that these fevers are never fatal, and come to think of malaria as something we can endure and become accustomed to. There were 30,000 deaths in this city last year, more than half of which were due to malarial diseases. He next referred to the three chief theories held by physicians in regard to malarial diseases; first, the gaseous theory, that they are due to certain gases; secondly, the vegetable theory, that they are due to germs; thirdly, the specific poison theory. Malaria has a history, a geology, a botany, a chemistry, a topography, a geography; yet all these have failed to explain it. It is hoped that the new science of biology will do more for it. Many of these diseases attack a person but once, and are contagious; a certain time elapses between exposure and the development of the disease. They generally run a certain length of time. These are called acute specific diseases. Could any gas do this? We know none with such power. The theory of specific poison only substitutes a general term and explains nothing, but only re-
most worthy of study by biologists. The speaker exhibited
a drawing of the penicillium glaucus magnified, also of a drop of blood from a patient that died within 48 hours with small pox; the latter viewed under a microscope was as lively as a pond full of fish. The similarity of the two forms was quite remarkable.
Nearly the entire food of plants is derived from the air It must be the refuse of the animal world, things which are hurtful to animal life. We all know that the country, where vegetable life predominates, is more healthy than the town. Tyndall has shown the presence of minute organisms in the air, and how they can be developed into larger forms. This island was, in its primitive state, a most beautiful place, and now how changed! Nature is for ever dethroned, the rivers are encroached upon and polluted, watercourses are cut off the supersaturated soil gives off these germs of disease which make it as bad as the Roman Campagna. Central Park has become a mass of shrubbery through which no winds can blow, and is dotted with pools of stagnant water. Let thi be remedied, and let botanists plant there those trees which are capable of consuming most of these poisons, and let our citizens aid to destroy the poison by the same means. The speaker concluded by pointing out on maps that, where fevers most abound, there have formerly been watercourses, and showed that the Roman fever was likewise brought about by the destruction of drainage systems and watercourses. A somewhat spirited discussion followed, in which Dr. Newberry remarked that the globulus and the other species of eucalyptus known to us at present, are not sufficiently hardy to endure our climate, but expressed a hope that the mountainous portions of Tasmania might yet give us a more hardy species, or that those known may be gradually accli matized to our latitude by beginning to cultivate them furthe outh.
Mr. Alfred R. Conkling then read a very interesting paper on the
illustrated by a large blackboard map. The region about this lake seems to be an exceedingly interesting one. On the east side, near Carson City, are several hot springs with water at temperatures of $111^{\circ}$ Fah. to $120^{\circ}$. The formation is quarternary. There are several gold mines on the east side of the lake, in quartz and granite, and several shafts have been sunk. In some of these mines copper minerals are also found. At the northern end of the lake is a peak called Mount Rose, 1,082 feet high. There are two other outcrops of igneous rocks on the east summit, one of which is called Shakespeare's Cliff, from the grouping of lichens on one side, which resemble that famous dramatist. The other is called Cave Rock. The lake itself is 21 miles long, and 12 broad at the widest part. Its depth near the south end is 900 feet, and increases to 1,645 near the north end. The temperature of the water is $54^{\circ}$ Fal. It lies 6,000 feet above the level of the sea. On the west side are mineral springs whose waters contain carbonic acid and sulpheretted hydrogen gases, and have a temperature of $46^{\circ}$ Fah. They are bottled and sent to Carson City. On the same side are some ridges and peaks. Evidences of ancient glacials are abundant. One of of these old glaciers was equal to the Mer de Glace. The paths of several others are marked by morains. In the neighborhood are some small lakes, the basins of which may have been dug out by glaciers. At the southwestern side is a bed of graphite. Echo Lake, near by, is so called because there is no echo there. North of the lakeis a hot spring, the water of wich has a temperature of $132^{\circ}$ Fah.
Dr. Newberry made a few remarks on this interesting phe nomenon of a deep cold lake on the top of a mountain, and the probability of its being the result of glacial action.

## Fly Paper.

Powdered black pepper is mixed with syrup to a thick paste, which is spread by means of a broad brush upon coarse blotting paper. Common brown syrup will answer, but syrup made from sugar is preferable, as it dries quicker. For use, a piece of this paper is laid upon a plate and dampened with water. The paper may also be made directly at the mill by adding sugar to the pulp, and afterwards $\frac{1}{4}$ to of powdered black pepper, and rapidly working it into porous absorbent paper

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## NEW BOOKS AND PUBLICATIONS.

ow to Teach According to Temperament and Mental
Developmenti or Phrenology in the School Room and Developient; or Phrenology in the School Room and
the Family. By Nelson Sizar. Illustrated. Price the Family. By Nelson Sizar. Illustrated. Price
$\$ 1.50$. New York; S. R. Wells \& Co., 737 Broadway. Although physiologists generally believe that phrenology has not yet
settled itself into a fixed science its disciples invariably use its theories as mathematical axioms and undisputed facts. The many instances in which its teachings are nullified, by the fine skull development of many idiot and criminals, have done little to shake the faith of believers in the sug gestions of Gall and Spurzheim; and as is usual in such cases, those cele-
brated craniologists would have been surprised to tind their ideas (founded with apparent justification on the comparison of many heads) resolved into arguments as to the direction of the studies of youth. The volume efore us attempts to do this; and it is illustrated by engravings of variou types of heads, from which many people might deduce a theory that a
man's errors and vices are due not to his immoral nature or his neglect of self-control, but to the shape of his head
How ro Raise Fruits: a Handbook of Fruit Culture. By
Thomas Greeg.. Ilustrated. Price $\$ 1.00$. New York
city: S. R. Wells \& Co., 737 Broadway.
This little book is a thoroughly excellent and practical treatise; and it
This little book is a thoroughly excellent and practical treatise; and it
has our special commendation, not only on account of its valuable instruction to fruit growers, but for its conviacing demonstration of the value of fruit, to the
article of diet
A History and Handbook of Photography. Translated from the French of Gaston Tissandier. Edited by J
Thomson, F.R.G.S. New York city: Scovill Manufac turing Company, 419 to 421 Broome street.
.Tissandier is the editor of our excellent contemporary La Nature and one of the best French writers on popular scientific topics. In the photographic art, the latter of which is excellently adapted of the purposes of the amateur. For general perusal, the work can be especiall ommended, as it gives in pleasant, readable style, a capitalaccount no only of photography but of many of the new processes, for the mechanica
reproduction of pictures, dependent on photographic manipulation. The subjects of photo-micrography and astronomical photography are full discussed. The illustrations are numerous and remarkably good; and an ppendix is added, giving many valuable practical recipes.

