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A WEEELLY JOURNAL 0F PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.


THE GATLING GUN FOR POLICE PATROL SERVICE. The latest model of the Gatling gun, shown in the accompanying illustration, has been given the name of the "Police gun," from its admirable adaptation for police or mounted service, for guarding railway trains, banks, or safe deposit institutions, or for use on vessels, yachts or boats. Its weight is but 74 pounds, so that it can be carried if necessary by a single man, or, with all accessories for the field, on a single animal. It has six barrels, and the feed is positive, enabling it to be fired at the rate of 800 shots per minute at all angles of elevation and depression. When set up in the back part of a patrol wagon, and served by two or three men, it is designed to do more effective work in dealing with a mob or in dispersing rioters than could beaccomplished by a whole company of infantry. In the patrol wagon is also carried a supply of ammunition, and a tripod on which the gun may be mounted for service out of the wagon.
This latest type of a rapid firing weapon retains the individuality of the Gatling gun, its revolving locks and barrels enabling perfect continuity of loading and firing, and giving it great power of rapid and prolonged action. The locks and barrels all revolving together, and the barrels being discharged one at a time as they rotate, there is absolutely no trouble from heating. The Gatling gun has been subjected to the most severe tests by the government officials, and many guns of this type are now in use in the navy, where it is considered a very powerful weapon for repelling attacks matter how long the firing is continued, the barrels do not become heated or fouled so as to be unfitted for use, or the firing mechanism deranged.
An electric firing mechanism for the Gatling gun
was not long since tested under the direction and inspection of officials of the United States navy department. The electrical apparatus was attached to the barrel of the gun so as to move with it, while it was so disposed of as not to interfere with the elevation or depression of the gun. By the use of the electrical apparatus the gun is fired automatically at a rate of speed, for a piece of ten barrels, of 1,500 discharges per minute and upward. If the electrical apparatus becomes disabled, or its connections are severed, a handle can be connected in a few seconds, by which the gun may operated by hand, as shown in the picture, the en-barrel gun being capable of discharging 1,200 Imots per minute when operated by hand.
Improvements calculated to add to the efficiency of the Gatling gun in every field have for years been the special study of Dr. R. J. Gatling, the inventor of this well known type of machine guns. The manufacture
of the gun in its various styles is carried on by the Gatling Gun Cor

## Ancient Ruing in Arrica

At a recent meeting of the Royal Geographical Society, Mr. Theodore Bent read before a large audience a paper on his recent exploration among the Zimbabwe and other ruins. The paper, Nature says, was one of great interest. Mr. Bent said that, with his wife and Mr. Robert Swan, he went to Mashonaland primarily to examine the ruins of the Great Zimbabwe. These ruins, so named to distinguish them from the numerous minor Zimbabwes scattered over the country, were situated in south latitude $20^{\circ} 16^{\prime} 30^{\prime \prime}$ and east longitude $31^{\circ} 10^{\prime} 10^{\prime \prime}$, at an elevation of 3,300 feet above the sea level, and formed the capital of a long series of such $\left|\begin{array}{l}\text { level, and formed the capital of a long series of such } \\ \text { ruins stretching up the whole length of the west side }\end{array}\right|$
of the Sabæ River. They covered a vast area of ground, and consisted of the large circular building on a gentle rise with a network of inferior buildings extending into the valley below, and the labyrinthine fortress on the hill, about 400 feet above, naturally protected by huge granite bowlders, and a precipice unning round a considerable portion of it. Mr. Bent ave a minute description of the ruins, drawing atention to evidence that their ancient inhabitants must have been given to the grosser forms of native worship. Perhaps the most interesting of their finds in one portion were those in connection with the manufacture of gold. Mr. Bent held that the ruins and the things in them were not in any way connected with any known African race; the objects of art and the special cult were foreign to the country altogether, where the only recognized form of religion was, and had been since the days when the early Portuguese explorers penetrated into it and El Masoudi wrote, that of ancestor worship. It was also obvious that the ruins formed a garrison for the protection of a goldproducing race in remote antiquity. So we must look around for such a race outside the limits of Africa, and it was in Arabia that we found the object of our search. All ancient authorities speak of Arabian gold in terms of extravagant praise. Little, if any, gold came from Arabia itself; and here in Africa gold was produced in large quantities, both from alluvial and quartz, from the remotest ages. A cult practiced in Arabia in early times was also practiced here; hence there was little room for doubt that the builders and workers of the Great Zimbabwe came from the Arabian peninsula. He had no hesitation in assigning this nterprise to Arabian origin, and to a pre-Mohammedan period


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## ACETATE OF SODA WARMERS AND CAUSTIC SODA steam bollers.

In France acetate of soda has received an extensive application by railroad companies for the purpose of supplying foot warmers. The principle on which it operates and even its true functions are not generally understood.
Sodium acetate is used in the class of foot warmer and similar devices as a factor in the storage of heat. If a brick is warmed in an oven, it represents a source of heat which will supply a greater or less quantity in proportion to the degree of heat which has been imparted to it. A bottle of hot water is of the same cate gory. The weight of the substance heated, its tem perature, and its specific heat determine the quantity of heat which is absorbed and will be given out
In sodium acetate a fourth element enters into the problem. It is a solid crystalline salt, having three molecules of water of crystallization. It possesses the property of dissolving at a boiling temperature in one part by weight of water. If allowed to cool, most of it crystallizes out, leaving about one-third still in solution in the mother liquor. If the apparently dry salt is heated, it liquefies in its water of crystallization, what is practically a fusion of the salt resulting. If kept in this state of fusion in an open vessel, the water gradu ally evaporates and the salt becomes anhydrous.
The melting of the crystals occurs at a comparatively low temperature. The fusion begins at $136^{\circ}$ F., and at $167^{\circ} \mathrm{F}$. is complete. As this fusion involves the conver sion of a body from the solid into the liquid state, a large number of heat units are absorbed in the process in other words, a large quantity of heat is rendered latent. This heat is given off during the solidification of the material.
The method for its use consists in packing cases of purposes, as desired, with the salt. These cases should be closed. Placed for a short time in boiling water, the temperature of liquefaction is soon attained, and the salt remains practically at that temperature until melted. The action, though not so definite as regards the point of fusion, is identical with that of the water of melting ice, which cannot pass $32^{\circ} \mathrm{F}$. as long as any solid ice remains. The case of melted acetate is now charged with latent as well as sensible heat. In use the salt gradually solidifies, but as it does this maintains its temperature of fusion approximately until it is solid. Then the loss of sensible heat begins and it rapidly cools.
The last described action is again comparable to that of water freezing. As long as liquid water remains in a vessel the temperature, except under special condi tions, cannot fall below $32^{\circ} \mathrm{F}$. In the case of sodium acetate, the temperature cannot go much below $136^{2}$ F. until the whole mass is solidified.

When a brick or a metallic slab is used for a foo warmer, the low specific heat of the material renders it ineffective in proportion to its weight. Hot water, on the other hand, is effective, because of its high specific heat, but is too bulky. The sodium acetate seems to avoid both difficulties.
This use of the above salt must not be confounded with the application of caustic soda or sodium hydrate for the generation of steam. In the latter application a direct chemical act of combination is utilized. Wate has a strong affinity for sodium hydrate, and unites with
it with the production of heat. A parallel case is seen in the uniting of water with quicklime, the heat pro duced in which operation is familiar to all. The "caustic soda boiler" as it is termed has melted caustic soda surrounding its water chamber. This is neces sarily hot when introduced, so that steam is at first generated by the sensible heat. The exhaust steam from the engine is blown into the caustic soda. This, by its combination with the sodium hydrate, generates additional heat. The process goes on until the causti soda solution becomes so weakened by the water absorbed that it ceases to respond enough to be effect ive in maintaining the steam pressure in the boiler.
The caustic soda boiler has been successfully tried in the form of locomotives for tramways, tunnels, and in a submarine torpedo boat. It is evident that its ad it peculiarly adapted. for such purposes. Up to th present time it has been used very little.

## Great Bodies of Fresh water.

Geographers claim that there are twenty-five rivers on he globe which have a total length each of over 1,000 miles. Of these, two, the Mississippi from the source of the Missouri in the Rocky Mountains to the Ead jetties, and the Amazon from the source of the Ben to the isle of Marajo, are over 4,000 miles in length To be exact, the former is 4,300 and the latter 4,029 miles from the source to the places where their water are mingled with those of the ocean. Four claim total length of over 3,000 and under 4,000 . They are th Yenisei in Asia, length 3,580; the Kiang, Asia, length 3,900 ; the Nile, Africa, 3,240 ; and the Hoang-ho, Asia, which is 3,040 miles. Seven streams on the globe are
under 3,000 and over 2,000 miles in length, the Volga in Russia and the Amoor in Asia each being 2,500 miles in
length; two are 2,800 miles long, the Mackenzie in British America and the Platte in South America The Rio Bravo in North America, the Rio Madeira in South America, and the Niger in Africa are each 2,350 miles from end to end. The Arkansas River just comes inside of this 2,000 mile limit. Ten of the great rivers of the world are over 1,000 and under 2,000 miles in length. Three of these are in North America, the Re River 1,520 , Ohio 1,480, and the St. Lawrence 1,450 South America has also three in this list, the Rio Negro 1,650 , Orinoco 1,600 , and the Uruguay 1,100 miles. Asia has three in the same list, the Euphrates 1,900 miles and the Tigris and Ganges, each of which is abou 1,300 miles. In the group of great rivers, the St. Law rence is the most remarkable. It constitutes by far the largest body of fresh water in the world. If we include the great lakes and tributary rivers, with the St Lawrence system, as they cover about 73,000 square miles, the aggregate represents not less than 9,000 solid miles of water. The unthinkable size of this mass may be better comprehended when we consider the figure f Professor Cyrus C. Dinwidde, who says that it would take over forty years for this entire mass to pour ove Niagara at the computed rate of $1,000,000$ cubic feet per second.

## Indigo.

The chief source of natural indigo is the various spe ies of Indigofera, especially Indigofera tinctoria which are cultivated in India, China, and South Amer ica. It is also contained in European woad (Isati inctoria) and a few other plants, the cultivation of which for the production of indigo was a flourishing industry from the ninth to the sixteenth century, and urther, one which, thanks to the decrees of the ruling powers in England, France, and Germany, was the ause of delaying the introduction of the "devouring devil's color," as the Indian indigo blue was formerly called. The cultivation of European woad is to-day almost an extinct industry, although up to the commencement of the seventeenth century it was a source of considerable revenue both in France and Germany The color is not contained in the free state in thes plants, but as what is called a glucoside, to which the ame of indican has been given. In this glucoside the indigo is held in combination with a kind of suga -glucose-which former undergoes decomposition un er certain well defined conditions with the separation of indigo blue. It is the Indigofera plants of India China, and South America, especially the first of these from which the color is now prepared. The method f its preparation is very simple, although considerable attention is paid to the treatment of the soil previous to the planting of the seeds. Ten to fourteen day uffice for the first appearance of the shoots above the soil, after which they continue to grow rapidly. Shortly before flowering, or about three months after sowing he plants are cut off close to the ground, and are then ready for extracting the color. After cropping the plants are again allowed to grow until they are suffi ciently mature to admit of a second cutting. Occa sionally a third and even a fourth crop is made, but each of these contains successively less and less of the ndican. The cut plants are at once placed in large tone cisterns or fermenting vats, called "steepers," where they are covered with water, and kept in posi tion by means of boards and heavy stones.

## overeating vs. Overwork.

An abuse that tends to the injury of brain workers excessive eating. A writer in the Medical Mir ror recalls to mind several active brain workers who suddenly broke down, and fancied that it was due to brain fatigue, when, as a matter of fact, it was due to verstuffing of their stomachs. The furnace connect ed with mental machinery became clogged up with ashes and carbon in various shapes and forms, and as result disease came, and before the cases were fully appreciated, a demoralized condition of the nervou systems was manifested, and they laid the flatterin unction to their souls that they had indulged in menta verwork. Hard work, mental or physical, rarely ever kills. If a mild amount of physical exercise be taken and a judicious amount of food be furnished, the bow els kept open in the proper manner, the surface pro tected with proper clothing, and the individual culti vates a philosophical nature and absolutely resolves to permit nothing to annoy or fret him, the chances are hat he can do an almost unlimited amount of work for an indefinite length of time, bearing in mind al ways that when weariness comes, he must rest, and not take stimulants and work upon false capital. The ired, worn-out slave should not be scourged to additional labor. Under such stimulus, the slave may do the task, but he soon becomes crippled and unfit for work. The secret of successful work lies in the direc tion of selecting good, nutritious, digestible food, tak en in proper quantities, the adopting of regular methods of work, the rule of resting when pronounc ed fatigue presents itself, determining absolutely no to permit friction, worry, or fretting to enter into his life, and the cultivation of the Christian graces, charity, patience, and philosophy.

Mr. Christie, the Astronomer Royal, informed the epresentative of the London Globe that this is the largest spot yet photographed at the Greenwich Observatory (where the sun has been regularly and systematically photographed since 1873), and that the greatest attention has been paid to it, with a view to clear up, as far as possible, moot points with regard to the cause, periodicity, and, perhaps, even more particularly, the magnetic disturbance which these spots bring about on this earth. Some excellent photographs have been secured, but, unfortunately, on several days the sun was obscured, and until photographs are received from India or Mauritius the investigation cannot be regarded as complete. However, the information which Mr. Christie has obtained is of the greatest interest and value. In the first place, the spot is found to be composed of two nuclei, very black, surrounded, to be composed of two nuclei, very black, surrounded,
as usual, by a penumbra, or fringe, and with several smaller,nuclei connected with it. Occupying as it does an area of about $\frac{12}{8 \cdot 0}$ of the face of the sun as we see it, the "spot"-still to speak of it in the singular number-is plainly shown on the negatives taken at the observatory; photographic plates ten inches square being used, and the solar disk being eightinchesin diameter. Without, therefore, the aid of a magnifying glass the unusual size and importance of the spot are at once evident. But it is when the negative is placed under the microscope and accurately measured that the details of its size become more striking, for it is found that, while its greatest length is about 100,000 miles, and its greatest breadth 60,000 miles, the whole group extends over 150,000 miles.
Asked as to what was the cause of these spots, Mr. Christie said that there had been several theories framed to account for the phenomenon, but none that were entirely satisfactory. There were those, for instance, of Faye, Secchi, and Lockyer. The theory of the last named was that the spots are caused by a bombardment of meteoric matter falling into the sun, and causing a great "splash." The nucleus, as the dark part is called, is cold, and is at a lower level than the general surface of the sun; while around the spot are generally seen what are called faculx, part of the sun's surface which are raised up. Often by means of the spectroscope can be traced moving masses of molten matter surging round and over the nucleus. The apparent movement of the spot across the face of the sun the so-called spot with it. On these points Mr. Christie was careful to state that all is conjecture; and he pointed out, as an objection to Mr. Lockyer's theory, that while the spots never appear far from the sun's center, the nearer the spot is to the solar equator the faster it appears to move; a spot at the extreme limit from the equator taking two days longer to complete the circuit than one near to it. What he was able to speak more positively upon from the records at the observatory was the characteristics of the spots as they have been observed. In this connection a very valua ble series of diagramshave been prepared by Mr. Ellis, both from the observations? since 1873 and from the records prior to that year, showing not only that the magnetic disturbances have been coincident with the appearance of the spots, but that the intensity of the disturbance has been in exact ratio with the size of the
spot. They further show that the "spottiness" of the sun reaches its maximum every eleven years, dying gradually down to its minimum of absolute freedom from spots, and as gradually increasing. There was, for instance, a minimum in 1878 and a maximum at the end of 1882 or the beginning of 1883. Then, again, there was a minimum in 1889, since which year th number and frequency of the spots has been increasing It is a notable fact that when there are the fewest spot they come near the equator, but when a fresh cycle be gins the spots appear in higher latitudes-about $35^{\circ}$ or so from the equator, though never appearing at a greater distance than $40^{\circ}$

