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|  | NEW YORK, MARCY 22, 1890. | Werkit. |
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1. General view of the rock excavation and future course of the canal. 2. Dumping rock and debris from trestle. 3. Bird's eye view of the connection between the Hudson River and Long Island Sound by the ship canal n the Harlem Rive
THE HARLEM RIVER SHIP CANAL.-[See page 183.]

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## TERTS FOR THE SCIENTIFIC AMERICAN



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NEW CONFERENCE OF THE INTERNATIONAL INDUSTRIAL UNION.
The object of this union, which was inaugurated in 1883, is to promote reciprocity among the various nations, in respect to industrial properties such as patents and trade marks, and, like the Postal Union, to secure to the citizens of the respective members cer tain advantages and facilities not otherwise to be en joyed.
The rules of the Union provide, among other things, that trade marks and patents that have been lawfully secured in one country may be secured in all the othe countries belonging to the Union, subject to the res pective laws of the several countries. A priority of right to secure patents in the Union is given to the original patentee. This priority is denied to citizens of countries not members.
The United States joined the Union in 1887; but owing to the extremely liberal nature of our patent and trade mark laws in respect to foreigners, they re ceive little additional benefits through the Union; and owing to the peculiar rule of the Union, which only allows a term of seven months' priority from the date o the original filing of an application for a patent, the Americans have received little or no benefits.
The rules of the Union provide for conferences of the members, at which changes and reports may be con sidered. The next conference takes place at Madrid on April 1.
Mr. A. F. Seely, of the Patent Office, and Mr. Francis Forbes, of New York, have been appointed to attend the conference as representatives of the United States. Both gentlemen are highly qualified for the mission. Mr. Seely has had a long experience as Principal Examiner in the Patent Office. He is familiar with the working of our patent laws and the needs of inventors. With the trade mark laws he is especially posted, having had charge of that division in the Patent Office for several years. The aim of our representatives will be to secure modifications of the Union rules, by which Americans and all the members will enjoy real be fits, instead of the present nominal advantages.
Among the subjects which perhaps will come up be fore the conference is that of the establishment of uni form fees for patents. In this respect there is at pres ent a great divergence. England charges $\$ 770$ as fees for a 14 year patent, France $\$ 300$ for a 15 year patent, and the United States $\$ 35$ for a 17 year patent. In this country the patent holds good for 17 years without being worked. In France and other European coun tries, if an American takes patents there he is contina ally subjected to loss of his patent by failure to work within a year or two years. Reforms in these direction
would be very desirable. As to trade marks and goods, would be very desirable. As to trade marks and goods,
it is well known that imitations of American trade marks and goods constitutes the principal basis on which many European makers flourish and grow rich.

## PROGRESS OF DYNAMITE GUNS.

Trials were recently made near Utica, N. Y., of shells loaded with dynamite anddischarged from an ordinary cannon. The location was a ravine at Perryville Falls, and the gun used was a 9 inch English Blakesley rifled gun. Four successful shots were fired, as follows
The first consisted in firing a shell weighing 280 pounds and containing $51 / 4$ pounds of dynamite. The charge of powder was 12 pounds. The shell struck the cliff and one-half of the dynamite exploded. The sec ond shell was the same, using 20 pounds of powder. The third shell weighed 300 pounds and contained $8^{3 / 4}$ pounds of dynamite. The charge was 25 pounds of powder, the service charge for this gun. The shell did great execution on striking the rock. The shell passed through an 8 inch tree on the way without exploding the dynamite. At the cliff it burst, tore up the rocks generally, and split the steel bullet in half, one piece landing nearly a mile off. The fourth and final shot was the largest ever fired in the gun since testing ; 35 pounds of powder were used. The shell, weighing 350 pounds, or a hundred pounds more than the regulation, contained nearly 19 pounds of the best dynamite. This shell blew to powder the quartz block which it hit, and the bullet ricocheted up the cliff out of sight The dynamite all exploded at the moment of contact and would have blown a ship out of water.

In the Justin system the projectile is cushioned and protected from the action of the firing charge in such a way as to avoid shock and explosion of the dynamite. In 1886, 1887, successful trials by Lieut. J. W. Gray don were made at San Francisco, before boards of officers appointed by the War Department. These consisted in firing dynamite shells from ordinary cannon. Many charges were fired, and the effects of the dynamite upon the targets were terrific. The gun used was a 7 inch Ames wrought iron rifle, $23,000 \mathrm{lb}$. weight, powder charge 23 lb ., weight of shell 122 lb ., containing $22 / 3 \mathrm{lb}$. dynamite. The new plan of pneumatic guns by the same inventor are calculated to be able to throw projectiles carrying from 6 up to 1,200 ib. of high explosives.
In 1888 we chronicled the trials with great success a Constantinople of the invention of Mr. F. H. A. Sny
der, of New York, for throwing dynamite shells from ordinary guns. An ordinary field piece was used. Ten shells were fired, each carrying ten pounds of a secret explosive, containing 94 per cent of nitro-glycerine. Mr. Snyder's invention had been previously tried at Washington with success.
The Hotchkiss Ordnance Company are preparing a new style of pneumatic gun for firing dynamite shells from which brilliant results are expected. It will con stitute a new style of armament. Is adapted for field artillery as well as for ships and forts.
Our new torpedo boat Vesuvius, launched in 1888, has been so far completed that her guns were recently test ed with a degree of success, as will be seen from the particulars given in another column. This fast boa is provided with three pneumatic guns, each 56 feet long and 15 inches bore, capable, it is claimed, of delivering at a distance of two miles a projectile of 1,500 pounds weight, containing 600 pounds of dynamite No ship now afloat could stand the effect of such a projectile.

These various experiments are promising, and show that decisive progress is being made in the adaptation of high explosives to the uses of modern warfare.

The Glory of the Great Republic.
There are some eloquent figures which cannot, be re peated too often and which men are too apt to forget The fashion in which this great land has paid its debts, while others have increased theirs, is one of them. Here are the figures for just a quarter of a century, a mere s


While we have done this, Europe, with about five times our population, about four times our wealth and ot twice our natural resources, has added to it national debts in the last 20 years $\$ 8,200,000,000$, or over thrice our total original debt, and the interest charge to-day is thirty-fold our own. In 1865, when our figures begun, Europe owed $\$ 15,000,000,000$. It owes to-day over $\$ 23,000,000,000$, it pays $\$ 1,068,000,000$ a year interest, and is loaded besides with $\$ 887,000,000$ for military, war, and naval expenditures, including pensions, where our own are $\$ 130,000,000$.
This is the lesson of liberty; these are the fruits of freedom, and the Great Republic, without debt, without an army, without a navy, goes on in the great race of prosperity and industrial supremacy, distancing these heavily loaded competitors.-Philadelphia Press.

## Improved Photo-printing Plate Proces

M. Chas. Guillaume Petit has perfected a process of typographic engraving which insures, with skill, the absolute purity of the whites. This is the process The photograph is printed on a copper plate, covered with bitumen, and developed with essential oil, which leaves the copper bare in the absolute lights. It is washed, dried, and finally covered with powdered resin. It is then heated until a grain is perfectly formed. This dressing of resin on the insoluble bitu men has the property of rendering the bitumen soluble wherever the grain is formed. By plunging the plate again into the turpentine bath, the dissolved esin leaves a deep perforation in the bitumen. The plate is then recoated with a solution of bichromatized elatine; it is then exposed under the same negative by the aid of registration stops previously arranged, and is developed with perchloride of iron. In the pure whites there is no grain, and we have a plate where here is no need to have recourse to a tool in order to obtain the whites. Prints were shown in support of this process, which is very interesting, and may lead to other applications. M. Petit says that the dressing of resin has the effect of deoxidizing the bitumen rendered insoluble by light. We ought to know, in the first place, whether this insolubility proceeds from oxidation. Messrs. Chevreul and Kaiser have demonstrated that the effect caused by light is produced without the presence of oxygen, but with this reserve concerning a detail only affecting the theoretical question, we recognize the truly practical and very interest ing communication of M. Petit.-Photo. News.