## Inventions Patented in England by Americans.

 From April 24 to April 30, 1877 , inclusive. Carrying Weights.-J. E. Barlow, Sing Sing, N. Y. Concentrating Sulphuric Acid.-F. W. Kalbfleisch, Brooklyn, N. Y. Emery Wheel.-I. P. Brown, Jr., Newark, N. J.Feed Water Heater. - steel New York city Feed Water heater.-G. Steel, New York city
Hydrauic Lift etc Journal box and bearing. - W. b. Bishop, New York city. Life boat.-G. Bates, Massachusetts.
Milling Machinery, etc.-T. D. Jones, SJracuse, N. Y. Propelling vesskis, etc.-J. H. Carpenter, New York city.
RECording Thermometer, etc.-R. K. Boyle, New York city REDUCING ORES, ETC.-C. M. Dupuy, Philadelphia, Pa. REDRIGERATOR CAR.-J. M. Ay er, Chicago, Ill.

## Becent Americau axd forcign eatents.

Notice to Patentees.
Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the Scientific AmerCan. We are prepared to get up first-class wood engravings of inven
ions of merit, and publish them in the Scientific American on ver ions of merit, and
We shall be pleased to make estimates as to cost of engravings on receip photographs, sketches, or copies of patents. After publication, th ants become the property of the person ordering them, and will be foun

NEW MECHANICAL AND ENGINEERING INVENTIONS
IMPROVED COMBINED COTTON CHOPPER AND SCRAPER. Empson C. L. Bridges, Brick Church, Tenn.-In this machine the fram which wion with the transporting wheels, and the said vibrating frame ca e raised and lowered by a crank shaft, and adjusted forward or back by like adjustment of the sliding frame to which it is attached. The scrape which goes in advance of the chopping mechanism, may be adjusted later y by a treadle mechanism.

IMPROVED CAR COUPLING
Edward B. Middleton, Charleston, S. C.-This coupling is composed of hook fixed on a rod which slides vertically in suitable bearings in th rawhead. When two cars meet, the hook engages with a catch block, Which is also fixed on a vertically sliding rod in the opnosite drawhead. Ided with enlarged heads which are so constructed that they tend to hold he hook and catch block in proper position, lengthwise with the draw
improved double acting anti-freezing force pump. Henry M. Wyeth, Richmond, Ind.-This invention is intended chiefly to provide a submerged double acting porcelain lined pump, which shall be of a simpler construction and less expensive manufacture than those heretofore made. It is an improvement upon that form of pump in which two
inlet valves are employed in connection with a single outlet valve arranged in a side pipe which opens into both ends of the cylinder. The invention consists mainly in casting the pump and the side pipe in a single piece which secures the desideratum of cheapness, and with the greater porlio of the said pipe offset or removed from the periphery of the cylinder so as to leave a space between, which permits the successful lining of the pump with porcelain
improved combined center and carrier for lathes. Charles A. Niebell, Scranton, Pa., assignor to himself and P. Franz, of same place.-This device is so constructed as to enable the workman to get
the correct center of a shaft without its being necessary to remove the the correct center of a shaft without its being necessary to remove the
work from the lathe more than once. It may be adjusted to correspond with a long or a short center. It also may be used for gas pipe centers, on shafts for cutting off the riser, for facing pipes, and as a chuck upon any kind of a lathe.

## improved nut lock.

Joseph C. Wright, Philadelphia, Pa.-The object of this invention is to construct a nut in such manner that it may be rigidly held on its bolt capable of expansion, into a recess cut, punched, or swaged in the face of the nut in such manner that the packing may have a direct bearing on the thread of the bolt.
improved hose coupling.
William B. Kilbourne, Auburn, Me.-This hose coupling may be readily united. It is not liable to clog so as to prevent it from being quickly put together, and the threads cannot be crossed. The lugs of one part are
placed in the recesses in the other part, and the parts of the coupling placed in the recesses in the other part, and the parts of the coupling
guided by the lugs are brought squarely together. A sleeve is then moved guided by the lugs are brought squarely together. A sleeve is then moved
forward and screwed on the threads of the recessed part by means of a forward and screwed on the
spanner placed on the lugs.
improved pumping apparatus.
Waldemar F. Plockross, Fagundus, Pa.-This relates to apparatus used in pumping oil or water from deep wells. It consists of a suitably braced right angled lever, which swings on a pivot between stationary posts, and
is connected at the end of its horizontal arm with the pump rod, and at the lower end
motive power
improved cornstalk press.
Edgar P. Davis, James E. Davis, and John Fisk, Crete, Neb.--This is an improved machine for pressing cornstalks, weeds, hay, brush, etc., into until bound, and is so made that one person can be sawing the bundles into lengths while another is passing the bands around them.

IMPROVED PUMP
Michael Cook, West Le Roy Mich.-The object of this invention is to provide an improved means for giving motion to the piston; also for coun-
terbalancing the same, and for readily removing the lower valve of the pump without removing the pump from the well. An advantage of the by the peculiar construction of this pump is, that the displacement of water by the enlarged piston rod reduces the weight of the water resting on the piston.
improved steering piopeller.
Clemens Uller ancl Jasper N. Bennett, Columbus, O.-The object here is to provide, as an auxiliary device for vessels already built, or to be built, an improved propelling and stcering apparatus, by which the vessel may
be propelled to the right or leit, forward or backward, without stopping the engine. The invention consists of a vertical revolving shaft, with horizontal paddles that are submerged in the water and turned alternately into horizontal position by a cam of a sleeve around shaft, said sleceve being adjusted by a steering lever, in connection with a disk and ratchet device.
improved folding boat.
John H. Bates, Nanticoke, Pa.-This consists in the arrangement in a
boat of a folding bottom, folding ribs and flexible sides, and a removable boat of a folding bottom, folding ribs, and flexible sides, and a removable
rail, seat, and oar lock. A covering of canvas, or other flexible waterproo material, is attached to the boat bottom by means of nails, and is secured to the rails at the top of the boat by straps which are engaged by buttons that project from the rails and from the posts at the bow and stern. The boat thus constructed is light and strong, and is capable of being quickly taken apart or put together, and when taken apart it may be folded to gether and packed in small compass
improved steam road wagon
George W.Wade, Clam Lake, Mich.-The track wheels are made large and with wide flanges upon the innersides of their rims, to serve as tracks for the small driving wheels to run upon, so that the machine may lay its own
track as it advances. A power is applied to the axle, the driving wheels roll forward upon the flanges of the track whecls, and are all the time rolling up a slight inclined plane. Should the track wheels, or either of them, strike an obstruction, they will stop, while the driving wheels will roll up
a steeper inclined plane until the center of gravity has passed the point of resistance, when the track wheels will gently tilt over the obstruction, and the wagon will pass on without jar.
improved combined nozzle and sprinkler Neil Malmquist, Brooklyn, N. Y., assignor to himself and John Loyd,
New York city.-This invention consists in a sprinkler provided with a short tube in its face directly opposite its screw socket, and having its outer end covered with a perforated cap, with a tube in its side, having the outer end closed. A small marble is placed within to adapt the device for throwing water in a solid stream or a shower.