These are the solar phenomena in connection with the spots. The terrestrial magnetic phendmena are equally striking, the magnetic storms or disturbances being of great extent-amounting to several degrees in the deviation of the compass. In the present instance soon after the spot had passed the central meridian there was a great magnetic disturbance from noon on
Saturday to noon on Sunday, and that was accompanied by aurora on Saturday night. During this period both the movement of the needle to the north and its attraction to the earth showed a great disturb-
ance. This has been fixed by the recording instruments at Greenwich, which work in this way. In the point of the magnetized needle is a small mirror, which reflects light upon sensitized paper. Ordinarily, therefore, there is on the paper, which revolves on a drum, a continuous line, which shows that the needle has been quiescent. But when the magnetic disturbance of
Saturday set in, instead of a straight line there was recorded a series of zigzag lines, showing that the needle was darting from one side to the other to such an extent as to get off the paper-some four or five inches in width-on both sides, many times, and exactly the
same results were found in the register of currents pass-
ing through the earth. The matter of interest now, said Mr. Christie, is to discuss what is the connection between the sun spots and these extraordinary mag-
netic disturbances. There are now three or four marked cases on record of large spots on the sun being coin cident with these disturbances on the scale experienced during the past few days; but while there are no cases of a large spot being seen without magnetic disturbances being felt, there are cases in which the latte have been experienced without sun spots being visible This might be urged as upsetting the theory; but we only see what is going on on one side of the sun, and it is very possible the spot was "on the other side;" so that the absence of a visible spot cannot be held to turbance.

## The Screw Propeller

In these days of high art in using steam power it is interesting to call to mind the day of small things, within the memory of thousands of people now living. I find a few notes on this subject in an unexpected quarter, namely, in Bishop Heber's travels in India which he made tediously by sail on the sea, by oar, setting pole, and sail on the rivers, and, on land, by palanquin, horse, and elephant, through sections now long traversed by railroads. His notes are the more in teresting, because he was a good man and a keen ob server-" a godly gentleman and a great lover of learn
ing," as was said of John Harvard, the founder of Har ing," as was said of John Harvard, the founder of Harescaped the ky one of his contemporares. He visited the King of Oude in 1824, and the king talked about steam vessels, speaking particularly of a new way of propelling ships by a spiral wheel at the bottom of the vessel, which an English engineer in his pay had invented; and in a letter dated at Calcutta on Decem ber 14, 1825, he says the steamboat long promised from England, the Enterprise, is at length arrived, after passage of nearly four months. Here we have an acpropeller, made by an East India king living away up in the interior; and of the first steamer by the Cape of Good Hope to India.
The late John Ericsson, whose remains were not long ago borne to his native Sweden by a United States ship of war, in consideration of his invaluable service in the late war, was the man of all others to persevere in making the screw propeller a power throughout the world. Previous to 1839 Ericsson tried unsuccessfully to introduce it in England, and came to the United States. In 1840 the English woke up, and the propeller came rapidly into use in England. In 1841 the Prince ton was built by our own government, and was the first vessel with a screw propeller in this country. - The introduction of the propeller was slow for ten or fifteen years, but now for more than fifteen years it has been the only mode of propulsion used on sea-going steam essels and tug boats. There is no more animating and impressive sight in busy harbors and on busy river than to see the lively tug boats darting about, towing the largest ships with ease; and it is hard to realize
that even in Boston i.arbor, for instance, there were no that even in Boston iarbor, for instance, there were no efforts of John Ericsson the screw propeller came into general use. Truly, "Peace hath her victories, as well as war. "-The Locomotive.

A Wonderful Star that No Man Has Yet Seen.
The many wonderful discoveries in astronomy re cently made by the aid of photography have seemed to leave the older methods of astronomical investigation ar in the rear. But just now Mr. S. C. Chandler, of Boston, has made what may be called a discovery by the aid of mathematical methods, recalling the achieve ment of Leverrier and Adams in the detection of Nep tune fifty years ago. There is in the northern sky a star known as Algol, which the sharp-sighted Arabs who discovered its variations in light called the demon minutes this star suddenly begins to fade, and con tinues to grow fainter for three or four hours, at the nd of which it has sunk from the second to nearly the ourth magnitude. After remaining thus for a few minutes it begins to brighten, and in the course of
three or four hours more regains its former brilliancy. Within the past few years it has been discovered tha there is a huge dark body revolving around Algol at a distance of some three mision miles, and to this phenomenon the rariations in Algol's light are due. At egular intervals this dark companion star comes int partially eclipses Algol, cutting off, perhaps, five-sixths partially ec
These stars, Algol and its strangenon-luminous com ade, are of great size, Algol itself being more than eleven hundred thousand miles in diameter, while the diameter of the dark body that circles around it is eight hundred and forty thousand miles.
Mr. Chandler, meditating on certain irregularities in the motions of Algol and its companion, suspected tha
they might be due to the presence of another invisible star in their immediate neighborhood. He carefully compared the observations back to the time of Good ricke, more than a hundred years ago, and pursuing a mathematical method similar to that which resulted in the discovery of Neptune through the effect of its attraction on Uranus, he arrived at the conclusion that such another star must actually exist. According to his conclusion this mysterious body is far more ?mas sive than either Algol or its companion, but does not give forth any perceptible ligh $\grave{\text {, }}$, and it forms a center of attraction around which both o $Y$ the other stars re volve in a nearly circular orbit, in a period of one hundred and thirty years. Mr. Chandler's theory seems to fit in well with the observed irregularities of Algol. He remarks, moreover, that there are several other stars known to astronomers to be variable which evidently have one or more dark companions like those of Algol
It is natural to inquire what is the nature of these mysterious dark bodies existing in the neighborhood of bright stars comparable in brilliancy with our own sun, and evidently obeying the same law of gravita tion that prevails in our solar system. The primary distinction between a sun and a planet is that the for mer glows with a brilliant light of its own, while the planet, having been encrusted with a solid and opaque shell, only shines by the reflected light which it re ceives from its sun. The dark companions of Algol may then be regarded as in the planetary condition, at least so far as the question of luminosity is con erned. But they differ widely from any of the planet of our system in their great size as compared with the sun in whose neighborhood they circle. That com panion of Algol, which by its eclipsing effect produces the variation in the light of the star, is not very far inferior in size to its bright comrade, while the greater dark body, whose existence seems to be demonstrated by Mr. Chandler's investigations, greatly exceeds them both in mass. Here, then, if we choose to adopt the idea that this great invisible orb around which Algol revolves is a planet in our sense of the word, we have a evolves is a planet in our sense of tine word, we have a
world which is the center of motion for the sun that world which is the center of motion for the sun that
illuminates it. This is going back to the old preilluminates it. This is going back to the old pre-
Copernican idea of the earth as the center of the solar ystem, having the sun as its satellite. Such a system eems unnatural, if not impossible, because the ordi nary laws of the radiation of heat require that a large body, other things being equal, should cool down from the solar to the planetary condition later than a maller body. But it would seem that in the Algo system, for some reason yet to be discovered, the most massive member of the system has parted with it light and heat far earlier than one of the satellites re volving around it
If it should prove to be true, as Mr. Chandler sug gests, that there are other, and perhaps many other systems similar to that of Algol, then we shall simply have additional evidence of the great variety that ex ists in the arrangements of the stellar universe. There really is no reason why we should take our own solar system as an invariable type to which all the other systems throughout space must correspond. It might be suggested that in the case of such a system as that of Algol, all the bodies belonging to it have long since become extinct through the operation of those laws of cosmical evolution which seem to be manifested in the universe at large as well as in our own planetary system and that through some such cause as a collision one of the minor bodies of the s"stem has again been brought to a luminous condition.
But there is no end of 1 speculation when we try to interpret the wonderful discoveries with which the astronomy of our time is continually surprising the world.-New York אun.

The Magnetic Properties of oxygen.
Commenting on Prof. Dewar's recent experimental verification of the magnetic properties possessed by liquid oxygen, M. Guillaume points out, in L'Industrie Electrique, that if we accept the values found by
Edmond Becquerel for the magnetic constant of oxyEdmond Becquerel for the magnetic constant of oxygen, it ought, when in the iquid state, and in a field of medium strength, to possess a magnetic moment per cubic centimeter one third of that of iron, and a mag netic moment per gramme twice as great as that of iron; so that the strange conclusion is forced upon us that oxygen is the most magnetic of substances. M. Guillaume also points out that liquid oxygen might be made to give a faithful and delicate representation of the distribution of the lines of force in a magnetic field, the liquid being heaped up in the strong places.

Messrs. Escher, Wyss \& Co., Zurich, Switzerland received a first of prize $£ 200$, and Messrs. Ganz \& Co Buda-Pesth, Prof. A. Lupton, Leeds, and Mr. J. Stur geon, Birmingham, England, received second prizes of $£ 150$ each, for projects for hydraulic development, pre pared last summer, for the commission of the Niagara Falls Power Company. It will be remembered that none of the projects presented were approved and accepted in their entirety by the commission.

A SPEAKING TUBE AND EARIPHONE. The accompanying illustrations represent the practical working of an extremely simple improvement in forward in the usual way; but one can likewise hear speaking tubes, the mouth piece being provided with the return message without change of position, the an attached ear piece, whereby messages may be more conveniently received and transmitted. This improvement has been patented by Mr. Frederick Schluchtner, of No. 2661 Atlantic Avenue, Brooklyn, N. Y.
One of the pictures shows the improvement in use in the hallway or vestibule of a house, another representing its employment in a factory, where the different floors are thus held in communication with the office. The mouth piece may be of the usual form, but the tube in front of the whistle has an opening at one side, surrounded by a tube leading into an attached flexible tube, at the end of which is an ear cup. The branch tube leading from the side opening, in front of the


SCHLUCHTNER'S SPEAKING 'TUBE-USE IN A VESTIBULE.j
mouth piece, leads backward at a slight angle from the main tube, and the branch tube is also made tapering, the flexible tube being secured to its smaller end When a person blows into the speaking tube, the air exerts its full force upon the whistle in the usual way,
voice in this case b e ing diverted
into the branch into the branch through the flexible tube to the ear cup, so that a conversation may be carried on without constantly changing the end of the tube from the mouth to the ear, and vice versa. A fork
supports the ear cupwhen the mouth piece is not in use.
This invention has also been patented in Canada, England, France, Belgium, Germany, Austria, Italy, Switzerland, and Spain.

SURFACE CONDENSING TRIPLE EXPANSION MILL ENGINES.
The engines which we illustrate have recently been constructed by Messrs. Hick, Hargreaves \& Co., Soho Ironworks, Bolton, for a cotton mill belonging to the Kampenhofs Aktiebolag, Uddevalla, Sweden, to take the place of a pair of Woolf beam engines supplied by the same makers about thirty-five years ago. We are indebted to Industries for our engraving and the following particulars: The new engines are horizontal, following particulars: The new engines are horizontal,
and of the four-cylinder double-tandem type, the high and one low pressure cylinder working on one crank, and the intermediate and the other low pressure cylinder on the other crank. The high pressure cylinder is fitted with the makers' well known Inglis \& Spencer's Corliss gear, the intermediate pressure cylinder with a piston valve, and the two low pressure cylinders with plain slide valves. All the cylinders are jacketed with steam at boiler pressure, and are lagged with composition and felt, cased with planished steel. The steam on its way from the hish pressure to the intermediate pressure cylinder, and from the latter attached the air, circulating, feed, and jacket drain

pumps, all four being worked by levers of the piston rod of the intermediate pressure cylinder.
The boilers for supplying steam-which are two in number, of the Lancashire type, with a 120 pipe econ omizer-were supplied by the makers of the engine The following are the principal particulars of the plant :

| High-pressure cylinder. | n. |
| :---: | :---: |
| Intermediate-pressure cylind | 20 i |
| Low-pressure cylinders (two) | 21 in . |
| Stroke. | 36 i |
| Steam pressure | 160 |
| Indicated horse power. |  |
| Air pump, single acting. | 12 in . |
| Circulating pump, single acting |  |
| Cooling surface in condenser | 640 sq .8 ft |
| Boilers (two). |  |
| Length of shell.. |  |
| Diameter of shell. | $7 \mathrm{ft}$. |
| Diameter of flues |  |
|  | 250 lb |

Messrs. Hick, Hargreaves \& Co. are well known makers of large high class engines, such as are required for cotton mills for which large power, steady driving and economy are demanded, and have in one year, we are informed, turned out about $25,000 \mathrm{i}$. h. p. of such engines, with the corresponding boilers and mill gearing.

## A GRAIN SCOURIER, POLISHER, AND SEPARATOR.

The illustration represents a machine having an upper fixed and a lowerrevoluble screen between which the grain is fed centrally and passed out peripherally, a suction fan forcing a current of air through the screens, whereby the grain is thoroughly scoured and polished, the screenings and other impurities being at the same time separated from the grain. By means of an inlet chute the grain is passed through a central feed opening in the middle of the upper screen, there being a feed screw arranged upon the vertical shaft in the feed opening to press the grain coming down the chute into and between the two screens. The lower end of the vertical shaft on which the lower screen is mounted is set in a step supported at its ends on springs, whereby the scouring disks will be self-adjustable when the stream of wheat is not regular, hand wheels being provided to enable the miller to adjust the machine while in motion to scour hard or light. The grain is discharged from the peripheries of the screens into an annular receptacle into which extend wings on the under side of the rim of the lower screen, whereby the grain is forced upward on the outer wall of the receptacle, finally passing over the edge upon an inclined flange extending into an annular casing supported on the main frame. The grain is thence discharged upon another inclined flange, and falls through into a discharge channel in which operate wings secured on a spider rotated by the central shaft, the channel having an outlet chute
through which the scoured and cleaned grain is discharged. A suitable suction fan with fan wheel is secured on the vertical shaft centrally in the top of the casing, and the air current through the separating chamber, as shown by the arrows, is regulated by a ring with slotted holes working over similar holes in


RUSSELL'S GRAIN SCOURER AND SEPARATOR.
the outer casing, all the air holes being closed and opened at the same time alike all around the machine The arrangement is such that the grain is subjected to two distinct currents of air, the first passing through the grain while it is being acted on by the screens and the second current passing up through the annular separating chamber. This machine has been in prac
tical use a sufficient time to demonstrate that it runs with comparatively small power to do excellent work, and it is not expensive to build. The invention forms the subject of a patent issued to Mr. George E. Rus sell, deceased, and further information relative thereto


Fig. 1.-AUTOMATON REPRESENTING A JUGGLER PLAYING WITH BALLS.