## Cocaine Pencils for Use on the Skin

A writer in the British Medical Journal makes a suggestion which is easily convertible into a capital article for a cosmetic "special." It is, in short, a pencil or "stick" for use on the chafed and irritated skin, or on skins very susceptible to insect bites, etc. He says that an addition of two per cent of cocaine to the ordinary cacoa butter pencils converts the latter into a cosmetic remedy, which gives almost instant relief when rubbed over the irritated spot.

## Electricity on Board warships.

A paper by S. Dana Greene, late ensign of the U. S. navy, on the use of electricity on board ships of war, is published in the last quarterly report of the proceedings of the United States Naval Institute. Mr. Greene suggests, among other things, that the electric motor could replace auxiliary engines on board war ships, and enumerates these auxiliaries as follows
Steam, air, and condenser pumps located in engine room, both for main and auxiliary condensers. Steam pumps for fire purposes, for pumping out the ship, washing decks, etc.; steam reversing engines for each engine; steam engines for jacking the engines; steam steering engines; steam capstan engines; blower en gines for producing forced draught in the fire room ; ventilating engines for ventilating the living spaces below ; hoisting engines, under which head are included steam ash hoists and hydraulic ammunition hoists; steam winches about the decks for lifting heavy weights, swinging out boats, etc.; steam or hydraulic training engines for large guns; steam engines for driving the dynamos; steam engines for working lathes, drills, etc., in workshops.
Taken together, these auxiliaries will aggregate 40 or 50 engines on a large ship, representing perhaps 200 horse power. The engines, however, are never exert ing their maximum power at the same time. Hence, if the work were done by motors, not over 60 or, 70 per cent of this 200 horse power, allowing liberally, would have to be provided for in the dynamo room.

## Transmission of Power.

M. Marcel Deprez gives an account of the electrical transmission of power at Bourganeuf, in the Comptes Rendus, the following abstract of which appears in the Institution of Civil Engineers' Transactions. The author first calls attention to the partially successful experiments on electric transmission of power between Paris and Creil which he made in 1886, and which demon strated that $80 \mathrm{~h} . \mathrm{p}$. could be transmitted when $165 \mathrm{~h} . \mathrm{p}$. was being absorbed by the generator. In these experiments a pressure of 9,000 to 11,000 volts was used, and the failure of completely satisfactory results was attributed to the improper construction of the connecting cable, to defects of organization, and want of experience now available. This year, however, the authorities of the town of Bourganeuf decided, if possible, to utilize the power of a waterfall on the Maulde, situated 1,100
yards from St. Martin-le-Chateau, and $83 / 4$ miles from yards from St. Martin-le-Chateau, and $83 / 4$ miles from
Bourganeuf, and the work was intrusted to the Societe pour la Transmission de l'Electricite, engineered by the author. The fall utilized is about 100 ft ., and develops 130 h . p. in a horizontal turbine making 150 revolutions per minute. The generator is a high tension dynamo having two armatures on the same shaft in series with one another, of the form known as the Deprez model. The electrical details of each armature are as follows: Resistance two ohws, diameter of wire two millimeters, allowing for the armature a total cur rent of 35 amperes.
The machine is separately excited, the magnets absorbing 90 volts 20 amperes, rather more than 2 E.H.P. The line is double (out and return wires), composed of bare silicon bronze wire five millimeters diameter (about No. 6 B. W. G.) carried on porcelain insulators, after prolonged rain. The total resistance of the line is 23 ohms. The motor is identical with the generator, and is excited by part of the current from the dynamo and is excited by part of the current from the dynamo
used for the illumination of the town, while to start used for the illumination of the town, while to start
the motor the current from a set of accumulators is used. The actual lighting machines are Gramme dy namos. Experiments with an artificial line having a resistance of 25 ohms gave the following results : E. M. F. at generator terminal 3,550 volts, current 20 anperes, the E. M. F. of the lighting machines being 115 volts and the current 376 amperes, taking the efficiencies of the low tension dynamos at 80 per cent, and the high tension machines (as experiment showed) at 90 per cent. This experiment proved that 60 h . p. could be developed at Bourganeuf on expenditure of $100 \mathrm{~h} . \mathrm{p}$.
at St. Martin. The actual working of the machines has proved admirable. The regulation is effected by a pure water liquid resistance, and by a code of signals from the motor attendant to the attendant at the generator station. In a month there was only one stoppage of the generator and three of the motor, principally due to the inexperience of the enginemen. Particular precautions have been taken to avoid damage to the machinery from lightning discharges from the line, which appear to have been successful, but the methods adopted are not described by the author.

## A Telephone Signal Needed.

Those who have spent a half hour or so trying to ring up a man at the other end of a telephone line, and have found out after much effort that there was no one
there, would feel better if there was on the market something which would at once, when a box was rung up, give a signal stating that there was no one to receive a message, and how convenient if some attachment could be devised for communicating the time the person would return to receive the message.