## NEW AGRICULTURAL INVENTIONS

IMPROVED PLOW.
James F. Wilson and Richard I. Wilson, Calhoun, Ga.-The wings o this plow are so constructed that they may be raised out of, and lowered into, working position separately or both together, as may be desired
They also may be adjusted to prevent small plants from being covered or injured by having soil thrown upon them.
improved corn planter.
Robert Fox, Decrfield, Iowa.-This relates to improvements in corn by turning which the plows are raised or lowered.
improved plow.
Charles Atkinson, Monterey, Ill.-This is an improved plow for opening trenches and subsoiling. It is so constructed as to clear itself in opening trenches, and may be readily adjusted to work at any desired depth in the ground.

## improved ditching machine.

James R. Slaton and John M. Wadlington, Morganfield, Ky.-This is a improved machine for opening ditches of any desired depth and width. I
may also be used with advantage for grading roads, and for various othe purposes where soil is to be moved. The scraper may be raised or purposes where soil is to be moved. The scraper may be raised or
lowered by the advance of the machine, according as a lever is operated.

Devices are provided to lock the scraper in place and hold it down to its
work in operating upon hard soil. There is an upper carrier designed for work in operating upon hard soil. There is an upper carrier designed for
use in opening deep ditches to prevent the soil, and especially clods and lumps, from sliding or rolling back. As the soil reaches the upper end of the carrier it passes into an inclined spout, by which it is conducted to the side of the ditch. The spout may be inclined in either direction to deposit the soil upon either side of the ditch, as may be desired.

## IMPROVED CHURN DASHER.

John L. Maxwell, Bentonville, Ark.-By suitable construction, as the dasher is raised, the tendency is to form a vacuum beneath it. This open
the valve and draws air into the cavity of the handle and the cavity of th the valve and draws air into the cavity of the hande and the dasher is forced downward the valve is closed, and the air
dasher is forced into and through the milk. This introduction of air, and the peculiar form of the dasher, throws the milk into violent agitation and brings the butter quickly.

## IMPROVED DITCHER.

Wilbur R. Peet, Viola, Iowa.--With the bottom cutter is connected a to turn only at some distance from the knives, and thus prevent any strain
the surfer and that might arise from tearing the slice. A turning board is arranged, cut and fitting diagonally across the face of the rest, and rising on a gradual lateral slant to and above the bars, so that when the furrow slice rises above
the bars it will be thrown over and reversed from its natural position, and not merely turned on end over and reversed from its natural position, and nels to allow the moisture to drip back into the furrow.
improved swinging gate.
William A. Ohaver, Monmouth, Ill.-To the shorter end section of the
gate is attached a balancing block, which facilitates the swinging of the gate is attached a balancing block, which facilitates the swinging of the gate into open or closed position, but which docs not entirely balance the longer section, so that the latter is slightly heavier than the block and
shorter section, for bearing, by its outer and lower end, either on a notched block when closed, or on the ground when opened, for being retained in either position without propping or holding.

IMPROVED PLOW
William Clore, Rising Sun, Ind.-This invention consists in so construct ng and connecting the share, land side, and colter of a plow, that a close and firm joint

## IMPROVED PLOW

John M. Looker, Abilene, Kan.-This plow may be readily adjasted for
the different kinds of plowing, and to take and leave land. The invention consists in a plow provided with an arrow-head point having its landside wing projecting beyond the line of the landside of said plow; and in the share formed solid with the arrow-head point, made nearly flat, and having
the outer part of its forward edge curved forward.

## improved farm gate.

Orlando F. Fuller, Lamont, Mich.-This is an improved farm gate that may be conveniently adjusted at suitable distance above the ground, to
clear the snow in winter, and admit the passage of smaller animals. It is lso self-closing by its own weight

## mpioved hop dryer.

Charles A. Sands, Burlington, Kan.-This invention consists of a hop drying apparatus, consisting of a centrally pivoted box that takes the place of the drying floor. The box has a op angs in the walls of the upper and
hinged end doors that connect with openings lower stories, for charging and discharging the hops to and from the dryer.
The end doors of the drying box are provided with transverse rubber The end doors of the drying box are provided with transverse rubber
cushions or strips for closing the space between the walls and the box cushions or strips for closing the space between the walls and the box
when said doors are in a horizontal position, and thereby compelling the heat to pass through the drying box.
improved hay raker and loader.
John S. Hewitt, Wheatland, Mo.--This is a machine that may be attached
to the side of a wagon, which will gather the hay from the ground and deliver it to the hay rack carried by the wagon. As the wagon is drawn forward the machine is set in operation by the rotation of a wheel. The forward motion of the machine gathers the hay on the teeth of the rake.
An endless apron elevates the hay and delivers it to another apron, which carries it laterally to the rack of the wagon.
improved self-rake for harvesters
Isaac N. Cherry and Robert N. Cherry, Jersey city, N. J.-The object here is to provide a rake for harvesters that will deliver the gavels at the
rear of the machine in compact form for binding. The reciprocating morear of the machine in compact form for binding. The reciprocating motion of the ratchet bars, the teeth of which move the grain along the plat
form, is continuous, and when a sufficient quantity of grain is carricd into form, is continuous, and when a sufficicent quantity of grain is carried into
the fingers of the delivering apparatus, they first close down on the gavel and then are drawn backward. When the gavel is drawn from the platform the fingers fold down and allow it to pass, but afterward spring up and pre vent the escape of loose grain. The entirc mechanism is exceedingly in genious.