## Fig. 2.-INTERNAL MECHANISM OF AUTOMATON

may be had of the administrator, Mr. Charles S. Rus sell, care of Hardesty Bros., Columbus, Ohio.

## A CURIOUS AUTOMATON.

The automaton figured herewith has the peculiarity of being actuated by a simple flow of sand, and what renders it still more curious is that the epoch of its manufacture dates back to the first half of the 18th century. This unique piece belongs to Mr. Gaston Tissandier, and we have been enabled to study it in detail upon taking it apart in order to repair it.
The image, clad in an oriental costume of bright colors and seated behind a little table, presents its back to a brick and stone structure of the style of Louis XV., painted white in front, and ornamented with blue and gold fillets. The structure is capped with a slate roof, which is itself crowned with a sort of belvedere. All this is of cardboard, and each ac cessory object, such as the stools to the right and left of the automaton, the sconces with their candles, and the small lamp suspended in the center, is a mas terpiece of patience and exactitude (Fig. 1).
When the automaton is in motion it acts as a juggler. The arms rise alternately or in unison and lift the cups, and, at every motion, expose upon the table, first, to the right, a white ball, which disappears and passes to the left, and then, to the left, a red ball, which passes to the right and disappears. Then two white balls make their appearance upon a new motion of the cups, and these are changed into red ones at the rext motion.
These results are obtained as follows: Let us begin by removing the little belvedere that crowns the whole and then fill the receptacle that we observe in the edifice with fine sand. This done, let us allow the sand to fall by drawing out a small strip of metal which closes the aperture at the bottom of the hopper, F (Fig 2). The sand flows in a continuous stream and causes wheel are fixed six tappets which engage with a toothed wheel are fixed six tappets which engage with a toothed
wheel, J, which thus diminishes the rapidity. This wheel itself, provided at the back with tappets, communicates through the latter a slow and continuous motion to the cylinder, H, which causes the automaton
to act as follows: Opposite the cylinder there are two series of levers of four each, the extremities of which we suppose to be marked $\mathrm{A}, \mathrm{B}, \mathrm{C}, \mathrm{D}$ and $\mathrm{A}^{\prime}, \mathrm{B}^{\prime}, \mathrm{C}^{\prime}, \mathrm{D}$. The two levers, D and $\mathrm{D}^{\prime}$, lift the arms, $L, L$, and the extremity of each of the six others is placed under a small strip of cardboard. Each of these strips is hinged by one of its extremities to the table, the other end, on rising, places itself just beneath the small aperture in the table, $E$. If now we examine the cylinder, $B$, we the table, E. If now we examine the cylinder, B, we
shall see that it is provided with a series of cams, A, B, $\mathbf{C}$ and $\mathbf{A}^{\prime}, \mathbf{B}^{\prime}, \mathbf{C}^{\prime}$, and opposite these, other and smaller ones, D and D'. Each cam, when the cylinder revolves, strikes in turn one of the levers. The larger cams lift the levers and consequently the hinged cards, with the balls of different colors, and keep them lifted for some time, and during this period the smaller cams act upon the levers of the arms that hold the cups. In this way, the balls are in place when the arms rise, and do not disappear, in order to be replaced by others, until the arms have descended. The cams, A and $\mathrm{A}^{\prime}$, cause the red balls to act, and the white balls are raised by the cams, $\mathbf{C}$ and $C^{\prime}$. As for the cams, B and $B^{\prime}$, they act upon strips of cardboard that merely support obturators for the apertures in the table.
Such is the ingenious mechanism of this little work of art, which it would not be impossible to construct from the above data. We again state that all the parts of the mechanism are of cardboard, and, further, that the levers are formed of the very thin wire used in the manufacture of artificial flowers.-La Nature.

## Help for the Russians.

The American steamer Indiana lately sailed from Philadelphia with about 4,000 tons of grain and flour, the generous gift of the citizens of that noble town to the suffering people in Russia. The railroads transported the cargo free, and all who dealt with it, from truckmen and stevedores down to insurance companies, rendered free service. This ship was soon followed by the steamer Missouri, from New York, carrying about 3.000 tons more of meal and flour to the famine-stricken Russians, the generous contributions of Western millers and farmers. The use of the steamer was also given free of charge, by the Atlantic Transport Line. The total contributions to the Russians, so far, reach the sum of about half a million dollars.

## AN IMPROVED LUBRICATOR.

The accompanying illustration represents an improved device designed to deliver oil upon moving mechanism, and especially adapted to be suspended above moving belts to keep them well oiled. It has been patented by Messrs. Albert A. Taylor and William C. Edwards, of Cornwall, N. Y. The lower cylindrical reservoir has drip tubes on its under side, and connected with its opposite side is a yokelike upper reservoir having at the top an inlet opening provided with a removable screw cap, there being eyes near the ends of the upper reservoir to enable the device to be conveniently suspended in any desired position. Within the lower reservoir is a cylindrical valve which extends the entire length of the reservoir and projects from its open end, fitting closely in the packing nut, and its outer end terminating in a head with a milled edge. The valve has openings registering with the ends of the yoke-like reservoir, and it also has perforations registering with the bores of the


## TAYLOR \& EDWARDS' LUBRICATOR.

drip tubes, the slight turning of the valve preventing any oil from passing through the tubes, while it may be so turned as to cut off entirely the supply from the yoke-like reservoir. The valve is preferably adusted by turning it, but it may be made to slide endwise with the same effect, being readily adjustable to nicely regulate the flow of oil.

## AN IMPROVED RAIN WATER CUT-OFF

By means of the cut-off spout shown in the illustration a portion of the water from the roof may be dis charged into the sewer, and, after the first water has been run off, carrying away the accumulated dust, etc. the stream may be readily diverted into the cistern or other reservoir. The improvement has been patented by Mr. Edward A. King, of St. Joseph, Mo. The roof spout leads into a receiving chamber, preferably made in two sections, and provided with a lid or cover, thi


## KING'S CUT-OFF SPOUT

chamber having two outlets in its bottom for the dis charge of water to the cistern or the sewer, while the receiving inlet is low down in one side. All these open ings are surrounded by nipples to facilitate the connection of the pipes with the chamber. A plug or stopper is provided for the closing of either of the bottom outlets, the stem of the plug extending up within conven ient reach when the cover is removed. The first wate from the roof is directed into the sewer by placing the plug in the cistern pipe, and after the roof has been well washed, the plug is changed to the other opening, closing the sewer pipe and leaving the cistern pipe open, so that the clean water will pass into the cistern. The several parts are preferably made of terra cotta or other earthenware, to secure cheapness and durability of construction, and by making the receiving chamber in two parts it can lue more cheaply made and trans ported.

## Tests of Life-line Rockets.

One of the most important tests lately held for firing life-line rockets by life-saving crews to disabled vessel was made at Craney Island, Va., under the super vision of Lieut.-Commander W. T. Burwell. The tes was made in a twenty-mile wind. Four rockets wer tested. Each weighed 150 pounds and was fired with the following results: First, 1,200 feet; second, 1,552 third, 1,750; fourth, 2,218. The time of flight of the first two was seven seconds each; third, eight seconds fourth, ten seconds.

## sulphonal.

In a lecture delivered at the Congress of German Neurologists in Baden, June, 1891, Dr. Gilbert, of Baden Baden, describes four cases which were treated in the sanatorium there. Two of the patients were under treatment for the sulphonal habit, as it had become perfect mania, so much so that the absence of it caused symptoms similar to those experienced when overcoming the morphia habit. This was not the case with the other two, but serious symptoms were evident. Besides the well known injurious effects produced by the use of sulphonal, all the four patients were unable to write straightly and distinctly. The characters were unsteady, and in an ascending line from left to right. Attention is called to the fact that although the effects of sulphonal are well known, still it is used as freely as ever. In Germany it can even be obtained at chemists' shops without medical prescription. In conclusion, when the use of this drug seems unavoidable, it is recommended that it should be prepared as follows: Boiling water is poured on the dose of sulphonal, and the mixture is cooled by constant stirring until it is just palatable. By this means precipitation is nearly avoided, and the drug enters the stomach in a dissolved form. Thus sleep is said to be generally produced in from fifteen to twenty minutes, and the troublesome feeling of weariness, enervation, etc., usually experienced by the patient on the day following the use of sulphonal does not appear.--Lancet.

FIfTy cents per pound is now the price for alumi num in large quantities.


DAVIS' NEW FAMILY QUILTING MACHINE.

SANITARY, VENTILATED BOOTS AND SHOES.
Wool, hair, fur, and feathers-consisting essentially of the same constituents-are the natural covering of animals in every clime and at all seasons. Many attempts have been made to popularize wool-lined shoes, especially for winter wear ; but in none of them has effectual provision been made for ventilation where it is more especially needed. Consequently the perspiration was arrested, or retarded, or retained in the shoes, to obviate which the ventilated shoe was


## GREEN'S VENTILATED BOOT OR SHOE

invented, and improved, as shown in the accompany ing illustrations. The cuts are nearly self-explanatory. The sectional views represent the lower part of the hoe, showing the ventilating device in detail. The shoe is lined with the so-called "Jaeger sanatory allwool fabric." Immediately beneath the foot is an exceedingly porous felt insole lining. Under this lies the insole, made of tough wool felt, also porous and freely perforated, thus facilitating the passage of air to and from the foot, by way of the air duct opening externally at the heel, and communicating with the air well in the heel. Between the insole and the usual leather outsole, another layer of porous wool felt is used as a filling. As these three layers of wool, and one thickness of leather, are not held in position by any adhesive substance, but by stitches at the edges only, there is nothing to interfere with the free passage of air, in and out, throughout their entire length, with each step of the foot. The circulation of the air is promoted by the action of the steel shank springs, which facilitate the pumping action at each movement of the foot; and the spiral spring tube lying between the springs keeps the passage open to the air well in the heel. This ventilated shoe has been patented by Mr. John Green, and further information respecting the above described invention may be obtained by addressing the Dr. Jaeger's Sanitary Woolen System Co., 827 and 829 Broadway, New York.

## The Wear on Hzels.

Charles Schuette, the shoemaker, said: "Very few men are knock-kneed, a fact that is proved by not one pair of shoes in a hundred coming in to be repaired with the heels worn down on the inside. The percentage of soles worn this way is a little larger, but that is often caused by the toes being turned in instead of out. About one man in ten will wear his heels down at the extreme rear, but for every one of these there are at least half a dozen who will wear the outside right to the welt before the center shows any signs whatever of giving out. Physicians say that this bow-legged tendency is the result of children being en. couraged to walk before their legs are strong enough to bear the weight of their bodies, and if this is so, the error must be very general. In making shoes to order it is usual to run two or three extra rows of nails or brads where the tread is heaviest, and some customers ask to have iron protectors driven in. The best device of this kind is a steel wedge driven into the leather, which thus cannot wear down any faster than the steel, bnt the objection to this is that when a man walks on a granitoid sidewalk, he makes almost as much noise as if he was wearing military spurs."-St. Louis GlobeDemocrat.

White lead is poisonous to most people;
one layer at a time, and as the goods are quilted the quilted parts are rolled up on the inside roller. These operations are repeated until the goods are all quilted. This machine is manufactured by the inventor, Henry T. Davis, 18 to 30 W. Randolph St., Chicago, Ill., U. S. A.
but there are examples of individuals who are unaffected by it. John Jarvis worked for over 50 years in the well known white lead establishment of Wetherill \& Brother, Philadelphia, and always enjoyed good health. He lately died of old age. Thomas McCann was another example. He worked over 55 years in the same concern.

## ©orrespondence.

## Molasses in Mortar.

To the Editor of the Scientific American:
In see in your issue of February 27 a letter from Big Stone Gap, Va., in regard to sugar in mortar. In repairing and modernizing a residence, my plasterer had occasion tear off a plastered ceiling that had molasses spilled above and run through on plastering. The rest of ceiling came off easily, and he had to take off the laths to remove the part that had been soaked with the molasses. Hence I am sure that his discovery is a very useful one, and will prove a success when it comes into common use
W. T. Hanks.

Eminence, Ky., February 29, 1892.
Visibility of the Proposed odd Fellows,
To the Editor of the Scientific American:
In a recent copy of your excellent journal, $I$ find the statement-presumably indorsed by you-that the proposed Odd Fellows' Temple, in Chicago, 556 ft . high, will be visible for 60 miles.
Is not this statement rather deceiving? First, because inland, where there might be hills or other elevations, the atmosphere is always to hazy (especially near Chicago) to see that distance. Secondly, out on the lake, supposing the atmosphere to be perfectly clear, an observer at 32 miles distance would have lost sight of the building below the horizon, while to see it at 60 miles distance one must stand at an elevation of $2,166 \mathrm{ft}$. above the level of Chicago.

Florence B. Lining.
Philadelphia, March 6, 1892
[Our correspondent is correct, and the statement we copied from is wrong.-Ed.]

## occupation for old People

To the Editor of the Scientific American
Perhaps a suggestion from an irrigating district on this subject would be in order
It is my opinion that about eight out of ten of the old men, and ladies too, would take kindly to a smal garden, could they have a wind mill and pump for irrigating.
I would suggest that they begin, not for a livelihood but for the purpose of enlivening others. Grow all they can, and sell everything at the very highest price possible.

This they can conscientiously do, when the object ahead is pleasure for others
Let the proceeds be divided: First, for the happiness of others; second, for enlarging or perfecting opera tions; third, for the "rainy day."

Of course, each particular person could decide as to the per cent to be set aside for each particular purpose.
Could the above suggestion be the means of giving one day's happiness to one person, I will, indeed, be amply repaid, and would take pleasure in giving any hints or help to any one taking an interest in such project.
D. D. Smith

Gila Bend, Arizona, Feb. 29, 1892.

## Webb's Wonderful Test Plates.

To the Editor of the Scientific American
In an article by President Morton, in your issue of this date, page 133, on "Magnitude of Molecules and Light Waves," a reference is made to Webb's "test plates," which called up recollections of "old times"in my mind that may be of interest to some of your read ers.

The reference is to a "test plate" on which the Lord's Prayer, containing 227 letters, is written in th TV965\% of a square inch, or at the rate of eight Bibles to the square inch, the Bible containing $3,566,480$ letters.
Now I have had in my possession since, I think about 1868 one of these "test plates," on which the Lord's Prayer is written in the $\frac{1}{50} \times \frac{1}{65 s}$ of an inch,
 74,115,500 letters-being more than twenty Bibles-in the square inch.
Webb has, however, produced them up to twenty seven Bibles to the square inch
If not taking up too much of your valuable space, I would like further to say that I feel especial interest in these "test plates," as they were, I believe, written by Webb with a machine invented by a Mr. Peters and exhibited by him in the "great exhibition" in London, 1851, where it caused intense excitement in the scientific world. It was purchased by the Microscopical Society of London, now Royal Microscopical Society, for, I think, $£ 500$.
I was elected a Fellow of that society in 1866, and at that time there was only one of the Fellows practically acquainted with its mechanism-Mr. Virtue.