## Electrical Calculations.- $\mathbf{I}$.

The readers of this paper often send questions as to the battery required to do different kinds of work. It is believed that a few words on the subject will be ap preciated by them.
In fixing the requirements in any case of electrical supply, three factors are concerned, the maximum difference of potential in the circuit, or the electromotive force, the resistance of the sircuit, and the current re quired. Any two of these being given, the third is deducible by Ohw's law, which may be thus expressed:
The current, C, given or required is equal to the elecThe current, C , given or required is equal to the elec-
tromotive force or difference of potential, E divided by
the resistance, R. $\left(C=\frac{E}{R}\right)$ Amperes, volts, and ohms are generally used as the units of current, of po tential or electromotive force, and of resistance respec tively.
In considering the battery to be used, we must have regard, $a$, to the minimum number of cells that wili do the work, and to their arrangement, or, $b$, to the proper number of cells to work economically. As regards the latter, it may be said that, theoretically, the more
cells we use, the more economical will be their working. We can apply practical considerations only in deter mining the economical number, because of the fact stated in the preceding sentence. We may first consider case $a$.
A battery cell is rated by its resistance and electromotive force. Dividing the last by the first, we get the current it can give through an external resistance equal to zero, or infinitely small. Multiplying such current by E. M. F. (electromotive force), we obtain the energy which it can develop through such a circuit, such energy being expressed in volt-amperes or watts. Suppose a battery giving 2 volts E. M. F. with a resistance of $1 / 4$ ohm. Its current through zero resistance is equal to $\frac{2}{1 / 4}$ or 8 amperes. The energy it can develop through zero external resistance is equal there fore to 8 amperes multiplied by 2 volts $=16$ volt-amperes or watts. To ascertain the energy absorbed by any
appliance, a lamp for instance, the same calculation is gone through. A 100 volt lamp of 30 ohms resistance requires a current of $\frac{100}{30}=31 / 3$ amperes, absorbing 100 volts multiplied by $3 \frac{1}{3}$ amperes $=3331 / 3$ watts of nergy.
The general rule for determining the minimum number of cells required per lamp, etc., to be supplied may be thus stated: Divide the energy absorbed in a single lamp or other apparatus by one-quarter of the energy of a single battery cell as deterwined above; both en-
ergies being expressed in watts. The quotient is the ergies being expressed in watts. The quotient is the
smallest number of cells that will do the work. In the case cited in the preceding paragraph the lamp energy is $3331 / 3$ watts. One-quarter of the battery cell energy is $\frac{16}{4}=4$ watts. Dividing $3331 / 3$ by 4 , we obtain $831 / 3$ cells as the number required.
This rule is derived from the following considerations. If a current is passing through a circuit energy is expended on any portion of the circuit in proportion to its resistance. If, therefore, a battery supplies an external circuit of resistance equal to its own, one-half the energy is expended in the battery and one-half in the external circuit. But the total current or energy expended on the whole circuit is equal to one-half that which the battery could develop with an external circuit of zero resistance. Therefore, the external circuit (lamp or other appliance) receives only one-quarter of the sum of the energies of the cells when calculated as short-circuited
A less abstract way may be taken to reach the same result. A given battery does the maximum work when its internal resistance is equal to the resistance of the external circuit. By its internal resistance it acts as a rheostat. To force a given current through a lamp or other appliance and through its own cells, double the because the resistance of the battery in addition to the external resistance has to be overcome. Hence, double the cells required to give the voltage of the lamp have to be placed in series, and as this doubles the resistance the number of cells has again to be doubled in order to form a parallel circuit,thereby reproducing the original resistance. This quadruples the battery, and the rule embodies this multiplication of the cells.
Thisrule is of interest, as it is so general. But where a definite voltage and amperage are to be supplied, it does not always apply. Thus, it gives the minimum battery required per lamp where a number are to be supplied, but not necessarily the number required for a single lamp only. The following rule is simple and of general applicability :
Express the ratio of resistance to voltage in the ap pliance to be supplied and call it $1: n$. Do the same for one cell of the battery. If it is $1: 2 n$ or $1: 3 n$ that is to say twice as great, or more than twice as great, as that of the outer circuit, lamps, etc., the cells of ber deduced by the following rule : The number of cells
equals the amperage of the outer circuit (lamp or other appliances) multiplied by the resistance of the same outer circuit divided by the difference between the voltage of a single cell and the product of the amperage of the outer circuit by the resistance of a single cell. Using small letters for the cell constants, and large ones for the outer circuit constants, the formula is thus expressed: Number of cells $=\frac{\mathrm{C} \frac{\mathrm{R}}{e-} \mathbf{C} r}{} \quad$ If the cell ratio is less than $1: 2 n$, then, by placing two or more cells in parallel, a group can be made which will satisfy exactly or exceed as little as possible this ratio Then the formula given is to be applied to such group exactly as if it was a single cell.
Suppose a 100 volt $31 / 3$ ampere lamp is to be supplied. The resistance of such a lamp is found by dividng 100 by $31 / 3$, giving 30 ohms. Suppose it is to be supplied by a battery of cells, each of 2 volts electromotive force and $1 / 4$ ohm resistance. The lamp ratio of resist ance to voltage is $30: 100$ or $1: 31 / 3$. The battery cell ratio is $\frac{1}{4}: 2$ or $1: 8$. This latter being more than twice as great as the lamp ratio, the cells must be placed in series by the formula: $\quad$ Number of cells $=\frac{\mathrm{CR}}{e-\mathrm{C} r}$, or $\frac{31 / 3 \times 30}{2-(31 / 3 \times 1 / 4)}=\frac{100}{2-0.833}=\frac{100}{1.166}$ or $85 \frac{8}{10}$ cells. To test the accuracy of the work, we may apply Ohm's law. $\mathrm{C}=\frac{\mathrm{E}}{\mathrm{R}+R^{\prime}} \quad 86$ cells give $\mathrm{E}=172$ volts $R^{\prime}=211 / 2$ ohms. $R$ we know is 30 ohms. Substituting these in the formula, we have $C=\frac{172}{30+21 / 2}=3 \cdot 34$ amperes. A light excess of current is given, as we have taken $\frac{2}{10}$ of a cell too much, which is unavoidable.
Next assume the same lamp to be supplied by a bat tery of the foliowing cell constants : $e=1 r=8 c=1 / 8$ The battery cell ratio of $r$ to $e$ is $8: 1$ or $1: 1 / 8$. Fifty four such cells placed in parallel will reduce the resistance to ${ }_{6}^{174}$ this amount, or the resistance of the group will be expressed by 尔 ohm, giving the ratio $\frac{8}{6}: 1$ o $1: 6 \cdot 675$. Applying the formula to this group, whose
electromotive force is still 1 volt, we have: Number of electromotive force is still 1 volt, we have: Number of
$31 / 3 \times 30$
100 groups $=\frac{1-\left(31 / 3 \times \frac{8}{54}\right)}{1-(3)}=\frac{100}{0 \cdot 506}=200$ groups in series,
uearly ; or 54 cells in parallel and 200 cells in series, nearly; or 54 cells in parallel and 200 cells in series,
otal of 10,800 cells. Testing the correctness of our work by Ohm's law, we have current $=\frac{200}{28 \cdot 5+30}$ or $3 \cdot 4$ amperes, again a slight increase over that required.

## Trying the Air Guns on the Vesuvius

The Secretary of the Navy having been unwilling to receive the dynamite gunboat Vesuvius from its contractors, because the former trials of the guns with which she is supplied had been made with dummy hells, a new trial was ordered with "live" shells, which took place on the Delaware River, a few miles below Philadelphia, March 13. Gun cotton instead of dynamite was used in the shells, the kind of dynamite desired not being readily obtainable. Three 500 pound shells were fired, on a mile range, the No. 1 projectile passing 250 yards over the mile, the No. 2, 300 yards, and the No. 3,400 yards. A large company of engineers and naval officers was present, and the trial was declared to be a great success. The three shells exploded with great accuracy at the instant they had been adjusted to go off, the first one being five seconds after striking the water, the second one second after, and the third at the instant of striking. The report of the latter explosion was heard at a great distance, and is described as having been sharper than that from any high-powered gun at present in use by our government.
The public has been led to believe this ship was built for the express purpose of firing dynamite shells, but so far not a single charge of this explosive has been fired, and there appears to be no one willing to take the responsibility of subjecting the vessel to a dynamite test. Can anybody teli us what is the real trouble?

## The Head and the Brain.

Dr. Starr, of London, says that it is impossible to draw any conclusion from the size or shape of the head as to the extent or surface of the brain, and so as to the mental capacity. It is absurd to judge of the brain surface by either the size of the head or the extent of the superficial irregular surface which is covered by the kull, without taking into consideration the number of folds or the depth of creases. "For a little brain with many deep folds may really, when spread out, have a larger surface than a large brain with few shallow folds." What do phrenologists say to this?

Camphoric acid is a substance that has been introduced very recently into medicine. It is a crystalline body, forming colorless, needle-like crystals, it is difficultly soluble in water, but dissolves freely in alcohol and ether. It is recommended for external application in the treatment of chronic diseases of the larynx, throat, and nose, and is administered in solutions of 1 per cent or more in weak spirit.

## SMOKELESS GUNPOWDER.

Much has been written lately concerning the smokeless powder that has been adopted by the French army, and which foreign nations have vainly tried to copy. Nevertheless, comparatively few have had the opportunity of witnessing any experiments with this new product, and do not recognize certain differences that exist between the old and the new powder. Without examining into the ballistic properties of this explosive, we shall refer simply to the suppression of the smoke and the advantages to be derived therefrom.
Through the kindness of one of our colleagues, Mr. Paul Gers, the distinguished amateur photographer, we have the good fortune to be able to present to our readers two very interesting photographic repro ductions of the trials. The first photograph, Fig. 1, represents a volley in which the gun used was of the model of 1874 , and the other proof represents a similar trial in which the gun with the smaller cal: ber of the model of 1886 was used.
In the first trial common powder is used; in the second, the smokeless powder. The difference is very striking and scarcely needs any comment.
it must be borne in It must be borne in
mind, however, that in the discharge of firearms the cloud of smoke is very rapidly modified in such a way that it presents a very different appearance at different instants. The proofs in question were taken immediately after the order
mediately after the order,
"Fire." Thus, with the model of 1874 and the old powder the cloud of smoke is at once projected forward and then floats back upon the troops, whom it conceals completely. The photograph shows the first period after discharge. With the new powder, at the discharge there is a slight veil, which immediately disappears. This veil is entirely invisible at a distance of 100 paces. In the instantaneous photograph it is exaggerated, and the photographic plate in this, as in other cases, has brought out more than the eye is able to perceive. This absence of smoke will have an unforeseen influence upon future wars.
The troops will be able to shoot with much greater accuracy, as they will not be blinded by the smoke of the powder. Furthermore, their position will not be as readily indicated to the enemy as with the old powder.
It is well known that the location of the person shooting is not able to be determined with any accuracy without the help of the smoke. On the other hand, the troops of the second line, who serve as a support and re-enforcement and who could conceal their movements under the curtain of smoke produced by the first fire, lose the benefit of this shield, the advantage of which, however, is much questioned by competent authorities. The adoption of the smokeless powder will certainly introduce some changes in military tactics, and it will be interesting to observe what modifications will be introduced into the tactics on the field of battle.-Albert Londe, in La Nature.