## NEW HOUSEHOLD INVENTIONS.

improved nignt lamp.
Harry W. Huntington, Williamsburgh, N. Y.-This lamp is provide with a very small wick tube, and is intended for burning through the night and by the arrangement of the wick tube the flame is located ata distance
above the oil, so that the oil is not heated and gas is not generated, and, consequently, danger is avoided. By the use of a chimney of suitable length and more complicated burners.

## improved spittoon

Picrre Célestin Ste. Marie, Montreal, Canada.-This spittoon is composed of two parts, so constructed and fitted together that when the spittoon i
overturned its contents are received bytheupper part thereof, thereby pre overturned its contents are received by the upper part thereof, thereby pre-
venting soiling of the floor or carpet. The spittoon is supported upo venting soiling of the floor or carpet. The spittoon is supported upon
casters, whose stems or pivots are fitted in sockets formed in ornamented casters, whose stems or pivots are itted in sockets formed
bases or enlargements of the base rim of the spittoon.
improved combined desk, washstand, and blacking
Alexander O. Kirkwood, Yonkers, N. Y.-This consists in the combina ion, in a single piece of furniture, of a desk having a convenient recepta cle for books and papers, a washstand having a convenient reservoir for
water, a stationary bowl, an adjustable mirror, and a closet for towels, etc. and also a towel rack and a blacking case, which contains a folding res for the foot and a place for the blacking and brush.

IMPROVED SPRING BED BOTTOM.
John H. Palmer, Warren, Pa.-This spring bed bottom is so constructed that the springs may be conveniently adjusted according to the weight they may have to support, that the rails may be braced a gainst the pull of the springs, and that the springs may be kept in proper position whe under pressure. In it, plates are provided with single or double notched
flanges, and made in two parts, with their adjacent ends inclined to cause hem to meet at an angle, in combination with the frame and springs of
hed bottom and couplings, formed of two short rods, are rigidly connected by an arm, in combination with the springs.

## tmproved stove mat.

Christian A. Reimers and John C. Branch, Davenport, Iowa.-The woode ody of the mat is covered with a zinc sheet which is spun over its circula ge. In order to form a raised rim on the zinc a bead is spun, or othe wise formed, on its upper side, near the edge of the mat, and a rod or stout
wire is laid in the groove (on the under side of the zinc) to prevent the bead being indented or flattened by blows or pressure
improved vegetable slicer.
Joseph II. Alfred, Rosbach, Iowa.-This consists of a frame containing pivoted and grated support on which to place articles to be cut, and in series of knives arranged tangentially to a circle described from the pivot
on which they swing, and which pass between the pars of the support. The whole is supported by a frame, to which are attached receptacles fo the articles to be cut, and for the slices cut by the apparatus.
improved knife and fork cleaner.
Albert E. Van Horn, Sebewaing, Mich.-This consists of an inclined couring table with side rims, having a till or receptacle at the lower en
or the scouring powder. A leather strap is stretched on a fork-shaped support for facilitating the cleaning of the forks.
improved door check.
James B. Everest, Yonkers, N. Y.-This consists in a spring of peculia shape made from a single piece of spring wire; the object being to provide
an inexpensive and simple device that may be readily placed under door of every description for holding them in any desired position.

## improved table easel

Christine Fisher, Salisbury, N. C.-This casel is adapted to the use of djusted to have a level top, or to give its top any desired inclination, and to enable paper of any desired length to be used, holding the part being worked upon smoothly and firmly.
improved butter and fruit jar.
Charles A. Sands, Burlington, Kan.-This improvement consists of utter and fruit jar having a bevelled lid seated by an interposed rubbe band lapping over the lid and the recessed edge. The bottom edge of the r has also a circumferential recess with a rubber band extending into the recessed part and lapping over the bottom cdge, to produce, in connection with the top band, protecting cushions.
tMPROVED ARM REST
Philo R. Wago, Reckport, Mo.-This is a novel device to be attached to desk or table for supporting the arm while writing; and it can be adjusted the required height to suit books of different thickness. In working on he sesk, thus making it convenvient to write on the extreme lower edge o the shect. It also can be used with equal adyantage in any position which the writer may assume.

## NEW MISCELLANEOUS INVEN'TIONS.

improved awl.
George P. Harley, Allendale, S. C.-By this invention leather may be itched together with rapidity and facility. It las a recess and hook back of the point, and tapering side channels running from the recess to th point.

## IMPROVED CARD HOLDER.

Henry J. Herbert, London, England, and Edward R. Wilbur, New York解. Wis is an improved device for holding business cards, adapted to be fang upon a wall, and so constructed as to display a carcl. The chic The rear side of the receptacle is provided with a weight or spring, to draw it closed when released, after having been opened.
imploved wilir.
George P. Overin, New York city.-The core is formed of one or more the rattan sections have not been used with the enameled surface, as th pith only has been employed; but, by this method, the natural strength
and elasticity of the outer or enameled surface are retained and utilized.

## IMPROVED COFY अоок.

John W. Manning, Cambria, N. Y.-This consists in an arrangement of ovable copies, and in an improved method of fastening the same in th ook, which facilitates the operation, so that the copy books may be readily made. The copy slips arc of the same length as two of the pages
of the book, and are folded in the center and placed on the threads an of the book, and are folded in the center and placed on the threads and
wirc. The copy is moved down the page, so as to cover each line as it is wire. The copy is moved down the page, so as to cover each line as it is
written, so that the scholar imitates the copy and cannot follow the line he has previously written.
improved filter rack.
Byron Fenner, Westfield, N. Y.-This consists of a filter rack made of spirally coiled wire, attached by top hook and jointed center link with

> IMPROVED FRUIT DRYER

Samuel Myers, Adamsborough, Ind.-This consists in novel means em ployed to pass a current of dry heated air over fruit until it is completely aried, without allowing the air to stand, or that which has been moistened
by contact with fruit on lower shelves to come afterward in contact by contact with fruit on low
with that on the upper shelves.
improved harness saddletree.
James McCormick, Glidden, Iowa.-This invention consists in a saddle ree made iu two parts having lugs formed upon their upper ends, halve oach other, and provided with tecth to mesh into tecth formed non the ceive the screw by which the said parts are firmly locked to $\boldsymbol{c}$ cther. Upo the rear end of the screw is formed a loop to receive the back strap, and which also serves as a handle for ecrewing the said screw in and out. The ree may thus be adjusted to fit the horse's back.
improved manufacture of spectacle temples and
JOINTS
Dormer C. Winans, New Haven, Conn.-According to the method here structed from separate pieces of metal, and soldered together. The object of the patentee is to cheapen and improve the construction of temples an joint pieces by forming them solid together, or in one piece. For details, see patent.
improved talking and crying doll.
William A. Harwood, Brooklyn, N. Y.-The object of this invention is o provide a sound-producing attachment to be applied to the bodi
dolls, which may be blown by the mouth to imitate vocal sounds
mproved ice box attachment for cooling ale, etc James J. Moloney and Isaac S. Schuyler, Brooklyn, N. Y.-This is an ice box provided with a cooling chamber below the ice chamber, and at heisting apparatus is arranged above. There is a detachable extension the tracks upon the outside of the ice box to receive a truck and cask, an a combination of crank shaft and rope for moving the trucks upon the tracks.