He took a fancy to me, and offered to teach me how to write with it. No less than three appointments were made for that purpose, all of which, unfortunately, fell through ; and shortly afterward he died.
A few years afterward I left London, and do not know how matters now stand.

The marvel is accomplished by writing in a rectangle about $6 \times 9$ in a large clear hand. This is reduced by a series of levers, and reproduced at an infinitesimal point on the glass cover.
Could any society, college, university, or the exhibition commissioners obtain the loan of this machine for the World's Fair? It would prove an immense attraction to thousands of "scientific Americans," and I do not doubt that for such a purpose, and under proper guarantees and guardianship, the Royal Microscopical Society would be willing to further the interests of science by loaning it.
Roselle, N. J., Feb. 27, 1892.

## The Papyrotint.

This process has been named papyrotint, being a modification of Captain Abney's improved method of photo-lithography named papyrotype.
It is specially adapted for the reproduction of subjects in half tone, such as architectural drawings in monochrome, or subjects from nature, and it is inexpensive. Its advantages over other methods of half tone photo-lithography are that a transfer can be taken in greasy ink for transfer to stone or zinc, direct from any negative, however large, without the aid of a medium, the grain or reticulation being obtained simply by a chemical change. The transfer paper being in direct contact with the negative, the resulting print are sharper than those by processes where interposed media are used, while the same negative will answer either for a silver print, platinotype, or a transfer for zinc or stone.
The method of manipulation is as follows: Any good surfaced paper is floated on a bath composed of -

Gelatine (Nelson's flake)...
Gelatine (Nelson's flake)..........
Chloride of sodium (common salt)
Water...
Chrome alum

Great care should be taken that the solution is overheated and that the paper is coated without bub bles.

The paper is coated twice with the above solution dried and floated in a 25 per cent solution of bicarbon ate of potash. It is then dried in a temperature of 60 F. The film will take about ten hours to dry, and in this state will keep for years. The paper is very hygro metric, and must be kept in a dry place. When re quired for use it should be sensitized by floating, o immersing in a bath of-
Bichromate of potash
Chloride of sodium.
Chloride of sodium......................................................180. 1 oz.
Ferridcyande of potassium................................... 100 gr.

This need not be done in the dark room, as the so lution is not sensitive to light.
The paper after sensitizing is dried in a temperature of $70^{\circ}$, and in a dark room. When dry it is exposed under any half-tone negative in the ordinary printing frame. It is preferable to print in sunlight, and for negatives of medium density an exposure of three minutes is required, but the exposure will vary according to the density of the negative. The correct time of exposure can best be judged by looking at the print in the frame. When the image appears on the transfer paper of a dark fawn color, on a yellow ground, the transfer is sufficiently printed. It is putinto a bath of cold water for about ten minutes until the soluble gelatine has taken up its full quantity of water, then taken out, placed on a flat piece of stone, glass or zin plate, and the surface dried with blotting paper.
The action of the light has been to render the parts to which it has penetrated through the negative part ly insoluble and at the same time granulated; a har transfer ink is now used, composed of-

## White virgin wax..

Steurine ........
gas jet and melted together in a crucible over a sma ink, and the mixture reduced to the consistency of cream with spirits of turpentine. A soft sponge is saturated with this mixture and rubbed gently over the exposed paper (in this stage the nature of the grain can be best seen). An ordinary letter-press roller made of "Acme" composition, charged with a little ink from the inking slab, is then passed over the transfer, causing the ink to adhere firmly to the parts af fected by the light, and removing it from the parts unacted upon. It will be found that with practice, rolling slowly and carefully as a letter-press printer would his form, the ink will be removed by the roller according to the action that has taken place by light, leaving the shadows fully charged with ink, and the high lights almost clear, the result being a grained transfer in greasy ink. The transfer is next put into a weak bath of tannin and bichromate of potash for a few minutes, and when taken out the surplus solution should be carefully dried off between clean sheets of blotting paper.
The transfer is hung up to dry, and when thoroughly ary, the whole of the still sensitive surface should be exposed to light for about two minutes. A weak solution of oxalic acid or phosphoric acid for zinc should be
used for damping the transfer (about 1 in 100), and this should be applied to the back of the transfer with a soft sponge. After it has been damped about four times it should be carefully put between clean sheets of blotting paper and the surplus moisture removed A cold polished stone is then set in the press, and after everything is ready the transfer is placed on the stone and pulled through twice, the stone or scraper is then reversed, and again the transfer is twice pulled through. A moderate pressure and a hard backing sheet should be used, care being taken not to increase the pressure after the first pull through. The transfer is taken from the stone without damping, when it will be found that the ink has left the paper clean. Gum up the stone in the usual way, but if possible let the transfer remain a few hours before rolling up. Do not wash it out with tur pentine, and use middle varnish to thin down the ink.

It should have been mentioned that varying degrees of fineness of grain can be given to the transfer by adding a little more ferridcyanide of potassium in the sensitizing solution, and drying the transfer paper in a higher temperature, or by heating the paper a little beore exposure, or by adding a little hot water to the cold water bath, after the transfer has been fully exposed; the higher the temperature of the water, the coarser the grain will be. The finer grain is best suited to negatives from nature when a considerable amount of detail has to be shown
The coarse grain is best for subjects in monochrome, or large negatives from nature or architecture, etc. where the detail is not so small. Even from the finer grain several hundred copies can be pulled, as many as 1,200 having been pulled from a single transfer, and this one would have produced a great many more if required.-Jour. Photo. Soc. of India.

## Government or Municipal Ownership

I have made a special effort, as evidence of our impartiality, to get together at this meeting some of those who believe in the abolition of private enterprise and in the surrender of all the ideas that mak us crave for a home of our own and the accumulation of a few dollars for a rainy day. If we are wrong in the opinion that self-help is the best help, and that ten well-to-do citizens count more for the community than twenty superfluous officeholders, it is time we knew it. Some people want the government to run the railroads and some want it to buy up the tele graphs and telephones. Others want the municipaligraphs and telephones. Others want the municipalilight plants. In Boston there is, I am told, a demand light plants. In Boston there is, I am told, a demand
that the city shall collect more taxes and put into that the city shall collect more taxes and put into
public coal yards. I am reminded of my reading, as a boy at school, when I learned that the foredoomed population of a great city once set up a howl for free bread and free tickets to the circus. Now, let me say right here that public franchises are a public trust In return for them we are to do something or agree to something that the community wants. In my humble judgment, it has yet to be proved that such a way of introducing improvements and benefits is wrong or foolish. I am a busy man, and have been earning a livelihood all my life, but I have had time enough to livelihood all my life, but I have had time enough to
observe that the whole vast industrial development observe that the whole vast industrial development that has added so enormously to the comfort and hap piness of life has come from the investment, unde public franchises, of private capital, skill, and enter prise. The public has thus been made the partner in all the great works of the age, and has thus gained infinitely more than it could have secured if it had raised an equal amount of money by taxation, and had placed the proceeds in the hands of a vast body of fficeholders for the same purposes.-Chas. L. Huntley, Nat. Elec. Light Convention.

Explosive Power of Henzine.
An explosion of benzine vapor at the Baldwin Loco notive Works, February 16, killed two men and seri ously injured a third. The dome of a boiler had been removed, and just before the noon hour the men applied a considerable quantity of benzine to bolt and rivet heads inside the boiler to soften the rust and scale. On resuming work one of the men got inside he boiler, and a boiler maker's lamp was lowered to him. A considerable quantity of benzine vapor had probably accumulated in the boiler and mixed with air, for an explosion took place, and the body of the man inside the boiler was fired like a projectile straight upward through the dome opening and lodged in the oof trusses overhead. The overhead electric crane had to be run underneath in order to reach him. Not withstanding severe burns and other injuries, he lived after the accident for several hours. The workman who lowered the lamp into the boiler, and who was standing directly over the dome opening, is supposed to have been struck by the body of the man inside He was also blown upward, struck one of the roo braces, and fell on a pile of iron plates. He died in a ew minutes. The third workman was standing on top of the boiler between the cab and the dome. He was thrown to the ground and badly burned and bruised.

## THOMAS STERRY HUNT.

In that most delightful essay entitled "American Contributions to Chemistry," delivered by the younger Silliman at the Centennial of Chemistry, held in Northumberland, Pa., in July and August, 1874, are the following words referring specifically to the eminent scientist whose death has so recently occurred. It says :
"The name of no American chemist occurs more frequently, or in a more important relation to the progress and development of our science, during the past quarter of a century than that of Dr. Hunt. His contributions to our science have been equally valuable in theoretical chemistry, in chemical philosophy and in geological and mineralogical chemistry."
He was descended from an old New England family and was born in Norwich, Conn., on September 5, 1826. His father, Peleg Hunt, was a descendant of William Hunt, who, in 1635, was one of the founders of Concord, Mass., and an ancestor of William M. Hunt, the well known architect ; while on the mater nal side, his grandfather was Consider Sterry, a distinguished mathematician and civil engineer, who, in 1790, published, in connection with his brother, Rev John Sterry, a Baptist divine, a treatise on arithmetic, and later one on algebra.
His early education was acquired in Norwich, and he was destined for the medical profession by his parents but, attracted to New Haven by the fame of the scientific development there in progress under the elder Silliman, he began the study of chemistry there, and was closely associated with the younger Silliman. For two years he continued his studies, serving part of the time as assistant in the laboratory of Yale College, and was offered the appoint ment of chemical assistant to the then newl established school of agricultural chemistry in Edinburgh. This, however, he declined and in 1847 accepted the post of chemist and mineralogist to the Geological Survey of Canada, under Sir William E. Logan which place he then held for twenty-five years. Meanwhile he also occupied the chair of chemistry in Laval University, Que bec, from 1856 till 1862, delivering the lectures there in French, and thereafter, till 1868, he filled a similar appointment to McGill University, in Montreal.
In 1872 he returned to the United States, and accepted the chair of geology in the Massachusetts Institute of Technology, made vacant by the resignation of William B. Rogers. This appointment he held until 1878, since when he devoted his attention chiefly to expert work and literary pursuits.

From these bare facts of biographical detail we turn to a necessarily brief consideration of his life work. As early as 1847 he began the contribution of a series of papers on theoretical chemistry to the American Journal of Science, which, originating in a review of some of the ideas put forth by Charles F. Gerhardt, led to his advancing and advocating those views, largely original with himself, which are now accepted as fundamental in our present system of chemistry. He developed a system of organic chemistry that was essentially his own, in which all chemical compounds were shown to be formed on simple types represented by one or more molecules of water or hydrogen Dr. Wolcott Gibbs has said, to Dr. Hunt "is exclusively due the credit of having first applied the theory to the so-called oxygen acids and to the anhydrids, and in whose earlier papers may be found the germs of most of the ideas on classification usually attributed to Gerhard and his school." An account of the growth of this branch of chemistry will be found in his paper read at the Centennial of Chemistry held in 1874, entitled "A Century's Progress in Chemical Theory."
"A Century's Progress in Chemical Theory."
His researches on the equivalent volumes
His researches on the equivalent volumes of liquids and solids were a remarkable anticipation of those of the great French chemist Dumas, while in his "Introduction to Organic Chemistry," published in 1852 with Silliman's "First Principles of Chemistry," he was the first to define that branch as "the chemistry of carbon and its compounds." His studies of the polymerism of mineral species, as set forth in his paper on "Objects and Methods of Mineralogy," opened a new field for mineralogy, but these philosophical studies were only incidental to his labors in chemical mineralogy and chemical geology.
His researches into the chemical and mineral composition of rocks were probably more extended than those of any contemporary scientist. From his long series of investigations of the lime and magnesia salts he was enabled to explain for the first time the relations
of gypsums and dolomites, and to explain the origin of gypsums and dolomites, and to explain the origin attempt to subdivide and classify geologically the
stratiform crystalline rocks was made by him. The names Laurentian and Huronian, applied to the earliest known rocks on this continent, were given by him to two subdivisions of the Azoic period. Likewise the distinctions and designations of Norian, Montalban Taconian, and Keweenian were originated by him and have gained an acceptance in the literature of geology In connection with these studies he attempted the dis cussion of the great questions of the origin and the suc ession of these rocks.
He sought to harmonize the facts of dynamica geology with the theory of a solid globe, and after reviewing and controverting various hypotheses, including the igneous or plutonic, the metamorphic, and the metasomatic, all of which he rejected as irreconcilable with observed facts and as isolating chemical theory, thus showing the essential correctness of the still imperfect Wernerian aqueous view, he advanced the so-called crenitic hypothesis, in which he argued that the source of the various groups of crystalline rocks was the original superficial portion of the globe, once in a state of igneous fusion, but previously solidified from the center. This portion, rendered porous by cooling, was permeated by circulating water, which dissolved and brought to the surface during successive ages, after the manner of modern mineral springs, the elements of the various systems of crystalline rocks elements of the various systems of crystaline rocks
These views were originally advanced in his essay on
ciated with James Douglass, Jr., in the invention of a wet process for the extraction of copper from low grades of ores, consisting essentially of roasting the ore, bringing it into solution, and then precipitating the copper in its metallic form by the introduction of iron.
He was the author of more than two hundred sepa rate papers that appeared in the transactions of variou learned societies and scientific periodicals. Besides the reports of the Geological Survey of Canada, he published in book form "Chemical and Geologica Essays" (Boston, 1874, 4th ed. New York, 1891); "Azoic Rocks," being Report E of the Second Geological Sur vey of Pennsylvania (Philadelphia, 1878); "Mineral Physiology and Physiography" (Boston, 1886, 2d ed. New York, 1890) ; "A New Basis for Chemistry" (Bos ton, 1887, 3d ed. New York, 1890). This also appeared as "The Nouveau Système Chimique" (Paris, 1889), and a Russian translation, being the initial volume of a eries of foreign scientific classics, was announced for the present year. His last work, entitled " Systematic Mineralogy According to a Natural System," was published in New York during 1891.
Dr. Hunt was a popular speaker on scientific subjects, and delivered two courses of lectures before the Lowel Institute, in Boston. He served on juries at the World's Fair held in Paris in 1855 and in 1867, being World's Fair held in Paris in 1855 and in 186, being
made an officer of the Legion of Honor on the latter occasion, and was also one of the judges at the World's Fair held in Philadelphia in 1876. The honorary degree of A.M. wa conferred on him by Harvard in 1852, that o LL.D. by McGill in 1857, that of Sc.D. by Laval in 1858, and that of LL.D. by Cam bridge, England, in 1881. Also he was an officer of the Italian Order of St. Mauritiu and St. Lazarus.
He was president of the American Asso ciation for the Advancement of Science in 1870 and of the American Institute of Min ing Engineers in 1877. The American Chemical Society called him to its presi dency in 1880, and again in 1888. He wa one of the founders, and the first presi dent by election, of the Royal Society of Canada in 1884. In 1876 he organized, in concert with American and European geolo gists, the International Geological Congress, was its first secretary, and vice-president at its meetings held in Paris in 1878, in Bologna Italy, in 1881, and in London in 1888.
In 1859 he was elected a fellow of the Royal Society of London, and in 1873 he was chosen to the National Academy of Sciences. He was a member of the American Philosophical Society, the American Acade my of Arts and Sciences, and abroad of the geological societies of France, Belgium Austria, Ireland, and of other scientifi bodies.
Failing health led to his retirement some three or four years ago, and since then he lived chiefly in New York City, where he had apartments at the Park Avenue Hotel, and there he died on February 12. • The meet ing of the National Academy of Science held in New York, early November last, saw him for the last time assembled with his distinguished associates. Those who had known him in his prime were then shocked at the ravages which time and illness had made upon him, but he hoped for better days and they have come to him.
Sixteen years ago, shortly after he had retired from active work, this was written of him: "Although an indefatigable experi menter and an extensive observer, Dr. Hun is also eminently an original and philosophical thinker and has taken an influential part in the establishment of the most matured scientific theories. He was early in of the most matured scientific theories. He was early in
the field of chemical speculation, and aided essentially the field of chemical speculation, and aided essentially
in that revolution of views which has ended in the es in that revolution of views which "
M. B.