## Height of Wave Dashes.

At the office of Major Handbury, United States Engineer, is to be seen a "dornick" of basalt weighing 62 pounds, which was brought from Tallamock Light by Mr. McClure, lampist of this district.
He reports that a most fearful storm was lately experienced at the rock, and that the dornick was thrown up by the force of the waves and fell on the roof of the lightkeeper's house, 110 feet above the sea level, breaking a hole in the roof. The waves were so high that the water came down the chimney of the boiler house of the fog siren in torrents, and poured out through the tubes of the boiler. The chimney is about 130 feet above sea level. The spray entered the cowl of the chimney over the lamp, which is 150 feet above sea level, and ran in streams to the bottom.-Portland Oregonian.
the original discoverers of the South Carolina phosphates, visited the spot, and his verdict confirmed the dawning supposition. The speedy result was the purchase by Mr. Dunn and a number of other capitalists of many thousands of acres of phosphate lands, and the formation of the Dunnellon Phosphate Company, with a capital stock of $\$ 1,200,000$. Representatives of the Bradley Fertilizer Company, of Boston, are said to have bought 4,000 shares in the Dunnellon Phosphate Company, for which they paid nearly $\$ 400,000$. The Company, for which they paid nearly $\$ 400,000$. The Dunnellon Company controls 35,000 or 40,000 acres of the best lands. The Baldwin Fertilizer Company, of Savannah, has bought not less than 40,000 acres of
phosphate lands. Representatives of the Augusta Fertilizer Company, of Georgia, are also buying largely. Many of the heaviest investors are Florida men, but nearly every large fertilizer firm in the United States has a representative States has a representative
either buying up lands or either buying up lands or getting short options on them. The excitement throughout all the adjacent country is intense. Land hitherto deemed almost valueless commands almost anything the owner likes to ask, and many formerly poor men are re formerly poor men are realizing fortunes on their
sales. In the country tributary to Peace River much the same spirit prevails. In the neighborhood of Arcadia, which is a second Dunnellon, at present three companies are operating - the Moorehead, rating - t h e Moorehead,
Scott, and Peace River


Fig. 2.-FIRING A VOLLEY WITH SMOKELESS POWDER. Scott, and Peace River
The Moorehead Company is
in similar abundance may be found in the northwestern counties. The line mentioned extends through parts of Alachua, Levy, Marion, Citrus, Hernando, Pasco, Hillsboro, Polk, and De Soto counties, and is about 160 miles in length.
Although everywhere throughout the territory traversed by this line every one is on the alert in regard to phosphates, and the far southern counties are already the scene of surprising development, perhaps the main center of interest is the little town of Dunnellon, on the Withlacoochee River, which forms the boundary be tween Marion and Citrus counties. It is a striking illustration of the newness of the discovery that only a few months since, in a pamphlet setting forth the beauties and advantages of the country around Dunnellon, while picturesqueness, health, orange groves, vegetable gardens, boating, fishing, etc., were freely
spoken of, not a word was said as to phosphates, which
are now the all-absorbing subject. The particulars of
Phosphate Company. The Moorehead Company is building a railroad from the Arcadia depot to the works at the river. The Peace River Phosphate Company is a heavy corporation, with headquarters in New York City, Gen. Nutters as president, and Maj. Singleton local manager. The Scott Company have put up works at Zolfo Springs, a railway station eighteen miles above Arcadia, and will soon be shipping heavily. It is expected that soon the three companies will run a regular phosphate train daily to the North. In the eighborhood of Bartow, in Polk County, large finds eighborhood of Bartow, in Polk County, large finds have been made, and sales of land have been effected
at a great advance. The phosphate deposits around Fort Meade are reported as large and exceedingly rich. The discovery of phosphates in Florida, in almost incredible abundance and a large portion undoubtedly of the highest value, is indeed a wonderful event in the history of a State that has experienced extraordinary vicissitudes. It comes most timely when the whole industrial community is awakening to a sense of its strength, and it will give a stimulus to every energy of the people. It will make Florida the headquarters of an interest contributing to the main industries of the country, and in more senses than we can pause to enumerate, it will bring Florida to the front rank of States in wealth and in of States in wealth and in industrial and commerciance.-The South.

## Cheap Production of Iron.

A correspondent to one of our daily newspapers states that the balance sheet of the Woodward Iron Comthe Woodward Iron Company, of Birmingham, Ala., a few months ago showed the total average cost to
the company, including rethe company, including rethe discovery and the resulting incidents are highly invested, improvements, etc., of producing pig iron, interesting. Hon. John F. Dunn, who is the ruling spirit in a great enterprise which has already made Dunnellon famous, has given for publication a statement which shows graphically the origin of what has transpired. Last June Mr. Albertus Voght left with him a package of marly earth discovered in digging a well near Dunnellon. He determined to have it analyzed. The result showed that it was rich in phos. phoric acid, and that in fact this "flinty-looking graysh white substance" represented a hitherto overlooked mine of wealth for Dunnellon and all Florida. Investigation proved that the substance existed in immense quantities. Professor Shepard, of Charleston, one of
had been only $\$ 8.36$ a ton for the year just then ended. During one month of the year the average total cost had run down to $\$ 7.71$ a ton, which is the lowest we have ever known of pig iron being produced.

Fire in a Car.-On the west bound overland train from Ogden, February 27 , when 35 miles west of that point, a fire was discovered in the mail car. Finding it impossible to extinguish the flames, an effort wasinade to reach a water tank six miles distant, and, although the speed of a mile a minute was maintained, the water tank was reached too late to be of much use, 158 sacks of through mail being almost wholly consumed.

## An Insurance Company with over $\mathbf{\$ 1 0 0 , 0 0 0 , 0 0 0}$

The forty-fifth annual report of the New York Life Insurance Company, a summary of which appears in another portion of this paper, presents some telling figures as to the great strength and remarkable prosperity of the company. Its income for the year 1889 was over twenty-nine million dollars, and it paid to policy holders during the year over twelve million dollars. The assets of the company on January 1,1890, were $\$ 105,053,600$. It goes without saying, therefore, that those insuring in such a company may be quite as sure of the prowpt payment of the amount called for by each policy as they would be if the money itself was deposited on their credit in the best bank or trust company. All theleading items in the company's business show a large ncrease over the corresponding items for the preceding year, and with the excellent management which has been for so many yearsan eminent characteristic of the company, it is difficult, if not impossible, to conceive of any calamity so serious as to materially impair its resources.

## AN IMPROVED CURTAIN FIXTURE

A fixture especially adapted for use with curtains covering shelving in stores, whereby the curtains may be readily rolled up or unrolled, is illustrated herewith, and has been patented by Mr. John L. Baker of Greensborough, N. C. Figs. 1 and 2 are sectional views of the operating parts, Fig. 3 representing the practical application of the improvement. Beneath the cornice and secured thereto are arranged perpendicular hangers, each carrying a grooved friction pulley, and slightly to their rear are secured horizontal sheaves, each carrying a grooved pulley, a series of pins being also projected outward from the beading or cap piece beneath the cornice, each pin carrying a loosely turning collar, and these collars forming friction rolls for a strip or bar of wood about one-half the length of the cornice. The upper end of the curtain is rigidly secured to the beading or cap piece, the curtain having a pole at its lower end, and cords secured to the cap piece passing downward on the inner face of the curtain and perpendicularly upward on its outer face, the number of cords used being determined by the


BAKER'S CURTAIN FIXTURE.
length of the curtain. The bar sliding on the sleeved pins has a friction roller journaled at one end, and all the cords which pass upward in front over the hanger pulleys, and certain of the cords which pass through the sheaves, are attached to the rear of the slidin bar, there being a connection between the end of the bar carrying the friction pulley and a windlass. As shown in the illustration, two reels are provided for the manipulation of two curtains, both of which cover one set of shelving, as when an inner gauze and an outer heavy curtain are desired, the reels being ad justable to manipulate each curtain separately. Shelv ing on opposite sides of a partition may also have cur tain fixtures operated from one shaft or windlass.