## कusimgs and exersomal.

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bridge, Mass.

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eolian harp on p. 315, vol. 33.-J. M. McG., Jr., should ead Paddlefast's articles in the Scientific American Supplement.-S. B. W. should read our article on p. 33,
vol. 33 , on the horse power of an enginc.-C. S. S. can calculate the proportions of gear wheels by following , vol. 33, an excellent recipe for paint for outdo work.-C. A. S. should vulcanize his iron castings. See
p. 315, vol. 33. This also answers S. T. B.-A. S. C. p. 315, vol. 33 . This also answers S. T. B.-A. S. C.
will find directions for fastening leather or rubber to metal on p. 101, vol. 34.-H. W. S. will find directions for making printers' rollers on p. 283, vol. 31.-C. S. M.
will find directions for raising mushrooms on p. 129, vol. 34.-R. B. L. will find on p. 360, vol. 34, directions for renovating clothing.-A. T. N. is informed that the galvanic action set up by putting zinc into an iron boiler
is supposed to prevent the formation of scale.-J. W. G $\&$ Co. will find tables of the specific c. .ravity of water in
Box's "Practical Treatise on Heat."-B. B. will find omething on the passage of water through pipes on $p$.
8 , vol 29.-I. P. I. will find directions for making woo incombustible on p. 103, vol 34-J. J. will find a good recipe for liquid blacking on p. 73 , vol. 26 .
(1) A. B. R. and many others: The Spitz og is very closely related to the white or arctic wolf Hammond thinks that the Spitz is a cross between the Pomeranian hound and the arctic fox, and that it is probable that the saliva of the animal is nearly always
poisonous in our climate, and particularly so when the poisonous in our climate, and particularly so when the
dog is at all irritated or excited. It is safe to say that the Spitz dog has never been completely domesticated oo matter how many years have been spent in his ed thick coat of fur, which allows him to be acclimated
only in the arctic regions, whence he has evidently been
rought, an unwilling captive. In appearance, the dog, at maturity, generally averages 26 inches from the tip of his sharply pointed snout to his tail, which is quite bushy,
and in general curls up overhis back. He stands about 12 or 15 inches high. His head much resemblesthe fox in shape; the ears are small, and the entire body is thickly covered with beautifully white, stiff hair, that stands
more or less straight out from the body. This hair more or less straight out from the body. This hair is
very long-in some cases as mnch as three inches-cs pecially around the head, throat, and flanks, and gives the dog the appearance
(2) C. S. V. says: A friend argues that a cow can at will hold up her milk, that she can purposely old it to go dry. Can this be true? A. The secretio within her power to prevent the flow of milk from the udder under ordinary circumstances. It is best that the
animal be relieved of her milk whenever the udder beanimal be relieved of
comes fully distended
(3) E. T. V. asks: What is the law as to the examination of druggists' clerks in New York city?
A. All pharmacists must present satisfactory credentials A. All pharmacists must present satisfactory credentials or certificates of competency and qualifications to the
Board of Pharmacy, when, on payment of a fee of two dollars, and enrolling their names and places of busi from the Board. In order to register, the person must be a graduate in pharmacy, a licentiate in pharmacy, or graduate having a diploma from some legally consting of the caw college or society. Graduates, h had at lea our years' experience in stores where prescriptions o medical practitioners have been compounded, and who United States, or from some authorized foreign institu tion or Examining Board. Licentiates are those wlo have had at least four years' experience in stores, etc., Examining Board or Board of Pharmacy. Applican or examination must pay a fee of five dollars to the oard, and pass examination before receiving a certin-
cate. Persons failing to comply with the law are subject to a heavy fine.
(4) H. W. S. says: We use wood baskets or throwing charcoal on forge fires, and they are thu cheap preparation can we use as a coating to protect cheap preparation can we use as a coating to protect
them? hot water, or one of waterglass. The tungstate costs
about 25 cents per lb. The fireproof asbestos paint is, ve believe, a waterglass mixture of the asbestos powde
(5) T. McC. asks: 1. Is it possible to mix benzine and water? A. No. 2. Is it possible to mix lin
ced oil and water? A. No; but the oil may be saponi seed oil and water? A. No; but the oil may be saponi-
fied by heating with an alkali, and the soap so formed dissolved in water. 3. Is there anything that will dis cid. 4 Is there anything that, if put on rosin, will d troy it? A roof that is newly tinned has streaks ging the paint. A. We do not know of anything of the kind. Rosin is quite soluble in turpentine, benzine, naphtha, etc. 5. What is the quickest dryer for dis-
temper color? A. See answer to C. D. R., p. 300, vol. 36 . (6) C. H. W. asks: What is there about concentrated lye to cause an explosion? A short time
since a lady near Crawfordsville, Ind., was making soap nd was using concentrated lye; she had put a box of ly ook it in her hands, and it exploded (there being a small uantity left in the can), injuring her hand very much. She has since taken lockjaw from the injury. A. We are at a loss to explain this strange occurrence. You
evidently have not given us all the facts in the matter. You should have stated what kind of a box containc the lye, and what else was in the boiler at the time. Or
dinarily there is nothing in potash or soda lye that can directly cause an explosion such as you describe.
(7) C., in speaking of an article published in our issue of March 24 on "Light and the Distances
of the Stars," says: I question a problem that finds the of the Stars, says: I question a problem that inds the
distance of stars by the light which comes from them at a rate of 185,000 miles per second without knowing how long the light has been traveling. A. We reply by say
ing there are no such problems, the distances of but very ing there are no such problems, the distances of but very
few of the stars have been or ever can be measured hese are measured by accurately observing their posiion with regard to other stars; and then, six months af round the sun, or, in other words, has moved $185,000,000$ of miles to the right or left of its former position, ob servations are again taken. And if there is no apparen change in the position, then we have no means of determining their distance; but if there should be a sligh hange of position, the same as there is when a perso tances from him, then, knowing the distance we have ances from him, then, knowing the distance we hav may compute the relative distances of the objects. With those which have no apparent displacement, their dissars like the Pleiades; if they are not at a very grea istance from us, then they are quite near to each other, nd as they have no motion to prevent, they would
drawn together by their mutual attraction. Therefore us and from each other, and the apparently small mo tions which they have are velocities which we have no conception of. But whether it takes light thirty year or thirty thousand to reach us makes very little difference, as the distance of either is incomprehensible.
Some persons have asserted that the immensity of space nust be filled with stars, or else the outside ones would But this is not so, for a group of stars may have an bital motion in which the centripetal and centrifugal orces are balanced, in which case it requires no outside ttraction to keep them in position.
(8) S. B. G. asks: Why is it stated in text books that a degree is longer at the pole than at the
equator of the earth? A. It is becanse the length of
any more than a degree on an ellipse is measured from
its center of gravity. It is measured from the its center of gravity. It is measured from the center of is a part; therefore a degree at the equator is measured on a circle of shorter radius than at the pole. The
length of the degree being proportional to the radius of the circle on which it is measured, it will be longest a he pole.
(9) T. H. L. asks: 1. Why is it that some people, who seem to be quite strong in other respects,
ind it so difficult to climb hills, while others, whose physical development seems to be no better, walk up themwithout any apparent difficulty? A.'The only assign-
able cause is an existing difference in the physical pow able cause is an existing difference in the physical pow-
ers-strength of muscle and lung capacity-in compari-srs-strength of muscle and lung capacity-in compari-
son with the total weight. The difference between on with the total weight. The difference between
many people in this respect is often a radical one. 2 . What is the best means that may be used to overcome the difficulty? A. Physical culture in general is the only thing to be observed. Work in the open air and artake in moderation of nutritive food
(10) J. O. M. asks: How is the copper plating deposited on iron? A. It is usually applied by dipping the chemically cleaned iron in a hot bath of soluion of sulphate of copper
(11) D. C. H. says: Some months ago there appeared in a journal of materia medica an article describing a new kind of pottery which was said to stand wonderful fire tests. Can such an article be used in retoring sulphuric acid after the oil refiners have used it . There is no ware of this kind that we know of that would prove of much service for your purpose. See p.
268 (No. 17), vol. 1, of Scientific American Supple-
(12) W. E. B. says, in reply to W. H. B.'s gery as to bisecting a triangle by a line passing through