In the February number of Nature Notes, Mr. Rober Morley vouches for the accuracy of a story which seem to indicate the possibility of very tender feeling in monkeys. A friend of Mr. Morley's, a native of India was sitting in his garden, when a loud chattering announced the arrival of a large party of monkeys, who forthwith proceeded to make a meal off his fruits. Fearing the loss of his entire crop, he fetched his fowl ing-piece, and, to frighten them away, fired it off, as he thought, over the heads of the chattering crew. They all fled away, but he noticed, left behind upon a bough, what looked like one fallen asleep with its head resting upon its arms. As it did not move, he sent a servant up the tree, who found that it was quite dead having been shot through the heart. He had it fetched down and buried beneath the tree; and on the morrow he saw, sitting upon the little mound, the mate of the dead monkey. It remained there for several days dewailing its loss.

THE LARGEST AND THE SMALLEST WATER WHEEL. 3. A roaring flame, taking all the gas it will
The overshot water wheel shown in the accompanying illustration has the reputation of having been the most costly to build as well as that of being the largest water wheel ever constructed. It is at Laxey, on the Isle of Man, where it is used to pump water in working a lead and silver mine. The wheel is 72 ft .6 in . in diameter, 6 ft . in breadth, has a crank stroke of 10 ft ., and develops about 150 h . p. The power operates a system of pumps raising 250 callons of water per minute the lift gallons of water per minute, the lift being $1,200 \mathrm{ft}$. The power is transmitted several hundred feet to the pumps by means of wooden trussed rods, supported at regular intervals, the supports resting on small wheels, running on iron ways, to lessen the friction. The water to turn the great wheel is brought from a distance in an underground conduit, it being carried up the conduit, it being carried up the masont wheel was ponstructed som great wheel was some forty years ago, and has been running continuously ever since.
In the upper right hand corner of the same picture is represented another water wheel, drawn to the same scale, and which will afford as much power under similar conditions of head and water supply. This small wheel is the well known Pelton, having peculiar eup shaped Pelton, having pecular cup-shaped buckets on the periphery of the wheel, into which the water is so directed from one or more nozzles that nearly the full value of its weight for the height of its head or fall is transformed into the inertia of the wheel. The power represented by the force of the water is thus converted into mechanical movement, almost entirely without move ", al but friction," the buckets simply taking the energy out of the stream and leaving the water inert under the wheel." The Pelton wheel is extremely simple in construction, and is in size and appearance apparently but little more than a mere toy, in comparison with the ponderous piece of machinery shown as the great Laxey wheel with its massivecolumn arches and withe foundation Probably the cost of putting in position a Pelton wheel to afford the same power as this great overshot wheel would not construction. Such an object lon and was made. ing practice during the last half century.

## ELECTRIC LIGHT FOR MAGIC LANTERN.

A small lamp made by the United States Electric Lighting Co., requiring about 8 amperes at 110 volts, gave 355 candles. A Clark lamp of full capacity with a current of about 15 amperes gave 1,378 candles, and with a full current of 20 amperes on gave 1,758 candles. These figures show that candle power is much over-
 is called a 2000 measured is what
be one-fiftieth of that of the earlier and cumbersome jets cannot be forced and which they cannot long was



HE GREAT OVERSHOT WATER WHERL AT LAXEY ISLE OF MaN. was made.
of carbons.
It would seem that a focusing lamp might be made der such a bombardment.
A calcium light which had just been tested with a for a moderate price which would, with plain, strong, quiet flame was used as a standard by which to and durable workmanship, be as good practically as measure the candle power of the two arc lights for the highest priced lamp, and that such a lamp would lantern use belonging to the Adelphi Academy, with find a good market.

There is great diversity of opinion regarding the results given below. the candle power of both the calcium and electric arc lights. Makers and dealers in the calcium light claim as high as 900 candle power for it as actually used in the lantern. I have made numerous measure ments in the laborator of the Adelphi Academy upon both. The method employed was that of the Bunsen grease spot photometer with a sight box by the American Meter Co. The standard of light was the Sugg London standard Argand gas burner anú a Methven screen, by the same company. These have been compared with standard candles and are correct, or what is called so. The following table is compiled from my notes, each jet being tested three times. 1. A noiseles flame. 2. A medium flame making as much noise as would be allow able in the lantern.


ELECTRIC LIGHT FOR THE MAGIC LANTERN.
the lantern by some. In its ordinary form with a long loop of filament the light is too widely distributed. A special form has been made for the lantern of 100 candle power. The car bon filawer. The car bon filament was coiled into a close spiral of about a half inch in diameter, which is about the size of the white spot on the lime. This lamp is very easy to use, since its resistance would be fitted to the circuit upon which it was to be put, and it would run with the other lamps upon the same circuit and with no more attention. The operator has nothing whatever to do but to turn the key when the light is wanted. Where its light is sufficient nothing better can be desired, nothing cheaper be found. The lamp itself costs very little, and a support for it in the lantern can be made by any one. It is infinitely better than any
oil lamp. I have known them to be used in small lecture rooms in preference to the calcium or the are light. But it is the arc light alone which can take the place of the calcium light for all uses. It leaves nothing to be desired. I cannot agree with the remark of Mr. Lewis Wright in his recent book on "Optical Projection": "Such a powerful light is quite uselessfor exhibitions unless the disk shown exceeds 30 feet in diameter." My experience is that the better lighted a picture is, the less the eyes of the observer are taxed. With the calcium light the deepest darkness is necessary in othe, parts of the hall to save the picture from indistinctness, and the reading lamp of the lecturer often blurs one side of it. When the are light is used the illumination is so abundant that enough lamps, gas or incandescent electric, may be left lighted to enable the audience to see the lecturer and the lecturer to see his audience, so that notes may be taken or a manuscript read, while still the picture can be better seen in all its details than with any other artificial light. The ability to have other lights in the lecture room is some times an important consideration in controlling an audi ence of students. It is useful always. I often project a slide of a diagram or a machine without wholly dark ening the room, and go on with recitation or lecture upon it, while the class attend, copy, or take notes as required. In a popular lecture it is far pleasanter. Nothing is more weird for an audience than to sit in deep darkness and listen to a voice coming as from an abyss beyond ; nothing more unreal for a speaker than to stand upon a platform and to speak into darknes in which there may be supposed to be interested listeners. With the are light in the lantern all this is changed, and speaker and hearer may be en rappor changed, and speaker and hearer may
with each other in a fairly lighted room.
If the operator is on an are light circuit, his lamp i put directly in series with the others on the same cir cuit, but the high potential used on such circuit makes such an arrangement rather a ticklish one to work with. The low potential generally used with incandescent lights is more safely handled and there are now many are lamps used on such circuits. The potential is never above 110-120 volts. At this pressure the wires may be handled as safely as those from battery. Of course they must not come in contact with each other ; for a short circuit will produce a great heat

If the arc lamp is to be used on an incandescent circuit, additional resistance is required to enable the low resistance arc lamp to burn in multiple with the high resistance incandescent lamps. Arc lamps use from 8 to 15 amperes of current at 115 volts. Apply Ohm's law to this, $C=\frac{E}{R}$ or $R=\frac{E}{C}$, and we have $\frac{118}{8} \frac{\varepsilon}{8}=$ 15 nearly, and ${ }^{\frac{115}{15}}=8$ nearly. So an 8 ampere lamp requires 15 ohms and a 15 ampere lamp 8 ohms approxi mately of resistance to control the current.
A part of this is offered by the arc itself. The ad justing coils of the lamp furnish something more, differ ing in different lamps, but not enough to make up the resistance to the amount required to choke off an ex cessive current through the lamp.

There are two ways of arranging the apparatus.

1. The common way is to place a rheostat in the main circuit whose resistance can be varied at will, and thus more or less current be sent thro comes from central station at a constant pressure
2. Where there is a separate or isolate
3. Where there is a separate or isolated plant, as in not a few educational institutions, a coil of No. 12 German silver wire (so that it will carry the required current without heating, with a resistance of three or fou ohms) may be put permanently in series with the lamp The remaining adjustment will be made by the fiel rheostat of the dynamo. For this purpose the field wires should be brought to the lantern table, and a field rheostat be connected to them within reach of the operator. By varying the field resistance he can change the voltage of the current and thus adapt it to the lamp.

The only defect of the are light for lantern use is th "blinking" caused by the change of the position of the bright spot on the positive carbon. This bright spot emits by far the greater part of the light. To see it, place a deep red and a blue glass together and look through both. The bright spot still looks white, but the rest of the carbons looks dark red. This spot is seen frequently to move, sometimes to swing around, sometimes to jump across to the opposite side of the carbon. This motion is attributed to impurities, prin cipally silicon, in the carbon. The best carbons, th
Carre French carbons, are not free from this defect.
The blinking does not make much difference fo street use. The light flickers and hisses and we endure it, but in the lantern, if the are goes to the back side o the carbons, the picture is blurred or obliterated en tirely. This motion of the arc is fatal to the use of the light for projecting microscopic objects. The light entirely leaves the focus of the objective, and come back when it gets ready. Several microscopic societies have abandoned the arc light in disgust on this account, though when the arc is in its proper position, the illumination is superb.

The remedy for blinking has been to place the cente of the negative carbon in front of the positive by a The distance from the tip of the negative purposes The distance from the tip of the negative carbon to the front side of the positive carbon is the shortest and easiest path for the arc, and so the are will remain in front of the carbons, unless something makes it move. A second object which is gained is to form the crater in the positive carbon so that it slopes toward the con denser as shown in Fig. 1.
In street lamps the ares of the carbons are placed in the same vertical line. The crater tends to be hori zontal, and the light is radiated downward and equally all around as it should be. This is just what is not wanted in the lantern. The position shown in creases the amount of light sent out toward the con denser and screen. Carrying this idea still further lamps are made in which the carbons are set on a slope of about $20^{\circ}$, in which position the negative carbon cuts off but little of the light from the crater of th positive carbon, as is seen in Fig. 2. A comparison o Fig. 1 with Fig. 2 shows an angle of opening between the carbons $10^{\circ}$ larger in the inclined carbons, although both figures are made from the same negative. The arbons in the focusing lamp used on the tower of the Madison Square Garden are set in this position. It is more convenient for me to tilt my lamp forward and
make the lower carbon negative, which answers the same purpose.
According to my observation, this is but a partial remedy for the defect of blinking, and I have devised and constructed a special regulator for holding the arc in its proper position, which so far as I know is new nd original and which has proved successful
The fact that a magnet strongly repels an electri


Fig. 3.-THE ELECTRIC BLOWPIPE.
arc is of course well known. Dr. Samuel Sheldon, now of the Brooklyn Polytechnic Institute, based upon this fact an electrical blowpipe which he described in the Scientific American of Feb. 2, 1889. The cut, Fig. 3, is reproduced from his article
The same force in a less degree will hold the are on one side of the carbon. At first one pole of the electro magnet was used. This worked quite well. The ap paratus illustrated in Fig. 5 was afterward made which is an electro-magnet of the ordinary form, ex cept that the soft iron cores extend beyond the coils, s that the coils may be set back far enough that their insulation may not be destroyed by the heat. The cores are of $1 / 4$ inch rod, $21 / 2$ inches long, and set inches apart. Eight to twelve turns of No. 12 wire on each core will produce a field strong enough when th poles are set about a half inch behind the carbọns The mode of attachment to the lamp is plain from Fig 4. It will be seen that the rod which carries the regu magnets tan be the formard. If to near, they drive the arc out with a hissing noise. The regulator is adjusted once for all as high as the focus of the condenser, and as the carbons consume, th ack and pinion brings the arc up to its place again with reference both to the regulator and condenser The regulator is in series with the lamp, and the whole current goes through it. It might be in parallel, bu nothing would be gained by that arrangement.
I have had it in use for more than a year with the best results. Any one can easily make one and test its working. It is confidently expected that it will enable the arc lamp to come into use for lantern projection wherever the heavy current can be had.

## Torpedo Boat for Australia

The first-class seagoing torpedo boat lately construct d for the Victorian government by Messrs. Yarrow Co. left London for Melbourne, December 12. This vessel is 130 ft . in length by 13 ft .6 in . beam, and on trial was found to have a speed of $223 / 4$ knots during a run of three hours' duration in a fully equipped con dition, with all weights on board.

The Law's Delay, its Heavy Costs, its Uncertainty.
During the past eighteen years the Review has pub ished hundreds of columns relating to the suit of the Webster Loom Company vs. A. \& E. S. Higgins. It now remains only to close the account, as the famous itigation may be assumed to be practically ended. On a motion being made for final argument by Mr. Walter Griffin, delay was asked for by the plaintiffs on the ground that their counsel had thrown up the case and they desired to substitute new attorneys. This mean probably the final termination of a case which has at tracted more attention and cost more money, time and rouble than any in the history of American patent itigation.
The cost has been something enormous. Years ago it was estimated that each side had expended $\$ 200,000$ in fees and expenses. All the defendants, Elias S. Hig gins, Alvin Higgins and N. D. Higgins, are dead, a are also Judge Bradley, who wrote the decision of the United States Supreme Court in favor of Webster's claim; Judge Hoar, of Massachusetts; Judge Nixon, of New Jersey; Roscoe Conkling and Geo. Gifford, the awyers for A. \& E. S. Higgins; Parker, the New Bruns wick Company's lawyer; Davis, Wm. and John Duck worth, the experts; and E. N. Dickerson, the plain iffs' counsel.
At one time the damages were calculated at $\$ 28,750$, 000, but after Mr. Wm. G. Smith's examination, which lasted two years, covered 6,294 questions and filled 2,384 printed pages, thisclaim was withdrawn and the claim or profits reduced to about $\$ 1,500,000$. The Webster Loom Company's patents have expired; they never built a loom; all the defendants, as has been said, are dead, but the case has survived. And yet such is th judicial respect for previous decisions that the error made by Judge Nixon in the New Brunswick case i 1874 was not examined on its merits until sixteen year later, when the decision was pronounced radically er roneous. The master in chancery decided that the Webster Loom Company could receive only nominal damages. Judge Shipman reversed this decision. The defendants appealed, and Judge Wallace reversed his own decision of 1884. Then Judge Shipman wrote second decision, agreeing with Judge Wallace Beautiful uncertainty is the essence of law.
And yet in 1887 Mr. Griffin discovered that since 1856 the Roxbury Carpet Company had been using Johnson's wire motion, which the master decided to be better than Webster's. So there was really never any foundation for the action.-Carpet Trade Review.