## DECISIONS RELATING TO PATENTS Supreme Court of the United State EVORY V. BURT.

Letters Patent No. 59,375, issued to Alexander F Evory and Alonzo Heston, November 6, 1866, for an improvement in boots and shoes, Held to be for the manufactured article and not for the mode of produc ing it, and declared to be invalid for want of patent able novelty.
A mere carrying forward or more extended application of an original idea-a mere improvement in de gree-is not invention.
Where certain parts of a water-tight shoe were old a simple change in the form and arrangement of such parts, subserving the same purpose as like parts of shoes constructed under earlier patents and without causing any new function to be performed, does not constitute invention

## AN IMPROVED LISTER AND DRILL

The accompanying illustration represents a combined lister and drill whereby any desired amount of soil can be turned onto the seed in the center of the trench formed by the plow, Fig. 1 being a plan and Fig. 3 a perspective view, while Fig. 2 is a sectional elevation of the seed box. On the plow beam is pivoted


## LOUGHRY'S LISTER AND DRILL.

a curved bar carrying a wheel traveling on the ground in front of the plow, and designed to regulate the depth of the trench to be formed, the bar being ad justable higher or lower by means of a pin passed through apertures in its forward end and the plow beam. Near the rear end of the beam is pivoted a backwardly extending frame, carrying at its rear end a shaft with a grooved wheel held in line with the plow, and on this shaft is a sprocket wheel which ope rates, by means of a chain, the seed-dropping wheel the latter having recesses in its periphery adapted to register with an aperture in the bottom of the seed box. The seed are discharged into a spout extending downward between the mould boards into the center of the trench formed by the plow, the latter having a small ridger or subsoiler extending below to form a small furrow into which the seed is dropped. Angle irons are secured on each side, back of the seed box and two rods are adjustably attached to depend from these angle irons, there being mounted to turn loosely on the lower end of each of these rods a concaved disk held in front of the rear grooved wheel, these disks be ing set at an angle to each other, so that the soil turn ed up by the plow is thrown onto the seed dropped in its rear. The grooved wheel following directly behind the disks serves to tamp and give an oval form to the ridge over the seeds in the bottom of the trench. The rear end of the frame is pivotally connected with a rod extending upward between the plow handles, and on this rod is a handle by means of which the operator can conveniently lift the grooved wheel and the disks when desired, or by which they may be retained in elevated position. Next to the handle is also pivoted a spring lever pivotally connected by a link with a scraper, for scraping off any dirt gathering on the periphery of the grooved wheel.

## The Chicago Elevated Railway.

The Lake Street elevated railway, of Chicago, is now in progress of construction. The line is from the east end of Lake Street along that street to the village of Oak Park, about four and one-half miles. In order to get a franchise for the line, it was necessary to obtain the consent of fifty-one per cent. of the owners of the property fronting upon it, exclusive of public property This has been done, says the Railroad Gazette, and the ompany has contracts with the property owners and receipts for payments for right of way, thus prevent ng future questions of damages.
The posts are placed on the curb line. The stations are to be built in the middle of the blocks, in buildings bought or erected by the company, leaving the sidewalks entirely free. It is proposed to build the "up" and "down" stations on alternate blocks, and to make them architectural improvements to the street. The entrances and exits will be entirely within the build ings, and many applications have already been received or renting office room in the stations, and the company expects to make them a considerable source of revenue. By the requirements of the ordinance the company is compelled to build sixteen stations for four and one-half miles of road, but it is contemplated to start with thirty-two.
The plans and specifications for the structure have been prepared under the supervision of Mr. Theodore Cooper as consulting engineer. A contract for all of the iron work and erection has been made with Messrs. Cofrode \& Saylor, of Philadelphia, and erection has already been begun. Between twenty and thirty spans are now up. Messrs. Alberger \& Fitzgerald are the general contractors for building and equipping the

The structure is of wrought iron posts and girders the posts having a horizontal section of 14 in . by 15 in . Provision for expansion and contraction of the longitudinal girders to the amount of $3 / 4 \mathrm{in}$. will be made in each span ; one end of the girder being free to move and the other bolted to the cross girder. The clea spans of the girders will range from 45 ft . to 60 ft . The cross girders will be of wrought iron with upper and lower chords and web members riveted up of plates and angles.

The Eyes of the Mole.
Carl Hess, the German naturalist, says Nature, has proved by minute microscopical investigation that the eye of the mole is perfectly capable of seeing, and that it is not short-sighted, as another naturalist (Kadyi) would have us believe. Hess maintains that, in spite of its minute dimensions- 1 millimeter by $0 \cdot 9$ millime ter-the eye of this little creature possesses all the ne cessary properties for seeing that the most highly de veloped eye does, that it is, indeed, as well suited for seeing as the eye of any other mammal, and that in the matter of refraction it does not differ from the normal eye. In order to bear out the theory of short sightedness, the physiological reason was adduced that in its subterranean runs the mole is accustomed to see things at close distances, and that its eve had become gradually suited to near objects. But to this Hess objects that the mole when under ground mos probably makes no use of his eyes at all, as it would be impossible to see anything, owing to the absence of light, but that when he comes to the surface, and es pecially when he is swimming, he does use his eyes. In order to accomplish this, he only has to alter the erect position of the hairs which surround and cover his eves, and which prevent the entry of dirt when he is under ground, and at the same time to protrude his eyes forward.

## AN IMPROVED SENSITIVE DRILL.

The accompanying illustration represents a new form of drill, in which the variations of speed and power ar designed to be so completely under the control of the perator, and the adjustments so perfect, that the per son using the drill is always able to determine the pressure which is being applied. The speed of the drill spindle can be increased or diminished instantly, or the motion reversed, without stopping the machine or shifting belts, more or less power being applied to the pindle as the size of the drill or the nature of the work may require. The feed lever has a ver'y sensitive ad


## barnes' SENSITIVE DRILL.

justment, which makes it possible to use the smallest drills with the least possible danger of breakage. By hand screw within convenient reach the platen or table can be moved rapidly on the column, and can be clamped firmly at any desired height. This drill is made by the W. F. \& John Barnes Co., Yo. 9 Ruby Street, Rockford, Ill.

## The Whistling well.

In accordance with a request made to me by the editor of the Scientific American, I write what I believe to be the first description of what is known locally as the " whistling well," that has appeared in any scientific publication. The well is located on the farm of Colonel Weston Flint (for many years Patent Office Librarian), in the town of Great Valley, Cattaraugus County, N. Y., about twenty miles from where the writer now resides.
About forty-five years ago the father of Colonel Flint undertook to dig a well. At a depth of twenty feet a little water was found, but as it was thought to be insufficient, the well was continued to a depth of forty feet, and ended in coarse gravel, with no trace of water, except that already mentioned. Thinking that the cavity might form a reservoir for the dripping water from the small vein that had been cut, the well was stoned up in the usual way. No water, however, accumulated, and as a water well it was a failure. Before long it was discovered that at times a strong draught of air rushed into the well, and at other times rushed out with equal force.
A flat stone with a $11 / 4 \mathrm{in}$. hole through its center was fitted over the mouth of the well. Into the hole was fitted a whistle, which changed its tone, dependent upon the upward or downward current of air through it. It was soon learned that the whistle was a most reliable weather prophet or barometer.
In settled weather the whistle was silent. An approaching storm was heralded by the warning shriek of the whistle as the air rushed out of the well, but as clearing weather approached, the current of air changed and rushed into the well, and the faithful whistle told the story by its changed tone.
When I last visited the well, which was about five years ago, the whistle had been removed as worn out, but the flat stone with a hole in it was and is now in place.

While the air was rushing out one day, I tried to test the pressure by putting a chip of wood of the size and thickness of a man's hand over the hole, and it was thrown up more than twelve inches. I have of ten seen it during a rain storm, and as the water began to run down through the hole, the outflowing current of air threw it up in spray several feet high, giving it the appearance of a fountain.
This well attracted a good deal of local attention at first, but a generation of people has grown up about it, and I do not so often hear it spoken of as a curiosity, but it is the staple source of weather prognostica tions in that vicinity

The well is located about fifteen rods from a fair-sized creek. The bottom of the well must be some fifteen feet below the bed of the stream. Between the well and the creek is a very good spring of water. On the farm adjoining, and about thirty rods distant, a well was bored 75 to 100 feet deep, and affords plenty of water. No such phenomenon was observed in bor ing this well.
Six years ago another neighbor undertook to dig a well on the opposite side of the creek, and about 100 rods distant from the whistling well. At about thirty feet deep the well was in coarse gravel and no water At that time a heavy shower sent a flood of surface water into the well, and it disappeared quickly, but immediately after a roaring sound, something like the hum of a thrashing machine, came from the open well. This was heard by many people, but not by the writer.