The following solution is from ing." Let ABC be the given tri-
angle, and $P$ be the given point.
D parallel to
AC and PE par-
allel to $\mathbf{B C .}$ Bisect A C in F
nd join F D. From B draw B G parallel to FD, an bisect GC in H . On HEdescribe a semicircle. On it
set off $\mathrm{E} K=\mathrm{EC}$. Join $\mathrm{K} H$ and set 0 off $\mathrm{H} \mathrm{L}=\mathrm{K} \mathrm{H}$. Then LM, drawn from $L$ through $P$, will be the re quired line bisecting the triangle.
(13) A. C. says, in reply to C. A. C., in ron: We find the best speed to be that which gives circumferential velocity of about 24,000 feet per minute, using a steel disk 42 inches
(14) W. A. M. asks: What is boro-silicate of soda? A. It is a glass or enamel made with bora biborate of soda), soda and silicic acid (sand).
(15) E. W. asks: How can I make a cement quid? A. Fused paraffin is often employed for the purpose, also sealing wax. Sealing wax may be made ccording to the following recipes: Fine red, No. 1 Shellac (bleached), 4 ozs., cautiously melted in a bright copper pan over a clean charcoal fire. When fused add
11/ ozs. Venice turpentine, and 3 ozs. vermilion. No. 2: Shellac 3 lbs., Venice turpentine 19 ozs., finest cinnabar 2 lbs.; mix, and fuse as before. No. 3.-Same as last, but use half the amount of vermilion. Common red:
Resin 4 lbs., shellac 2 lbs., Venice turpentine and red Resin 4 lbs ., shellac $2 \mathrm{lbs}$. , Venice turpentine and red
lead, each, $11 / 2 \mathrm{lbs}$. Bottle wax, No. 1.-Black resin $63 / 4$ lead, each, $11 / \mathrm{lbs}$. Bottle wax, No. 1.-Black resin $6 \% / 4$
bs., beeswax 2 ozs., finely powdered ivory black 1 lb . No. 2.-As last, but substitute Venetian red or red lea cor ivory black. Fine black, No. 1.-Shellac 60 parts Venice turpentine 2 parts. No. 2: Resin 6 parts, shellac and Venice turpentine, each 2 parts. Soft red
Beeswax 8 parts, olive oil 5 parts, Venice turpentine 15 parts, and red lead to color. Green: As last, but substitute powdered verdigris for red lead. The addition of
little camphor makes the wax burn better ottles should be dry, and if was burn be to
(16) J. S. B. and others, who ask about postage stamp mucilage: The government mucilage,
used for postage stamps and envelopes, is said to be made as follows: Gum dextrin 2 parts, acetic acid 1 part, water 5 parts. Dissolve in a hot water bath, and dd 1 part alcohol
(17) H. G. says: I am running a horizontal engine of 4 inch cylinder and 6 inch stroke, with an upnches by ar boiler, the outside measure of lie dificulty in keeping up team I experience considas to whether the trouble lies in the engine, which is a pretty old one and loses steam somewhat, or whether the boiler is too small. What is the nominal horse power of the engine and of the
boiler? A. You might settle the question definitely by measuring the waterevaporated by the boiler, and using a brake at the same time to determine the power exerted by the engine. Any guess we could give from the data ent would be of very little value
(18) R. G. G. asks: Will you please inform ne how a compass is carried on an ironclad vessel,
o that the iron will not have any effect on it? A. It is either put up so high as to be out of the influence of the , or the effect is counteracted by magnet,
(19) J. H. M. says: 1. I have a $1 \frac{1}{2}$ horse power 16 inches in diameter. The boiler has twenty 15 inch ind tubes. Cylinder is $3 \times 4$ inches, pipe from boiler to cylinder is $5 /$, and exhaust pipe $\frac{7}{8}$ inch. Engine when started
frequently throws water up the exhaust pipe; and when frequently throws water up the exhaust pipe; and when
at work it will often throw up a stream of water, which, all day without throwing water. What are the cause all day without throwing water. What are the cause
and the remedy? A. You do not send sufficient particu-
lars to enable us to form a decided opinion. From your
statement, it seems problable that the circula statement, it seems problable that the circulation in the
boiler is not very good, and that the water level is not nt. If this is a correct view dry pipe, such as is used on locomotives. 2. The pump on the engine also troubles me occasionally, unless I loosen the cap of the first supply valve and let in a little
air to start the suction, it will not pump. With a little air to start the suction, it will not pump. With a little
air, it works all right, but causes a leak of water. A. air, it works all right, but causes a leak of water. A.
It may be that the connections are too small for the speed at which it is run.
(20) B. S. asks: What are the advantages cars running on trucks with 4 or 6 wheels vis $\grave{a}$ vis to ne does not think that trucks are an only? A. Every loubtless know; but their advocates consider that larger cars can be used, that will run more steadily, and go
around sharper curves. You will find a good discussion of the subject in the "Catechism of the Locomotive."
(21) W. D. D. says: I have a tank which holds 800 barrels of water, and one 3 inch pipe from
bottom of tank 300 feet long, to fill a street sprinkling bottom of tank 300 feet long, to fill a street sprinkling
wagon tank. The water does not half fill the 3 inch wagon tank. The water does not half fill the 3 inch
pipe. What is the cause? A. It is quite likely that the pipe has high points in which the air collects, and thus
reduces the effective area.
(22) G. W. B. asks: If a gallon bucket be placed 20 feet under water, the top of the bucket be-
ing closed and a $1 / 2$ inch pipe placed in the top and reaching up through the water through which the air may pass out, the bottom of the bucket being open, how long will it take for the bucket to fill with water? How ong will it take for each distance under water for a $3 / 4$ inch pipe? A. The difference of time in the several
cases would vary as the square roots of the depths. There would be no appreciable difference with the two
pipes.
(23) T. H. says: In your reply to W. L.'s query as to why a gun barrel scatters the shot, you said:
Gencrally it is due to the fact that the barrel is not true or is foul, or to the shape of the breech. I have got a rifle and it is an easy matter to hit a nail head in a fence over with 20 shot, as they scatter from 4 te 5 feet from the mark? A. You are confounding two distinct ar-
(24) E. H. says: A. claims that, when a steam fire engine goes to work from a cistern she is
pumping water, and, when the same engine goes to a plug and receivesall the water she wants, that she is only discharging what she receives in her pumps or wells. B. claims that a steam fire engine is pumping water, no
matter how or by what means she gets it. A. There eems to be some confusion of terms in these questions, but we answer according to our understanding of them, that the pump when at the well both draws and forces water, while at the hydrant it only forces.
Why are the front wheels of a wagon so much smaller readily.
(25) L.F. C. asks: Why does the light coming ous from fixed stars appear to twinkle? A. Because ferent strata of the atmosphere, which are not sensible the case of stars that have perceptible disks.
(26) J. H. S. says: 1. I have an engine of 16 nches bore and 36 inches stroke. I am driving the same
t 75 revolutions, with steam 10 lbs. to the inch, cut-off at half stroke. The engine is doing all that it is safe to rive with it, by shaft 8 inches in diameter. Belt is so
large thatit will hold the engine still at any part of the stroke. I wish to drive two engines, each as powerful s the one I now have; and I propose to add one of the same size on the other end of the shaft. The experts here say that I must make the shaft as large again as it
is, and the belt also. I say that both belt and slaft are as large asi is required as they have beaten the full power of the one engine. A. It is possible that you are right; but you cannot know without making an experiment. greatly increased. 2. How long is the expanding steam useful after being cut off? Condensation has nothing to do with this; I take the ground that there is useful effect in steam until it is down to the pressure of the atmosphere, assuming in this case that there is no con10 lbs. of steam to turn it over the if the engine takes 0 lbs. of steam to turn it over the center, that the ex-
pansion is of no use after the pressure has fallen below 10 lbs . I say that there is useful effect in steam as long sit is above the atmosphere, and so long will it give outuseful effect on the piston. A. You have the right
dea, but somewhat too extended. If there is any back pressure, that is the limit of the expansion. 3. Is there any advantage in the engine valves like Corliss' over ordinary valves? Take the common slide valve with a
cut-off on the back of the main valve, the top valve to be worked by the governor so as to cut off the steam at ny part of the stroke. Is this advantageous, and which is the best of the two systems? A. The valve that loses most quickly, and is the most nearly balanced,
will give the best results, other things being equal.
(27) H. T. says: I see in your Supplement an article on compressed air, stating that there is at force 10 cubic feet air intow 1 cubic foot space, would it exert a force of 150 lbs. to the square inch, and would it, less the friction for packing, etc? A. The statement to which you refer gives the reason. The air, instead of being allowed to expand and give back the power re-
guired to compress it, is supposed to be admitted for the whole of the stroke.
(28) J. H. G. says: 1. Iam building an engine $414 \times 41 / 2$ inches, and wish to put it into a boat, with fine
ines, 30 feet long, of 7 feet beam and 30 inches draught. Please give me the probable speed obtainable, the engine using steam at 100 lbs. pressure for $3 / 4$ of the stroke and making 500 revolutions per minute? A. Probable
speed from 9 to 10 miles an hour. 2. What should be the heating surface of boiler and diameter and pitch of the screw? A. Heating surface of boiler, 150 square feet. Propeller, as large as can be submerged, of 3 feet
pitch.
(29) M. T. S. says: I am making a machine cast iron for cutting fruits and vegetables. What ing? A. Paints or varnishes will not answer for this purpose. It is best to have the iron nickel or silve plated.
Iron."
(30) G. C. Q. asks: 1. What volume o water in the state of vapor can be absorbed by a given volume of sulphuric acid before the acid becomes conpletely saturated? A. Strong oil of vitriol will absorb more than twice its volume of water vapor; but as the dilution proceeds, the absorbing power of the acid de nethod by which the acid can be rid of the water it the bsorbed, so thatit is ready to absorb again? A. Th only way is by evaporation with the aid of heat in glass porcelain, or platinum vessels.
(31) G. E. asks: How can I mix paint that ine do for painting steam pipes or the parts of an en nine which are heated by steam? I I use water color it
rubs off; if oil, it turns dark from the heat? A. If you o not wish to use a dark color, mix your paint to a ighter shade than it is permanently to be, and let
(32) J. V. B. says, in reply to D. D., who sks what is the cheapest and best preparation for the water to the 1,000 shingles. This preserves the shingle and renders them to a great extent fireproof. Shingles made from wood of evergreen trees are best.
(33) R. B. R, asks: Is there any instrument in which, as in a reservoir, electricity could be stored o produce motion? If I should employ a windmill to generate electricity by a Gramme machine, could I stor p the electricity until it acquired a certain and suffient tension, and then draw from it as I choose, withou he necessity of using plates, porous cells, carbons, etc. and without danger? A. No. A battery composed of
Leyden jars may be charged with statical electricity, but the quantity of electricity that can be so stored is limited, and it is difficult to retain the charge for any lounth of time. Low tension electricity, such as is used elegraph lines, cannot be stored.
(34) J. F. D. says: Some time ago I made a oltaic pile, which I cannot get to work. I put circular blanks, 4 inches in diameter, thus: Copper, zinc, fabric,
copper, zinc, fabric, etc., punched holes in center of them, and piled them up around a stick. Please tell $m$ hat is necessary to make it work? A. Remove the the disks does not in any way influence the strength of current. Make the cloth the same size as the disks with which it is in contact. It will require several hundred of the couples to produce a sensible spark.
(35) A. B. asks: How can get I rid of lice in poultry? A. Make the roosts perfectly clean with hot soap and water, and afterwards apply spirits of tur-
pentine or kerosene oil. Also strew some sprigs and branches over the floor of the coop. The building hould be kept clean
(36) S. R. S. says: Having read that an en gine has been disabled by putting a bar of soap in the biler was? Did it what the action of the soap in the How can I take grease spots out of fine felt cloth
without injuring the cloth? A. Moisten the spotted arts thoroaghly with pure benzole, and immediatel over them on both sides of the cloth wlth dry pipecla or tripoli powder. Then place under a weight for som time, and the spots will disappear
(37) H. E. L. asks: Is there anything that here is nothing ink stains from drawing paper? A eraser or sanded rubber. Indian ink contains fin?ly divided carbon, which is unaffected by any ordinary sol
(38) J. A. H. asks: What size of wire and how much in length shallI use for magnets for the elec o-magnetic ens des give America ingle Calland cell? If I use 2 cells, how shall I connect em? What is the rule for estimating the resistance of batteries and of magnets and other wire connection says, in describing the engine above referred to: "No 31 wire is the best size for magnets;" you say, in an wer to a subsequent inquiry on the same subject, "us battery the greatest magnetic effect is obtained whe the resistances of the battery and magnetizing helix ar equal. The average resistance of a mediam size Cal and cell in good condition is about 1.5 ohms, conse quently the resistance of the helix should be the sam ccording to the above statement, and this is equivalen 5 about 350 feet of No. 18 or 90 feet of No. 23 pure cop er wirr. Win and fewer convo
(a))
(39) H., I., \& Co. ask: Does the putting of the iron? A. The lye will have little effect on the iron, but may cause the water to foam.
(40) C. R. asks: How can the lambskin prons used by freemasons be cleaned? I used be nd yellow. A. Have you tried soap and water? It yellow. A. Have you tried soap and water? It ool if used in excess. Bisulphide of carbon is amon the best solvents for oil and grease, and will perhap
 aphtha. If too little of the solvent is used, it will only arry the stain from the surface further into the mate al. It should be observed that all of these oil solvent tend to destroy the pliability of the leather and necess tate its re-priming or oiling after drying