## Causes of Carpet Sprouting.

The surface of a Brussels carpet is composed of loops of worsted yarns packed closely together. When any one loop is formed, the particular worsted thread of which the loop is a portion sinks beneath the linen or cotton cross thread (weft) and remains with other threads in the body of the fabric until it is required to form another loop on the surface. These surface loops are held in position by the cross threads (weft), the closeness of the fabric and the intermingling of the va rious strands of worsted. Not being tied or knotted down, should any loop be caught or pulled by a sharp point in brush, broom, boot, paw or claw, then the orsted underneath will be drawn above the surface and the loose ends and tag will form a well developed ase of sprouting.
The trouble is especially liable to occur in first-class roods in which the yarn is fine, soft and highly dressed and in carpets in which the ground is not well covered In grounds well covered the threads cross each othe frequently and are thereby held down more firmly.
There is but one remedy, and that is to clip off at once all the loose ends. With careful, close clipping the threads by degrees get flattened down and the trouble ceases.
In every case of complaint from a customer the deal er should be especially careful to place the matter in the hands of an experienced employe, whose specia business should be not only to see to the remedy, but al so to ascertain the cause of the trouble. He should keep a sharp lookout for dogs and cats, whose paws or claw may have started the threads. The cesters of all arti cles of furniture in the room should be examined, and likewise all legs of tables, chairs, etc., not provided with casters. A rough caster or a jagged end of wood has caused many a case of sprouting. Nails in boot heels have likewise much to answer for in this direction. Parrots, given the freedom of a room, are apt to use both beaks and claws on a carpet with disastrous effect But the worst enemy of carpets is the common broom in the hands of a maid more muscular than intelligent. If possible, the housewife should avoid sweeping a new Brussels carpet for some months; that is, until the loops get trodden down somewhat. If sweeping is regarded as absolutely necessary, the only proper thing to use is a good carpet sweeper run over the carpet with the utmost possible care.-Carpet I'rade Review.

A mysterious ringing of electric bells in a Swiss cuse was traced to a large spider, which had one foot on the bell wire and another on an electric light wire.

## RECENTLY PATENTED INVENTIONS.

 Railway Appliances.Train Signaling Device. - John Lyuch, Jamestown, North Dakota. This is a simple
and inexpensive device designed to afford means to reliably signal, either by night or day, that the track is clear, or that train orders are awaiting a train from either direction. A rectangular main semaphore blade sopported on the outer end of a horizontal brack arm, the upper half of the blade colored white, while main semaphore blade, colored red on the sides shown when pendent and white on the sides shown when rocked upwardly, there being journaied on the horizon with a device for rockıng each shaft from its inner end and locking it.

Car.-Mansel L. Heacock and Thomas H. Lovejoy, Portland, Oregon. This invention proines an improvement in car construction, affording quickly changed from an open to a closed car, and
 posts, and a series of sliding panels is provided, there
being a series of sashes above the panels pivotally connected to the car structure at their upper ends to eparately swing inward and upward, with latch devic whereby when the panels are carried upward to an en agement with the sashes the two are locked togethe The improved construction is designed to be simpl

Car. - DeWitt B. Williams, Prescott, frizona. This is a car adapted to be readily changed hen used as a box car, oo be readily opened at an part to unload some of the contents without disturbing port a band formed with longitudinal slots, while a ing the slots, there being a locking device for fastening the lower ends of the doors in place, and longitudina rods for supporting the doors in an uppermost position

Car Heater.-Lawrence Haas, Grand Crossing, Ill. The body of the heater provided by this
nvention is designed to be set in the car floor, so that invention is designed to be set in the car floor, so that
its top will be flush with the floor. Around the fire pot is a jacket, forming an inclosed chamber, in the ranged funnels communicating with the lower part of he chamber, while a valve 18 pivoted between the unnels. The air entering the funnel is compelled by the partition to take a spiral course around the fire pot, by which itis heated and is passed into pipes leading o buth sides of the car. When the car travels lin the opposite direction, the valve changes automatically to direct the air into the opposite funnel, whereby the
Railway Tie.-Thomas C. Anderson, Moscow, N. Y. This is a metal te consisting of two ertically separable parts, the upper of which has in between the bridges and the bottom portion of the tie The object is to produce a cheap and durable tie so constructed that it may be easily laid and will hold the rails securcly in place, while it may be readily adjusted n any kind of weather to bring a rail to the desired
Bell Ringer. - John L. Baker Baird, Texas. This is a device especially designed for use in locomotives, being effective and automatic, and haft without jar or pounding. The invention congist of a cylinder provided with a steam chest in which is eld a pinnger valve, three plungers being arranged to lead the motive agent from one end of the cyl
the other end to form a cushion for the piston.
Spring Box for Car Couplings.Patrick P. McMahon and George M. Wilcoxson, Chattanooga, Tenn. This is a detachable box or case or the secure retention of a buffer spring for a car
coupling which will permit the spring to be changed quickly if broken, and which can be utilized in conjunction with different styles of drawheads. The box
consists of two parallel side walls having interior consists of two parallel side walls having interior
stiffening webs and exterior locking ribs, and two ransverse apertured walls integral with the side walls and forming therewith a spring chamber, the side walls projecting beyond the transverse walls.
Switch Lock.-Jos. Judge, Pittston, Pa. Combined with a switch stand having a notched keeper is an apertured switch lever and a lock consist-
ing of an apertured casing and a spring-pressed bolt in the casing, the keeper being adapted to pass through the aperture of the switch lever and be engaged by the bolt of the lock. The lock is so made and located that the moment the switch lever is in position to close
the switch it will automatically be locked to the switch standard, and the switch lever cannot be released except with a key. The lock is simple and of few
parts, and cannot be opened by striking or otherwise jarring its exterior.

## Agricultural

Corn Harvester.-James W. Miller, Stewartsdale, North Dakota. The construction of this mechanism and cutting blade or blades may be carried downward to cut close to the ground, or carried upward to cut the corn some distance from the ground. The cutting knife is also sdjustable to any desired angle or
vertically, and means are provided whereby the cut cornmay be effectually guided to dumping platforms which are capable of being operated by the driver of the machine at will. This harvester is designed to be of very simple, durable, and inexpensive construction, and it is especially adapted for cutting a corn growing in the Northwest, the ears of which project from the Weeder. - Frank Hulse, Goshen,
of hand work, and adapted to be pushed along the
ground over a row of plants, when it will pall the weeds from between the plants, thoroughly stirring he soil, and without injury to the plants. Shoes dapted to run upon the ground are secured to the fingers are arranged between the handle bars, the

Feed for Thrashing Machines. Elmer E. Logan, Larncd, Kansas. This invention pro vides a force feed of simple and inexpensive construc tion, capable of attachment to any thrashing machine It consists of a toothed feed cylinder arranged above nd in advance of the thrashing cylinder, and adjus of the thrashing cylinder, while a carrier or elevato belt delivers to the feed cylinder. A regular, continn cis and uniform force feed is thus obtained, and very atisfactory results are also realized in the procesi hrashing.

## Miscellaneous.

Ditching Machine.-Louis A. Desy Montreal, Canada. A swinging scoop frame is hinged
at its upper end to the main frame, there being chai wheels in the lower end of the scoop frame, and the he center of the trench and the others the one will ditching devices are mounted on a car or platform, and the latter is mounted on a wheeled truck. The machine is especially arranged for digging trenches of a
uniform width, such as gas pipe, water main or sewa uniform width, such as gas pipe, water main or sewer
renches, the parts being readily adjustable to dig trenches, the parts being readily adjustable to dig a
deep or a shallow trench. The engine has two driving procket wheele, one belted with the scoop-operating action devices.
Hydraulic Stump Extractor. Alfred Taylor, San Francisco, Cal. This is a simple nd powerful machine which may be quickly applied and rapidly operated. It consists of a main frame carried on wheels and provided with crank axles, a cylinder carried by the frame baving an open upper
end while a movable piston is mounted in the cylinder end, while a movable piston is mounted in the cylinder
and projects from its upper end, the piston having a and projects from its upper end, the piston having a
grooved head at the top adapted to carry a lifting cub.e, grooved head at the top adapted to carry a lifting cub.e,
a pump carried by the frame being connected with the pump carried by the frame being connected with
ifting cylinder and with a source of water supply.
Window. - Jean J. Eyraud, Paris rance. This is a simple form of window which may e swung open in the usual way, and which can also b tilted or rocked to allow the air to pass above and
below it. The invention comprises a vertically-swinging frame to which horizontally-ewinging sashes are hinged, there being a fastening device for fixing the position of the frame, a hinged plate or shield prevent-

Boat Propelling Mechanism. William H. Dick, Dansville, N. Y. This is a mechanmall craft and designed row boats, canoes, and Euch ently placed in position in the boat or removed from it, being adjusted in position to the size of the hoat.
The seat is supported on the base of the mechanism and upon a standard are adjustable arms supporting carrying paddle wheels, the paddle shafts being ope carrying paddle wheels, the paddle shafts being ope-
rated by chain belts from crank shafts, No rudder is required, as each paddle is operated independently, and no fastening devices are necessary, the weight of the device and of the operator being sufficient to hold

Beam Clamp and Hanger.-William W. Canby, Philadelphia, Pa. This invention provides novel construction of adjustable clamps for I or
ther shaped beams, girders, etc., to be used as a hanger for steam, gas, water and other pipes, and also applicable to bridge building or rron construction work
of different kinds. The opposite jaw or clip-shaped lamp sections are provided with;bent legs at cheir inner o slide one upon or under the other the upper one having nut-lockıng ribs, in combination with a bolt and nuts above and below the base portions of the legs ecuring the clamp sections together.
Household Altar.-Leo C. Beaudet, New York City. A compact and ornamental altar
able is provided by this invention, adapted to be olded to produce an inclosing box or cabinet in which the adjunctive candelabra and vases are kept, but which may be quickly unfolded into altar form to sup-
port the sacramental altar service ware. A telescopic port the sacramental altar service ware. A telescopic
supporting standard and base therefor is also provided, supporting standard and base therefor is also provided,
affording a column of proper height to sustain the table suitably elevated, or allow the entire device to be greatly suitably elevated, or alow height if desired.
Wagon Jack. - Frederick Finsterer, von, Montana. Combined with a toothed lifting bar atted to slide and a hand lever carrying a lifting hook side and engage the toothed bar while being actuated from the lifting hook. The construction is simple and durable and very effective in operation, being arranged o automatically and securely lock the lifting bar in place to support the load.
Can Opener. - Anthony Ward, New ork City. The main portion of this device is formed end and a pivot at the opposite end, the cutter having an aperture through which the wire is passed when the cutter is secured in fixed position on the wire. The device is very simple and inexpensive, and the blade is
so formed that the walls of the kerf produced will be so formed that the walls of the kerf produced will be
quite smooth, and when the knife is introduced into the head of the can it will not have a tendency to leave the head during the process of cutting.
Culinary Vessel. - Seth Williams,
s afforded by this invention, being a vessel of that class in which an inner receptacle of earthenware metallic casing in such manner as to form a space or chamber for the access of heat around and in contact with the walls of the inner vessel without the vessel vessel is of very simple and inexpensive construction, n which the heat from the fire will be deflected and guided to impinge upon the interior vessel at its side

Burner. - Theodore A. Williamson Allegheny, Pa. This is a hydrocarbon burner for cook with a cill conetes, and has a blo unaly, able channel connecting with the other end of the cill while one or more burners on the back plate are co ected with the channel to receive the gas and oil sup ply. The device is simple and durable in construction
and arranged for convenient insertion and use in and arranged f

Muff. - Catharine Booss, New York City. This invention provides a simple and inexpensive device which may be easily applied to a muff to hold it $:$ correct shape, and by which the muff may be at-
ached to the persen. A ring, either flat or round and preferably yielding, is secured within the body of the nuff, and in one side of this ring is an outwardly exending ear from which extends a chain to the free end

Shoe Horn. - Newton A. Dickinson, Essex, Conn. This is an improvement on that class of portion of a rubber or leather shoe against the lower portion of the horn, thus forming a clamping device for pulling on the shoe. The lever has its upper end curved to form a finger hold and a roller is mounted
longitudinally on its lower end, the lever being pivoted longitudinally on its lower end, the lever being pivoted
to the horn and adapted to swing in a plane parallel to to the born and adapted to swing in a plane parallel to
t. The lower ends of the horn and lever may, if preit. The lower ends of the horn and lever may, if pre-
ferred, be convex and concave, whereby they are adapted to fit together.

EARTH AUGER. - Bradford Lane, Carton, Oregon. This is a device especially designed Por use in digging post holes, the cutting blades being
rigidly supported from a single handle, and the blades being curved or concaved transversely and having in urned bottoms, with slightly diagonal bottom edge This auger is calculated to effect the cutting of a larg nole in an easy and expeditious manner, enabling a
large bite to be quickly cut and compactly held while large bite to be
being removed.

Penholder.-Theodore O. Earle, New ork City. This holder consists of a cylinder with an crum in the cylinder, one end of the lever engaging a pen while its other end has a button extending out through an opening flush with the outer face of the
cylinder. The penholding attachment adapts itself to cylinder. The penholding attachment adapts itself to clamped and held in proper position for use, or may be quickly and conveniently released and removed withou ling the fingers.
Clasp.-George W. Kuchler, Yonkers, N. Y., and Hermann C. Fischer, New York City. device which may be utilized for clamping either hea the caliper type, in which the free or clamping ends of the arms are normally held apart by a spring, a locking lever being provided capable of forcing the arms to close upon material of varying thickness and lock the
arms in such position. The device is simple and inexpensive, and when made in small size for a garmen ap the locking may be fiected by one hand.

Inkstand. - George W. Galbreath Sedalia, Mo. This is a fountain inkstand, in which an apertured cap secured to the body carries a hollow flexi-
ble ball with top and bottom apertures, the lower one ble ball with top and bottom apertures, the lower one
registering with the aperture in the cap, a tube being carried by the ball, the tube being attached at its upper wartured portion and extending at its lower end do body of the stand. The moment a tion of the attachment is pressed downward the ink flows upward to meet the pen, so that the ink is pre-
sented to the pen only when needed, the ink ordinarily sented to the pen only when needed, the ink ordinarily
remaining in the body of the stand, where it is protected remaining in the
from dust, etc.
Police Nippers.-Samuel A. French, New York City. The body of the nippers is made in members, each embracing a handle of essentially -hape, and a curved arm integral with the bandle, but the construction is such that the nippers may be conveniently manipulated by one hand, and so that the
moment the lock latch or lever is released the the nippers will automatically assume an open position. The action of the lock latch or lever is also more easy and certain than heretofore, and its construction and
location such that when the nippers are carried in the pocket they will not present sharp edges to tear the

Aging Whisky. - John H. Halligan, Huntsville, Texas. This invention provides an apin much the manner that it is affected by allowing it consists of a cylinder, the lower part of which forms a heating chamber, while suspended in its upper part is a whisky holding tank, the arrangement being such that rotary motion within its tank. Itis designed in practice by thirty days' treatment with the apparatus, to give

Note.-Copies of any of the above patents will be send name of the patentee, title of invention and date of this paper.