Through some feeling of superstition on the part of the owner, the well was at once filled up and further investigations prevented.
The surface rock in that vicinity is a sort of sand stone, and the underlying rock is slate and is "in place." There is no limestone, hence no connection with caves. No scientific investigations have ever been made of the whistling well.
I should be pleased to hear some reasonable explana tion of the phenomenon described. I shall be glad to visit the well with any person wishing to investigate or to furnish further particulars if desired.
A well somewhat similar, located somewhere in the South, was described by a writer in the Scientific American about two years ago, and an explanation asked for, but thus far there has been no response pub lished.

Yours truly
F. S. Oakes.

Cattaraugus, N. Y., February 20, 1890.


## AN IMPROVED COUPLING LINK

The accompanying illustration represents a link capable of use with any drawhead, and adapted to automatically couple with the pin in an approaching draw head. It has been patented by Mr. Harry Ackerman, of No. 306 Second Street, Jersey City, N. J. Fig. 1 is a side and Fig. 2 a plan view of the link, the latter showing one of the plates removed and the arms car ried out to their farthest position, while Fig. 3 shows the device in use. The body of the link is held between a top and a bottom plate, secured together by rivets, and consists of a casting or forging with a rib like central section, on each side of which is pivoted a latch arm, both having hook-like heads adapted to interlock when closed. Upon the opposite sides of the arins a recess is produced in the heads, whereby the hook portion of one head will slide beneath the hook portion of the opposite head. The two arms are held in their locked or closed position by means of springs, preferably of rubber, located between the central rib of the body and the inner extremities of the arms, these springs yielding sufficiently to allow the arms to be pressed open by the pin in an approaching draw head, and closing the arms automatically as soon a


ACKERMAN'S COUPLING LINK.
such pin enters the slot to the rear of the hooked heads. To uncouple the arms are forced outward by hand, or in any other approved manner.

## Torpedo Gunboats for Chili.

Some time ago the government of Chili decided tha was necessary to increase the national navy. It was considered of the utmost importance to be able to keep the communications along the coast open, many of the towns, from the nature of the country, being almost unapproachable by land, their supplies de pending on the communication by sea. A commission was therefore appointed and sent to Europe, with a view of arranging for the construction of one very powerful armorclad, two swift cruisers, and two tor pedo gunboats of the Rattlesnake type. The order for the two torpedo gunboats was placed with Messrs. Laird Brothers, Birkenhead, who have just launched one o the vessels, while the second is almost ready for launch ing. The boats are rather larger than the Rattlesnake measuring 240 feet in length by 27 feet 6 inches beam, the maximum draught of water being from 9 feet to 10 eet. The vessels are divided into 38 water-tight com partments, a center line bulkhead dividing the two en gine rooms and the two sets of boilers. The machiner space is protected by steel bulkheads extending from the bilge to the gunwale, and forming the coal
bunkers. The vessels will be fitted with two pairs of bunkers. The vessels will be fitted with two pairs of
triple expansion engines, designed to develop 4,500 horse power under forced draught, and to drive the gunboats at a speed of 21 knots. The armament wil consist of seven Hotchkiss and two Gatling guns, be sides five torpedo guns.
mproved Draught Appliances tor Freight Cars
The effect of air brakes and automatic couplers in naking a modern freight car a more highly organized and expensive structure is extending to other portion of the car, particularly the draught rigging and the ruck.
With an efficient apparatus to control speed and stop quickly, the tendency is to run freight trains at speed twice as fast as has been regarded safe practice in previous years. The other details of freight cars, however, are retained and used now, and some of them are not suited to the new condition of things. Their rapid wear and frequent failure is pointing plainly to the wear and frequent failure is pointing plainly to the
necessity of further improvement in the way of more necessity of further improvement in the way of more
substantial, and consequently more expensive, construction.
The economy resulting from high speed freight trains is not to be all clear gain in freight receipts, for a portion of the increased earnings must be expended in more durable material and better workman ship, or that economy will not be maintained.

The sudden application of quick-acting brakes at high speed in mixed trains composed of cars fitted with link and vertical plane couplers will result in a more severe trial of drawbars and draught rigging than they have had heretofore. In switching, the use of automatic couplers will lead to quicker work and higher speeds, because the engineer will not have the fear of injuring his fellow trainmen constantly in mind, and he will not exercise the same care as when switchmen had to go between the cars. The caution which protected the man, and, incidentally, the car will now be relinquished, and the couplers and their attachments will suffer by it.
The draught rigging of freight cars, as is well known, is the one part requiring most frequent repairs, and the number of cars delayed for such repairs is certainly on the increase, as it amounts to 60 per cent of all cars held in shops and on track for repairs.-Mas ter Mechanic.

## The Nicaragua Canal

The election of ex-Senator Warner Miller to the presidency of the Nicaragua Canal Company, at a meeting of the directors in New York, on the 6th inst. is an additional indication, if any such were needed, of the intention of the promoters to push this great enter prise with energy and business sagacity to its conclu sion. The former president of the company, Mr. Alfred C. Cheney, of the Garfield National Bank, is still as actively connected with the enterprise as ever, and is now vice-president; but the time has come when the canal requires a working manager who can devote all canal requires a working manager who can devote all
his time thereto, which President Warner Miller intends his time thereto, which President Warner Miller intends
to do, pushing the work, as he says, " with all the to do, pushing the work, as he says, "with all the
vigor that men and money can bring to bear on it.' The board of directors includes many men of high standing in the financial and business world, and though there has not been much flourish of trumpet about what they are doing, as was so conspicuously the case at Panama, all accounts agree that the pre liminary work has been most thoroughly performed and a substantial commencement made toward th building of the canal.

## The Torpedo

At a recent meeting of the Physiological Society, Ber lin, Prof. Fritsch spoke on the anatomy of Torped marmorata. In opposition to the revolutionary view of many recent investigators, who deny the nervous nature of the ganglion cells, he laid great stress upon the extremely close relationship which exists between the ganglia and end organs, and is so strikingly shown in the torpedo. A thick nerye fiber runs from each gang ion cell to the electrical organ, divides into twelve to twenty-three fibrils before it reaches the organ, and ach of these fibrils is connected up with some one secial plate of the organ. Now, since each plate which is of hexagonal shape, owing to the close juxta position of the columns, receives one nerve fiber at each of its angles, it hence follows that the number of the plates must be, on the average, three times as great as the number of the ganglia. The fibers of one ganglion supply eighteen plates, the latter (being hexagonal) require six times eighteen fibers for their supply, and quire six times eighteen fibers for their supply, and
since on an average eighteen fibers run out from each since on an average eighteen fibers run out from each
ganglion, it requires six ganglia to supply eighteen plates with nerves.
The speaker had counted the plates of an electrical organ in the torpedo, and obtained a number corresponding closely with an older enu meration of Valentin's made on a torpedo of the same size; the number of plates he found to be 179,625 . He had further counted the gangion cells which supply the plates with nerves and found them to number 53,739 ; this corresponds closely with the enumeration of Boll, who counted 53,760 . The counting of ganglion cells is subject to much uncertainty, chiefly owing to the fact that in sections of the central nervous system many cells are cut through, and are thus liable to be counted twice; hence the speaker had enumerated, most readily by means of photographs, the axis cylinders of the nerves which supply the electric organ; he found them to number 58,318 , corresponding to the same number of ganglion cells. The last number is nearly one-third the number of plates in the electrical organ, and corresponds close$y$ to the number which should be found if the older view is the correct one, that the ganglion cells are the centers for the nervous end organs.

## The New Postage Stamps.

The portraits and colors of the new issue are as follows: One cent-Franklin; ultramarine blue.
Two cent-Washington ; carmine.
'Three cent-Jackson ; purple.
Four cent-Lincoln; chocolate.
Five cent-Grant; light brown.
Six cent-Garfield ; not decided.
Ten cent-Webster; milori green.
Fifteen cent-Henry Clay: deep blue
Thirty cent-Jefferson; black.
Ninety cent-Commodore Perry ; orange.
The number of stamps ordered before ready for issue aggregated nearly 44,000,000, representing $\$ 784,323$.