Minerals, etc.-Specimens have been re eived from the following correspondents, and examined, with the result stated:
D. M. B.-It is a coarse sand formed by the disintegra
fying glass, or low power microscope, you will find it
composed of films of mica, orthoclase, and quartz crys als. It contains some iron oxide and pyrites.-N. B. B. They appear to be all carbonate of lime crystals-cal-
ite. The varieties of calcite are very numerous and di verse in their diaphaneity are very numerous and a color, the variation being due to the different modes of rigin and impurities.-W. R. L.-It is graphite or plumago, mixed with clay.-E. D. R.- We have not been ble to classify the shells, as they were very much broken and imperfect.-M. M. B.-It is a hematitic iro re, containing crystals of iron pyrites. See p. 7, vol. 30 ropic form of carbon, sometimes called plumbago and black lead. It is found associated with sphene, tabular par in granular limestones, with pyroxene,spinel, chron in some iron ores. It is used for lead pencils, in black lead crucibles, and as a substitute for oil in lubricating machinery; and it constitutes what is known as stove blacking. It is found in many parts of the United tates, and is mined at Ticonderoga and Fishkill, N. Y.,
Brandon, Vt., and in North Carolina. Its marke at Brandon, Vt., and in North
price is from 3 to $61 / 2$ cents per 1 b .