NEW BOOKS AND PUBLICATIONS. The Optics of Photography and Pho Tagrar. London: Whittaker \& Co. Pp. viii, 244 . Price $\$ 1$.
This little work should be designated as both practi cal and timely. It is practical because it covers the ties, manipulation and testing of lenses. Mounts and cells, the grinding of lenses and special cases arealso treated. It is timely because in these days a photographer should know something about the tools of his
trade and should not be fatified to merely make the exposures. He should know something of what this book teaches
Money, Silver and Finance. By J. New York: G. P. Putnam's Sons. New York : G. ${ }^{\text {P }}$ P. Putnam'
1892. Pp. v, 242 .
The author of this book is opposed to the free coin spectacle of thousands of men devoting their time and labor to the taking of silver out of the mines, where it could do no harm, for the purpose of placing it in the Treasury's vaults, whence its monstrous bulk menaces the industries and the general prosperity of the coun-
try." Such a writer has evidently the courage of his convi
Electric Light Cables and the Dis TRIBUTION OF ELECTRICITY. By
Stuart A. Russell, with 107 illustraStuart A. Russell, with 107 IMustra-
tions. Lon: Whittaker
and George Bell \& Sons. 1892. Pp. and George Bell \& Sons. 1892. Pp.
xi, 319. 107 illustrations. Price $\$ 2.25$. This accession to "ThesSpecialist's Series " is worthy meeting of the requirements of some English "exam.," but for the working engineer. The thoroughly practinature of the work is evidenced by its topics, such current density in conductors, series, multiple arc, thre wire and five-wire distribution, and many others. Underground lines and systems receive very full consideration, American and English examples being liberally drawn upon. Calculations are employed throughout
the work, but the mathematics are kept well within the work, but the mathematics are $k$
range of the general practical engineer.
The Electric Railway in Theory
ELECTRIC RAILWAY IN THEORY
and Practice. By Oscar T. Crosby
and Louis Bel Ph.D. New York:
The W. J. Johnston Co. 1892. Pp.
400. Price $\$ 2.50$.

With nearly 150 ill ustrations this book is a very good contribution to one of the most important branches of will be, and what part electricity will play in its development is altogether conjectural. This book tells what the aspect of the subject is to-day. The sub jects of prime motors, electric motors, and car equipments, the line track and station economy, storage battery traction, high speed service, and commercial considerations are typical subjects. In the five appendices considera-
ble useful information is given, notably a section on lightninglprotection, by Professor Elihu Thomson.
Michael Faraday, MAN of Science. By Walter Jerrold. New York and Chicago: Fleming H. Revell Co. (No
date.) Pp. 160. Illustrated. Price 75 cents.
The story of Faraday's life, fascinating in its details his inauspicious start $1 n$ life, and of his later work, Which stamped his as one of the greatest minds that form in this little volume. The tale is an inspiring one The illuetrations of places connected with the philoso The Tannins. By Henry Trimble, Ph. $\begin{array}{ll}\text { M. Vol. I. } & \text { Philadelphia: J. B. Lip- } \\ \text { pincott Co. } & \text { Pp. 168. Price } \$ 2 .\end{array}$
This is a monograph on the history, preparation, proper ties, methods of estimation, and uses of the vegetable ject. The latter cannot fail to be especially valuable to any one proposing to conduct experiments in this line, regard to the tannins. The kind of information which the tanners are looking for, however, that which will enable them to readily determine the absolute and rela-
tive tanning values of different tanning materials-seems tive tanning values of different tannngg materials-seems by the experiments of Sir Humphry Davy in , 1803. It is not yet certain but that there are as
tannin as there are of tanning materials.
Essentials of Physics Arranged in THE FORM OF QUESTIONS AND AN-
SWERS. By Fred. J. Brockway, M.D. Philadelphia: W. B. Saunders. 1892 .
Pp. 330 . Price $\$ 1$. This " quiz compend" purports to give the essentials physics for medical students. It is always an open we feel that we award it much praise in stating that we believe most medical practitioners satisfy their con-
sciences with a far more meager allowance of physics sciences with a far more meager allowance of physics
than we have here presented. It wouid prove, we beeve, a useful manual for teacher's use in other than dical schools.
A Manual of Mining. By M. C. Ihlseng,
C.E., M.E., Ph.D. New York: John
Wiley \& Sons. Wiley \& Sons. 18.
trated.
Price $\$ 4$.
This work is a treatise on mining engineering from valuable. of an American. In this sense it is specially hitherto been to some extent hannpered by tradition The preparatory work, methods, extraction of ore, applicution of electricity and water power, pumping, venti-
lation and many other heads might be quoted in addi$\left\{\begin{array}{l}\text { lation and many other heads might be quoted in addi- } \\ \text { tion to show the exhaustive way in which the topic is }\end{array}\right.$
reated. A list of authorities quoted, and of "manu facturers represented in the illustrations" (meaning, we presume, manufacturers' machines and appliances, as
we see no portraits) are commendable features. A peculiarly full index closes the work.
Electricity and Its Uses. By J.
Munro. London: The Religious Tract The Religious Trac pany, New York and Chicago, sole
agents. 1890 . Pp. xv, 208 . Price $\$ 1.40$
The oft-trod ground of popular description of electrical appliances is traversed in this attractive volume.
Its neat shape and numerous illustrations make it a Its neat shape and numerous illustrations make it a
contribution of some valne, although in so crowded a contri
fleld.
Practical Directions for Armature AND Fideld MAgNET WivDING. By bier Publishing Co 1892 PPp. 113,
Illustrated. Price $\$ 1.50$. No index This book is of interest now when so many amateur lectricians ane while not going very deeply into subjects of sizes for given power, etc., ave clear and simple, and so expressed as to be understood easily, The last portion of the work, a little less than one balf devoted to an outline of the principles of commercia Practical Centering. By Owen B.

index.
The hand of the practical builder and constructor apears in the pages of this book. The thoroughly pratical cast of its text and the many useful hints scat engaged in the class of engineering work of which it
treats. The concluding chapters on honse carpentry
put before the reader
The Shoe and Leather Reporter Anmain portion of the book is a directory of the boot an main portion of the book is a directory of the boot and ings, hides, furs, etc., and manchinery manufacturere, in the United States and Canadla, with names of promi nent firms in otherparts of the worla. It also has par-
ticulars as to the organization of a number of trade bodies in different cities, and various other matters of interest in the shoe and leather trades. P
he Shoe and Leather Reportter, New York.

## SCIENTIFIC AMERICAN

BUILDING EDITION

## MARCH NUMBER.-(No. 77.

table of contents.

1. Elegant plate in colors of a residence in the Quee Anne style of architeclure, erected for F. S Perspective view, floor plans, etc. Longstaff \& Hurd architects, Bridgeport, Conn. Cost \$7,0 complete.
2. Plate in colors of a cottage at Richmond, Mo. Per spective elevation and floor plans. Cost $\$ 1,500$.
3. A residence at Cleveland, o. An admirable design. Floor plans and perspective elevation. Cos about $\$ 6,000$.
cottage at Gardner, Me., erected at a cost or plans and perspective view of a house at Portland, Me. Cost $\$ 3,800$ complete. 6. Design for an ornamental chimney piece cottage at Portland, Me. Cost $\$ 3,500$ complete Perepective and floor plans.
liver plans and perspective view of a very attrac
tive Queen Anne cottage erected at Babylon Cost complete, $\$ 2,800$.
iew of the proposed Odd Fellows' Temple a
Chicago. To be the most imposing structure of its kind in the United States, and the tallest buil ing in the world. Height 556 feet.
4. An attractive residence recent n attractive residence recently erected at Belle
Haven Park, Greenwich, Conn., at a cost $\$ 11,000$ complete. Floor plans and perspectiv elevation
5. A residence at East Park, McKeesport, Pa. An attractive desig
a bout $\$ 4,000$.
6. A cottage at Asbury Park, N. J. An excellent design Cost $\$ 5,300$ complete. Floor plans and perspective
elevation. it and what to avoid, with an illustration. suggestion for inventors. - Acoustics. - The bought burning houses.-Timber in damp places -The taper of chimueys.--Stained cypress.-Lo eilings.-An improved woodworking inachine illustrated.-A fine machine for cabinet shops,
illustrated. - Swezey's dumb waiter. - Graphic epresentation of strains. - An improved door hanger, illustrated.-A new woodworking ma chine, illustrated.-The baths of Diocletian.-The Stanley plumb and level, illustrated. - The Diamond Match Company.
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 Me charge for Insertion under his head is one Dollar a linefor each insertion ; about eioht words to a line. Adve for each insertion : about eight words to a line. Adver
tisements must be received at publication ofice as early Thursday morning to appear in the following week's issue.

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wing. either foot or steam power. Will pay cash. wing, either foot or steam
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## 

HINTS TO CORRESPONDENTS

Index of notes and Queries
Chemical trick
Glass etching
Induction coil


(4116) F. E. H. asks (1) Is there any way to oxidize nickel ? A. To oxidize nickel give it a
thin coating of silver and oxidize with sodium sulphide solution, or try dipping the nickel into a solution of mercurous nitrate and then treating with sodium sul phate solution. 2. How is etching done on souven poons? A. For silver etching we refer you to th Scientific american, no. 15 , vol. 65 , query 3445 .
(4117) P. B. W. asks : 1. Will you pub ish how to cure a cigarette habit? I have been a ela it for the last 5 years. A. Quit the dirty habit at once and forever. . What is good to take the pain smoking. 3. Is there a substance that you can put in our tobacco that will kill the nicotine? A. No. (4118) W. R. B. asks: 1. What size wire should I use for a telegraph relay magnet? A. Use ron core? A. $3 / 8$ inch diameter and $11 / 4$ inch long. 3 . How long and thick should the wire coils on the relay cores bes A. The length of the core and $11 / 8$ inch outside diameter. 4. Please state some way of softening
cores? A. Heat them to a cherry red and bury them in ashes overnight. 5. What kind of iron should I use A. The softest wrought iron. 6. What size wire and coils should $I$ use on my sounder to work on short circuit, on a circuit of two or three miles? A. No. 24 for local and No. 32 for line. 7. If I made the parte of my instrument of iron, would it be better to temper the
iron or leave it soft, to give the beet sound? A. If iron or leave it soft, to give the best sound? A. If
you use iton, leave it soft. For all parts except the (4119) T. C. S. writes : 1. What chemical could I put into a glass and let dry and in a little while, by pouring water or some other chemical into glass, turn it the water or chemical) black or any different color? A. For black add a little nut galls and
iron sulphate, both in powder. For blue use ferridcyanide of potassium in place of the nut galls. Excellent small quantity. 2. Would a 40 ohm telegraph sounder work with two batteries on a line of ten or fifteen feet? If not how could I remedy it? A. Yes; but it should
of a gravity battery? A. Use pure water, and drop the
crystals of copper sulphate into the bottom. A few tea crystals of copper sulphate into the bottom. A few teato start the battery
(4120) J. M. writes: I desire to learn of some absorbent that can be used in connection with
the storage of certain perishable products, such as eggs. I want to find something that will absorb gases and odors, without giving off any odor itself. You are aware, no doubt, that in machine storage, it seems necessary to keep rooms tight, and consequently any gases given off are confined in the rooms. It is this the more delicate kind of perishable merchandise We would suggest the use of a strong solution potassium permanganate exposed in shallow vessels. Bone charcoal would also have a good effect.
(4121) J. B. says: 1. He has been trying aristotype paper, and succeeds well except when mounting. After printing and toning I throw the prints into cold water and wash in several waters for two or three
hours. I use starch paste new made, but perfectly cold and thick enough to be stiff when cold. I take the print from the water and lay face down on glass and I then brush paste oner the print cares a way all water. I then brush paste over the print carefully, taking care
to cover every part of it. I then lay the print on the mourt and squeeze it down perfectly flat. I generally wipe off with wet white cloth. I often use a handkerchief, wringing it as dry as possible before using. It is now all right to all appearance. If I place them between blotters to dry. the paper makes them woolly, for it sticks to the blotting paper. If I lay them out on a table to dry, they get along all right till they get pretty the sides leave the mount too paper from says to treat the paper as albumen paper have tried it every way, and I have lots of trouble with it, and am a little doubtful about it. Please send me a good formula for toning aristo paper, also directions for mounting and burnishing. A. A better
mounting paste than starch for aristotype prints is: Nelson's No. 1 photo. gelatine......... 4 ozs. Water. 16 ozs.
1 oz.
5 oz. Glycerin 5 ozs.
Dis:olve the gelatine in warm water, theu add the glycerine, and lastly the alcohol. This is said to and fixing solution to harden the surface. A combined toning and fixing solution is made up as follows:

1. Hypo..
Add wa

130 ozs.
36 ozs.
Add water to make.................. ${ }^{3}$
When dissolved add 4 ozs. of powdered alum.
2. A. Sulphocyanide of ammonia, c. p. 1 oz

Dissolved in water
1 oz.
B. Dry chloride of gold, c. p ..... 15 krains

Chloride of ammonia......... 60 grain
Dissolve in water.
2 ozs.
Add $\mathbf{B}$ to $\mathbf{A}$ in small portions, shaking after each ad
dition till the precipitate formed is redissolved, then dition till the precipitate formed is redissolved, then be kept in a yellow bottle.

Different tones can
2 ozs.
of the three solution


The bulk of the solution may be lessened by using onethe prints are dry, and before burnishing, rub the fol lowing lubricator over the surface
Cetaceum (spermaceii)........ 10 grammes.
Castile soap................. 10 grammes.
Alcohol................. 1 kilogramme.