THE HARLEM RIVER IMPROVEMENT AND SHIP CANAL.
We illustrate in the present issue the progress of work upper the ship canaltan New York City The work is in pursuance of what is known as the improve ment of the Harlem River, New York, and is being executed by the Federal authorities under the direction of George L. Gillespie, Lieut.-Col., Corps of Engineers, U. S. A., who is chief engineer of the operations. The history of the improvement extends over a number of years, beginning in 1873 . The river and harbor act of March 3 of that year directed an examination to be made of Harlem River near the East River for the removal of rocks therefrom. Appropriations were made in successive years, and the examination of the Harlem, with certain improvements, was continued, until eventually it was decided that navigable connection should be made between the upper part of the Harlem and the Hudson River. The natural connection is by the water of Spuyten Duyvil Creek. This stream, which is very narrow and shallow in places, follows a crooked course and is available only for rowboats, except for a limited distance. Various ways were proposed of connecting the two rivers, but eventually, after due estimates of cost, the cut through what is known as Dyckman's Meadows, near Kings Bridge, a little above 200th Street, was determined on. Many legal difficulties were experienced and considerable trouble was had in obtaining the consent of the owners of adjacent properties. In some cases compromises were made, and eventually, in 1888, borings were made across the route to determine the character of the soil, and work shortly afterward began and is now in active progress.
Our large cut shows the eastern end of the new canal.

foot channel. Other restrictions are also imposed, ap plying to the Harlem River and canal. When the work is completed and when the Harlem River channel hall have been adequately dredged out, a very important addition will have been made to the water front of the city. At present the Harlem River is practically limited for navigation to the point marked by the High Bridge. When dredged out, however, and when this canal shall have been completed to the Hudson River, a clear waterway will be provided for all vessels able to pass through the many draws and under the High Bridge. In transit from the North River to the Sound this route will cut off a distance of 10 or 12 miles. One of our illustrations shows in bird's eye view the new connecting link between Long Island Sound and the Hudson River which it will form when completed. Owing to the numerous bridges, however the utility of this waterway as a through route will be limited to small sailing vessels, steamers, and barges. There is little doubt that for such traffic it will be very largely used, but the immense water front which wil be developed by it, and the facilities it will provide for the delivery of coal and building materials to the upper part of the city and to the annexed district will be the most important features of the improve ment.
A number of railroads cross the Harlem and Spuyten Duyvil Creek. Over the three railroad bridges at pres ent existing four separate railroads send a large num ber of trains daily. The use of these bridges will of course be greatly interfered with if the draws have to be frequently opened. It is therefore seen that in the near future some change will have to be made in thi respect. The bridges should either be raised so as to admit the passage of small steamers and barges, or tunnels should be made under the river for the passage of trains. Based on the interference with the railroads crossing these bridges, objections have been made to continuing the work now so far advanced, on which already bout $\$ 200,000$ has been expended To yield to such objections would be shortsighted policy. But the fact o such a feeling having arisen emphasizes the necessity for the construc tion of an adequate railroad tunne under the Harlem River at 4th Ave nue, for the passage of trains of the Harlem, New York Central, and New Haven roads.
Our thanks are due to Lieut.-Col George L. Gillespie for facilities afford ed by him. We have also to acknow ledge the receipt of many courtesie
At this place the waters of Dyckman's Creek formerly from Mr. A. Doerflinger, the assistant engineer in ran across the island, connecting Spuyten Duyvil Creek with the Harlem. The last named creek can be seen in the cut a little to the right of the canal, winding in a circuitous course through the meadows and around Johnson's Iron Foundry, one of the well known landmarks of the locality. In the background can be seen the cut through which the New York Central Railroad passes, and a little to its left is the natural depression through which the waters of the creek penetrate. In the far background the Palisades, extending along the further or western banks of the Hudson River, are visible.
The small map shows the line of the portion of the canal the progress of whose construction is illustrated It also shows the line formerly followed by Dyckman' Creek, now excavated out of existence. The hills of dolomite converging here had to be cut through, comprising practically all the rock cutting on the line. In order to pursue the work in comfort, two dams were constructed, one at each end of the proposed cut. Tongued and grooved sheet piling was driven across the axis of the canal, and by dumping solid earth and rocks back of the piling, its strength was still further increased. Then the excavation of the rock began. It is done by contract. The material is loosened by blast ing, and as fast as broken up is hauled out on tram ways toward the rear. The blasting agent is forcite and steam drills are used for making the shot holes The debris is hauled up on the railways to the dump and is deposited upon ground leased for the purpose At the base of the hill an engine house is located whence a cable is carried by which the cars are hauled up the steep incline. Eventually the material deposited on the dump will have to be removed, and it is unquestionable that much valuable building material can be procured therefrom.
A great part of the excavation has been worked down to the grade level of the bottom of the canal, which plane is shown in the large illustration. When com pleted, it will present a channel 18 feet deep at mean low water and varying from 350 to 400 feet wide. The law of May 20, 1879, provides that all bridges hereafter to be constructed over this channel shall be at right angles to its courses, and that the bridges at the draws shall not be less than 24 feet above high water of spring tide, and that no tunnel shall be cons of a
charge of the work.

## Rapid Method for Dental Gold Plates.

At the recent International Dental Congress, Paric Dr. Michaels, of Paris, read an article on "A Rapid Method of Making a Gold Plate," followed by a practi al demonstration. In half an hour he made a gold plate of four teeth, the time for the setting of the plas er not being counted. The author uses a special gold plate, which is very thin and pliable; it can be worked ike sheet lead. This sheet gold is smooth on one side and quadrilated or roughened on the other. A good mpression must be obtained with gutta percha. In his impression he runs a mixture of two parts plaste o one of sand, and obtains a model about an inch in height. He then adjusts on this model the teeth a well as the clasps. When a clasp is well adjusted, he ightens it somewhat, and pushes it with force into it proper position, so that it cannot be displaced. When the clasps are in place, he takes a piece of sheet lead and cuts it according to the shape he wants to give to the piece, and having marked the upper surface, he places it on the gold plate described above, and cuts a piece out according to the pattern.
He then takes this piece of gold and places it in posi tion, the smooth side of the plate in contact with the plaster while the roughened or quadrilated surface look upward. This is adjusted into position with a good bur aisher or other similar instrument. To retain this plat in position he drives little nails about half an inch in length by the side of it into the plaster, and with a pair of pincers he turns the ends of them so that they press on the plaster surface and render the plate immovable. The teeth are then placed again on the mode and plate, and retained in position with hard wax. He then invests the teeth and model in a plaster and sand nixture, while the wax is washed off with boiling water. Of course, the whole upper quadrilated or roughened surface must be left exposed, as it is by run ning solder all over this plate that he obtains the de sired thickness. When the plaster is dried, all the paces that may be left between the plate and backings of teeth or clasps are filled with small scraps of platinum foil made into pellets and pushed into position. After the whole surface and backings have been well covered with borax, the piece is ready for soldering.-Dental Cosmos.

## ©orrespondence

## Diminutive Electro-magnet

To the Editor of the Scientific American:
Some of your readers may be interested to know how to make small electro-magnets at very littlecost, which work well for home-made telegraph sounders, circuit beakers, etc.
If they will file off the head and point of a $21 / 2$ inch ire brad and hammer it into the shape of a horseshoe they will have the core. This is then to be wound with wo layers of No. 30 cotton-covered wire. The whol operation should not take more than five minutes, and the magnet, used with one Grenet cell, will sustain about an ounce. These magnets, moreover, canno cost more than a fraction of a cent apiece, if made in any quantity, and might be sold for five or ten cents Finally, considering their size (about that of a large thimble), they are extremely portable and astonishingly trong.

Daniel Gregory Mason.