## COMMUNICATIONS RECEIVED

The Editor of the Scientific American acknowledges, with much pleasure, the receipt of original papers and ntributions upon the following subjects: On Flying Machines. By D. J
On Interference Colors. By H. M On Compressed Air. By F. G. W. On a Snake-Eating Frog. By C. F. S
On a Needed Invention. By J. E. E. On Microscopy. By P. On the Flight of Birds. By J. H. H.

## HINTS TO CORRESPONDENTS.

 Correspondents whose inquiries fail to appear should that, for good reasons, the Editor declines them. Th address of the writer should always be given. Inquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be publishe here. All such questions, when initials only are give re thrown into the waste basket, as it would fill half o ur paper to print them all; but we generally take pleas is given.Hundreds of inquiries analogous to the following re sent: "Who sells hydraulic rams, and where ca circulars descriptive of them be obtained? Who make teel wire, suitable for spiral springs, to be wound cold ho sells sal soda and soda ash? Who buys bones, an what are they worth? Who sells machines for setting
pins in rubber cloth, for making metallic hair brushes? All such personal inquiries are printed, as will be ob served, in the column of "Business and Persunal," which is specially set apart for that purpose, subjec to the charge mentioned at the head of that column Almost any desired information can in this way be expeditiously obtained.

## official

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## Granted in the Week Ending

April 24, 1877
AND EACH BEARING THAT DATE.
[Those marked (r) are reissued patents.]
A complete copy of any patent in the annexed lis urnished from this office for one dollar. In orderin ene lease state the number and date of the patent desire
nd remit to Munn \& Co., 37 Park Row, New York city. Air, cooling, etc., M. J. Kelly (r) Anvil, cast iron, C. Fisher
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