This will give a good gloss. 2. Are the roller burnishers ahead of the other kind? A. They are considered saperior. 3. The other day 1 sensitized some albumen toning I found it all covered with little blisters abont the size of a pin head; at least they seemed to me to be it my fault or the fault erally occur when the solutions are of uneven tempera ture. All solutions should be between $70^{\circ}$ and $80^{\circ} \mathrm{F}$. Make the fixing bath one ounce of hypo. to eight alcohol and two drachms of ammonia $0.880^{\circ}$. This alcohol and two drachms
(4122) Young Electrician asks: 1. What mber of the SUPPLEMENT contains the construction 310. 2. What becomes of the energy that is emplo No in aplnshing water in a churn? A. It is dissipated in the form of heat. 3. How are storage batteries conetructed, and how many cells would it take to light eight 16 candle power lamps through an evening, the plates in the cells to be 10 in. by 8 in . by $1 / 8 \mathrm{in} .9$ A.
Consult Supplement, Nos. $322,677,685,342,426,455$.
(4123) H. S., A. L. S., and others ask how to restore a meerschaum pipe which has been
burnt. A. Place corks in both the bowl and stem hole of the pipe, and place for one minute in boiling milk, if same length of time in boiling beeswaz, if the pipe is
ored quickly
(4124) G. D. C. asks: 1. Can the simple Science.," be run by the on page 498, " Expe:Eimental many celle would it require to run the motor at 500
revolutions per minute? If ae gravity battery will not tery will it take to run the motor, or will it run it at alls A. Neither the gravity nor the dry battery is suitable for running the simple motor. The motor has very low resistance and requires a battery of low resistance. 2. If the motor be connected up as a dynamo, or as the oror should be and run at about 500 or 1,000 revolutions per minute by foot power, would it give a current of electricity which could be felt by any one, without an dynamo. It generates only a very slight current. For a dynamo, wind the armature and field magnet with ner wire and use soft cast iron in the field magnets.
(4125) Tel. writes : I am making teleer, 44 in. ocus. The other glasses areeye lens, $3 / 4 \mathrm{in}$. focus, field lens 2 in . focus. Should I have tabe 40 in . long? I is $3 \%$ in. long. Will that do as well? A. The 32 in. tube will answer. You can make out the length of the
(4126) M. D. writes : 1. I am making
he motor described in Supplement, No. 641, and would the motor described inSUPPLEMENT, No. 641, and would of a coil of sheet iron instead of the wire? Would it results? A. Sheet iron will not answer a well as wire. 2. Would this same armature do for
other motors with field magnets of solid iron instead of Russia iron? A. Yes. 3. How many cells of storage battery would it require to run this motor, and how many ravity cells will be required to charge the storage bat battery is not suitable for running the me gravity battery is not suable the running the motor, but will the least number of volts required to run this motor? A. Four. 5. What size dynamo would this motor run? About how many lamps would the dynamo light, each mall in candle power? A. A very emall one. So practically. It is poor policy to run a dynamoby an electric motor driven by batteries. Better make use of the battery current, which is much greater than you
could produce in themanner suggested. You might possibly run one or two lamps of smallest size, 6. Would this motor run a 16 ft . cauvas boat? How could the speed be regulated? A. Yes; slowly. You would hardly need a speed regulator. The regulation, however,
can be effected by introducing more or less resistance can be effected by introducing more or less resistance the circuit. 7. Could this motor be made more powerful by increasing dimensions? A. Yes; but we
do not advise basing the calculations for a larger motor on the dimensions and proportions of this. 8. In what number of Scientific American Supplement would I find a description for simple dynamo? A. Nos. 161 and 600 . 9. How could the battery be fixed to keep it from splashing out by the movements of a boat? A The battery may be provided
(4127) H. M. T. asks: Can you give instructions for making a Ruhmkorff coil? A. Con (4128) W. A. H. writes: 1. I have a glazed earthenware vessel, the right size for a porous
cup, but know of no way to take off the enamel. Could you suggest one? A. The glaze cannot be re very little. 2. I bave a single fluid four-cell battery each cell consisting of a rumber of electric light carbons with a leaden ring cast around one end and a
rod of zinc, well amalgamated in the middle; inside is solution of salt and water. After being worked through a door bell a few days the current diminishes, but the difficulty is removed by cleaning the zincs. Even then
the current does not exceed two and one-half volts the current oees ene the zincs. Could you tell me of any way to get more current without so much trouble? Have tried sal-ammoniac, but the current does notincrease. Is the zinc surface too small? A. Con-
vert you battery into a Fuller battery by placing the vert you battery into a Fuller battery by placing the
zinc in a porous cell having mercury in the bottom, into zinc in a porous cell having mercury in the bottom, into
which the zinc dips. Place bichromate solution outwhich the zinc dips. Place bichromate solution ont-
side the cell and water inside. The carbons will, of coures, be immersed in the bichromate solution. A current is measured by amperes, not by volts, hence your (4129) H. A. A. asks: 1. Why is the in wound as two coils? $\mathbf{A}$. To prevent the passage of sparks from one end of the coil to the other. 2. I want to make an induction con about 4 inches long by inches in diameter; will a $1 / 2$ inch core be large enough ? A. The core will I do. 3. How much and what size wire primary, and fill the with No. 46 core made inside of a brass tube, and to decrease the current the tube and core were both pulled out. Was this right or should not the core be stationary? A It is right to have both the brass tube and the core movable. The brass tnbe may be omitted if the core is movable. 5. How can I splice some pieces of No. 26 together neatly and solder with soft solder, taking care to wash off all traces of soldering fluid to prevent cor rosion. 6. Is there a Supplement through which I can get some hints on making an induction coil like the above? A. None that gives other information than that contained in "Experimental Science." 7. Please make
the following from "Experimental Science," page 550 , the following from "Experimental Science," page 550, clearer. A piece of quite thin brass should be bent topass through the channel thus formed. A. The $\mathbf{U}$ shaped piece of metal is designed as a guide. It rests on the coll while the winding progresses and the thickness of the metal determines the space between the convo
(4130) J. J. O'D. asks : How to work Mushett steel to the best advautage, and how to temper it. A. Work Mushett steel in the same manner, and with the eame care, as high tool steel. Must not be heated beyond a full red. Requires no tempering.
When the tool is finished under the hammer lay it or wet emery wheel
(4131) E. N. H. writes : I intend makng a motor like the one described in "Experimenta going to have castings made for the field magnetand e armature. Could not the armature be cast with Cast iron should not be used for the core of the arm ture. 2. What size wire should the field magnet an he armature be wound with? (In making it $1 / 281 z e$.) A. It depends upon the source of the current and dhe
E. M.F. Probably No. 22 or No. 24 would answer for battery current. 3. Should I put the same number of es. 4. If it is not a good plan to have the size? cast, could I not cut out some pieces of the shape decribed trom Russia iron? A. Yes.
(4132) S. M. S. says : Can you give me formula for sensitizing albumen paper that does not eed fuming with ammonia? One of my friends ca fume the paper. A, Try this:
Nitrate
Nitrate of silver..
Liquid ammonıa..
.40 grs .
..
 (183).
(4133) X. Y. Z. says : I have a negative from which $I$ have been making silver prints,and the silof dampness, I expect,and spoiled it for printing, Can ou tell me of any method of removing it ? A. If the negative is varnished, remove the latter by soaking in ancohol for a few minutes, then apply the following to
e stained part:
B. Nater.......
Water.....
$1 / 2 \mathrm{dram}$.
1 oz.
1/3 dram.

Mix A and B and apply. A fresh solution should plying a saturated solution of chrome alum.
(4134) W. H. W. asks : 1. What would e the result if a motor or dynamo were constructed Science," Fig. 485, with the exception of the armature core, or in other words, if the wire of the armature were wound on a wooden core (the shaft being aleo wood)
and everythirg else being the same as in Fig. 485 ? How nuch current would such a machine give, run as dynamo, and how much current would it take as
notor to run it? A. The result of the construction described by you would be to produce a very slight urrent when used as a dynamo, and as a motor would possibly rotate itself, but it would not be a success. 2. What would be the result if I wound the made and put all be wire onthe ousde of the core, in the sides of the core bringing and forth over pins ection on one side? A. The result would be a ma hine incapable of being used either as a motor or ynamo, as the currents in the different portions of the .
(4135) D. P. sends us diagrams showng two halos concentric with the sun and four sun utersection with the halos, and asks explanation. Both halos are surmounted by inverted colored halo tangent to each of the white halos. The phenomena attributed to the existence in the upper atmosphere, he region of the chrus couas, of snowlakes thinl ight of the sun at certain angles. As the snowflakes are crystallized in a great variety of forms, the reflections and refractions from their surfaces and through their angular forms seem to account for all the known variation in halos, coronas, sun dogs or parhelia and
(4136) E. L. says: Noticing your direcions for coloring photos. in Scientific american of February 20, 1892, page 119, I keg to ask : 1. Will not the solution render the oil colors soft and flow over the ther part of the paper when rubbed with the finger. dried. 2. Are the effects permanent, and for how long? A. Probably for several yeare
(4137) T. W. K. asks for the ingredients that compose luminous paint, to make numbers that phides formed by igntion are characteristic ingredients. See our Supplement, Nos. 229, 197, 249, 539.
(4138) G. A. L. says: Please let me know through your paper what direction the north star is from the north pole? A. The pole star is now about
$1 / 4^{\circ}$ from the true pole. When the middle one of the three stars in the handle of the dipper (Mizar) is on the meridian below the pole star, the true pole is $114^{\circ}$ below the pole star. In any poeition of the line between toward Mizar.
(4139) C. E. D. asks how to find the altitude of a triangle when the base and the sum of the $=$ sum of altitude and hypotenuse squared minus base equared, the whole divided by twice the sum of hypotenuse and altitude.
(4140) W. W. asks: 1. How can I exme know how to proceed what ry? Will you please let etc.? A. You can explode the charge in a cannon by means of an electric fuse having a small platinum wire surrounded oy fine powder. A current from a Grenet
battery heats the wire to red ness, and explodes the powder, the latter igniting the charge of powder in the cannon. 2. Is cast iron preferable to soft iron for the be. 3. Which is risto? A. No; soft iron is prefera ooth powderor face powder is put up and sold, that to sale can be stopped by law if it is not patented, while B says, if it is heneficial and harmless, its sale cannot be
stopped and that a patent is only to protect it? A.

Taking out a patent does not oblige the patentee to sell,
nor does the mere fact that a patent is not taken out or does the mere fact that a patent is not taken out patent. 4. Also what is the meaning when they say such an article (face powder, etc.) is liable to stamp? A. It probably refers to the internal revenue stamp.
The appliction of a stamp to articles of merchandise is not
(4141) J. F. L., Jr., asks : 1. What is a 10 per cent solution? I have been told the following
1.1 oz . sold substance ( 480 gr .) 10 fl . oz. water. 2. 6 grs .
 A. A solution containing one-teuth its weight of the ubstance dissolved. This corresponds with your third may I put up a formula as follows;:

## Dextrin.... Acetic acid. W <br> Water..

Alcohol.
A. Weigh all parts. 3. Can you me a formula for the
fastest developer you know of for fast gelatino-bromide . Eikonogen

When cool add
Carbonate of potash.
If this develops too slowly add more carbonate of potash. 4. Can you tell me briefly how to form articial crystals of alnm, copperas, salt, sugar, etc., on a atrong solution and while hot immerse the threads After crystallization place more solution in the vessel Always let it cool a little before adding.
(4142) A. M. asks for the name of the cid used for stencil work on glass plates and how to use its A. Hydrofluoric acid is used in etching glass. York prepared for use, or you can prepare it yourself by pouring sulphuric acid upon fluorspar. A lead dish is required for this operation. The glass is protected with wax, paraffine or varnish. Where lines are re-
quired the protecting coating is removed with a needie or scraper. The glass is placed over the lead dish and the hydrofluoric fumes rising from the dish attack the glass where it is exposed. Care must be taken to not inhale these fumes and to avoid getting the acid
(4143) P. T. T ${ }_{\perp}$ asks : What volume and all of water will it require to furnish power to maintain 68 arc lights 2,000 candle power and 5,000 incandescent lights 16 candle power? What will first cost be in comparison with a steam plant of say 600 horse power?
Will cost of maintenance be less? Is there less danger of stoppages? What is the life of a turbine working 16 bours per day: A. Your installation will require about 600 horse power actual from the water power motor. If a turbine of good make is used, the waterfall should be equal to 700 horse power, as this depends upon two elements viz., height of fall and quantity of flow. We must nece:esarily refer you to Scientific American method of measuring a water power. The first cost of urbine and head flume is much less than a steam plant, lant may be brought within the cost of a steam plant The economy of running expenses depends upon the cost of coal, but is no doubt much less than stcam. With any degree of care against floods there is little or no danger of delays, far less than with the dynamos. (4144) E. W. H. says : I have a long ence with $41 / 2$ inches by $41 / 2$ inches Oregon fir posts et 3 feet in the ground. Fence has only heen in posishow considerable rot on the surface when dug down on. The posta were green when set. I do not want to take up the post, yet, at present rate, it would appear that they would rot off in three or four years. Would it do any good to bore into the posts, just above the round, in a standing direction, and fill the holes with ome mineral salt? If so, how large should the holes be nd what should they he charged with? A. We do know will no doubt add several years to their llfe. Soaking he ends of posts in a strong solution of sulphate of ron or sulphate of copper for a day has been tried and ound efficient for several times the life of posts without any application of preservative. We think it will pay to bore a $5 / 6$ hole in as slanting a position as con venient, from 4 inches above ground, say at $45^{\circ}$, threeourths through the post, and fill it with a eaturated so ood or a cork.
(4145) W. W. M. asks : 1. Can you give description in the Scientific American of the ound, and illustrate if you can? A. We refer you for articles on ginseng in general to the Scientific AmeriCAN, vol. 65, p. 104, vol. 64, pp. 19, 69, 309. 2. I send specimen of ash of burned flax. Can you explain
what gives the color, etc.? A. The colors are due undoubtedly to the pres
(4146) J. K. M. - For the information you require regarding brazing and japanning, we refer
you to "Scientific American Cyclopedia of Notes and Queries, price by mail $\$ 5$
(4147) C. M. T. asks: 1. Have you a good book on induction coils? If so, what price? A.
Supplement, Nos. 160, 166, 229 , and 569 , also Dyer? "Induction Coil," 50 cents. 2. How many electric ight carbons will it take to give E.M.F. of one volt? Absut 5 inches of carbon in fuid.) How much zinc? A. One carbon and one rod of zinc of any size will give
an E.M.F of nearly two volts. 3. I have a telegraph E.M.F of nearly two volts. 3. I have a telegraph cores to such an extent that it affects the free movement of the armature. 1s there any way to remove the magnetism? A. Remove the magnet cores, heat them red hot and bury them in ashes overnight, or until
cool.
(4148) R. P. asks: Why do the English believe the occasional finding of a horseshoe to be a
good omen? A. There is no reasonable explanation of the horeshoe superstition. There is no scientitic luck, excepting possibly the fact that one who picks up a horseshoe or anytting else of slight value and save or makes use of it is apt to have good luck. Possibly some of our readers may be able to give the origin of
(4149) C. H. B. writes: 1. I have been contemplating trying to use water glass as a substilute for glue in sizing spirits of turpentine barrels. We think it would that it can be used for this. A We think it would answer your purposes. 2. How is
it prepared and used? A. It is made by dissolving silica in caustic soda solution under pressure. Apply with a stiff brush.
(4150) A. T. M. - The word "typewriter "does not indicate either sex, and is correctly tricity. "Cosmopolitan" is correctly used as a noun, and more frequently than "cosmopolte," though there is no objection to the latter if you prefer it. The word "macadamized" is usually employed as an adjective, (4151) J. V. D. asks : Would a five horse power electric motor ( 500 volts, 10 amperes) afford sufficient power to drive a 10 in . circular saw for cutting cordwood? A. Five horse po
ample for drıving a $10 \mathrm{in} .\mathrm{cross} \mathrm{cut} \mathrm{saw}$.

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