## Boston, Mass

## Sound Signals for steam vessels

Jas. A. Dumont, Supervising Inspector-General of Steam Vessels, in a recent circular calls the attention of pilots of steam vessels to the frequent collision ccurring through failure to observe the pilot rules laid down by the Board of Supervising Inspectors, wherea if such rules were strictly observed, collisions would be lmost absolutely impossible.
The main causes of collisions result from the failure of pilots to consider Rules I. to VII., inclusive, in stric connection with Rule III. of the Pilot Rules for Lake and Seaboard, which rule reads as follows

Rule III. If, when steamers are approaching each other, the pilot of either vessel fails to understand the course or intention of the other, whether from signal being given or answered erroneously, or from other cause, the pilot so in doubt shall immediately signify he same by giving several short and rapid blasts of he steam whistle; and if the vessels shall have ap proached within half a mile of each other, both shal be immediately slowed to a speed barely sufficient fo teerage way until the proper signals are given, an wered, and understood, or until the vessels shall have passed each other."
The rule quoted qualifies all the others, and is the only qualification that can be permitted with safety when steamers are meeting in such positions as to render collisions possible. There is no authority in the ules and regulations for vessels approaching each ther from opposite directions for what has become echnically known among pilots as "cross signals"hat is, answering one whistle with two, and answering two whistles with one. In all cases, and under all circumstances, when a pilot receiving either of the whistle signals provided in the rules, which for any reason he deems injudicious to comply with, instead of answering it with a cross signal, as is now so much the custom to do, it is his imperative duty to at once observe the pro visions of Rule III., namely, give the alarm signa whistle and at once slow his engine and reduce speed to bare steerage way; and the opposing vessel, imme diately on hearing the alarm signal whistle, should also slow down, and stop if necessary, till the dange of collision is passed
In investigating collision cases, inspectors of steam vessels would be justified in considering any pilot who gives a cross signal instead of complying with Rule III. prima facie guilty of neglect of duty. So, also, of the pilot giving the first signal, who fails to slow or stop his boat immediately after he discovers his signal whistles are answered otherwise than as given by himself.
Rule II. of the Pilot Rules for Western Rivers has the same application to those rules that Rule III. of the Pilot Rules for Lakes and Seaboard has to the latter ules, and it must be observed in the same manner. It is desirable that all pilots should thoroughly understand that when whistles are blown as passing signals, it is a rule, never to be deviated from, that one whistle means that the vessels giving such signal is or intends porting her helm; two whistles, that the vessel giving it is or intends putting her helm to starboard.

## Danger from Unclean Instruments.

Prof. Lancereaux brought before his clinic a man who exhibited a papulo-pustular eruption over the entire body. The cervico-occipital glands were enlarged, and showed all the signs of a syphilitic adenitis. The cause of the infection was a catheterism of the Eustachian tube. Another case was that of a lady who, a few weeks after some operation on her teeth, had an ndurated ulceration of the gums, followed by a diffused eruption and indolent engorgement of the glands, as well as by painful periostitis over the bones of the skull and forearm. In both cases antisyphilitic treatment restored the patient to health. Dentists, barbers, and hair dressers should also take care to keep their instruments aseptic, as syphilis has been communicated by them, as well as by the physician and surgeon.-Bull. Med., 88, 1889
bending and embossing sheet metal. A machine for simultaneously bending and embossing sheet metal plates, such as used for cornices, metal shingles, etc., is shown herewith, and has been patented by Mr. Benjamin J. Baldwin, Jr., of Paris, Texas, the illustration showing a plate of metal being shaped by passing it between the dies. In a table held on the front of a suitably constructed frame is an aperture in which is a vertically adjustable block supporting two vertical die plates, a short able block supporting two vertical die plates, a short
distance from each other, which may be moved


MACHINE FOR BENDING AND EMBOSSING SHEET
transversely and secured in place by bolts passing through slots in their flanges. On the outer side of these die plates are arranged similar plates inclined toward the vertical plates, and resting on adjustable wedges, whose position is fixed according to the radius to which the sheet metal is to be bent. A bove and be tween the central vertical die plates is adapted to slide a reciprocating die, having its under side formed to the shape of the upper ends of the lower die plates, the re ciprocating die being secured on a slide whose upper end is pivotally connected by a pitman with a crank disk on the outer end of a shaft on which is a fly wheel, the driving wheel being operated by hand or other power. In the rear of the meeting faces of the dies is held an adjustable gauge plate, serving as a stop against which the edge of the sheet metal being operated on
is held, thereby permitting any number of pieces to be uniformly bent and embossed

## Paper Pillows.

The latest fad in England is paper pillows. The paper is torn into very small pieces, not bigger than the finger nail, and then put into a pillow sack of drilling or light ticking. They are very cool for hot climates, and much superior to feather pillows. The newspapers are printing appeals for them for hospitals. Newspapers are not nice to use, as they have a disagreeable odor of printer's ink; but brown or white paper and old letters and en velopes are the best. The finer the paper is cut torn, the lighter it makes the pillow.

## Fire in a steam Heated Car.

It has been thought that the heating of the cars by steam from the locomotive would do away with the risks of fire in railroad trains. But the passengers on a Boston and Maine car running between Reading and Boston a few days ago were startled by the sight of smoke near the center of the car. An examination showed that there was fire beneath the floor, and it was found necessary to cut away a part of the floor in order to extinguish it. The valve by which steam was admitted or excluded was near the place where the fire was found. It is probable that a surplus of oil had been used about the valve, and the oil, aided by the warmth from the steam pipes, doubtless caused spon-D3P2-D3O3-E1O2-E1O
D303-D203-D2M5j
D2N1—D1N1-C5jN1j-D1N2-D2N2)
D2O1-D1O1-C5jO1j-D1O2-D2O2 ,
$\left.\begin{array}{l}\text { D2N3-C2N3-C2jN3j } \\ \text { C4N2-O3N4-M........ }\end{array}\right\}$
D2H3 C3H3--C2H3j-C3H4-D2H4
${ }_{\mathrm{D} 3 \mathrm{GH}} \mathrm{D} 2 \mathrm{j}-\mathrm{C} 3 \mathrm{j} \mathrm{H} 4 \mathrm{j}$

B4N3-B3N3...
$\mathrm{B} 4 \mathrm{~N} 3 \mathrm{j}-\mathrm{B} 2 \mathrm{jN} 3 \mathrm{j}$
$\mathrm{B} 4 \mathrm{~N} 4-\mathrm{B} 3 \mathrm{~N} 4 . . \mathrm{j}$
B2jO2-B2jO2-B2jO4-B3jO
C5P5-C5L53-DiK34-D2jK3
B2K5-B3L1-B2jL2
taneous combustion. The discovery of this fire will probably lead to the adoption of new precautions, especially in regard to the use of oil about the steam pipes and valves.

## Iceberg Dust.

One of the most interesting contributions of Prof. Nordenskjold to popular science is his examinationwhen about $80^{\circ} \mathrm{N}$. lat., before reaching Parry's Island, to the northwest of Spitzbergen-of the snow which covered the icebergs, and which had come from still higher latitudes. He found it strewn with a multitude of minute black particles, spread over the surface or situated at the bottom of little pits, a great number of which were to be seen on the outer layer of snow ; many of such particles were also lodged in the lower strata. The dust, which became gray on drying, the professor found to contain a large proportion of metallic particles attracted by the magnet, and capable of decomposing sulphate of copper. An observation made a little later upon other icebergs proved the presence of similar dust in a layer of granular cystalline snow situated beneath a stratum of light fresh snow, and another of hardened snow. Upon analysis, Prof. Nordenskjold found this matter to be composed in varying proportions of metallic iron, phosphorus, cobalt, and fragments of Diatomaceæ.

## Wages in Germany.

Statistics recently collected show that machine makers and workers in metal receive the highest average rate of wages in Germany. This average is for adults 26.66 marks a week at Barop, in Westphalia, 22 adults 26.66 marks a week at Barop, in Westphalia, 22
marks at Mannheim, and 21 marks at Berlin, Ingolmarks at Mannheim, and 21 marks at Berlin, Ingol-
stadt, Spandau, and Styrum. This is for day labor For piecework, the highest average was 30 marks, at Wandhofen, in Westphalia, 28 marks at Augsburg and Styrum, and 27 marks at Spandau and Weissenfels. Next in order come the factory hands, with 24 marks at Stassfurt and $22 \cdot 50$ marks at Essen. Joiners receive the highest wages in Berlin, Leipsic, Lindenau, and Mannheim, the average being 18 marks a week for day labor. The average for day labor is 27 marks a week for potters and glass makers at Rehau, 19 marks for shoemakers at Friedrichshaven, and 18 marks for tailors at Dortmund. Bricklayers are paid 30 marks a Berlin. A mark is equal to 23.8 cents of our money. Pottery Gazette.

## SENDING PICTURES BY TELEGRAPH

Mr. H. Rickinson, of 13 Wellington Street, Islington, London, $\mathbf{N}$., is the inventor of a system of transmitting sketches by telegraph. The advantages of such method of communication lie in its applicability in time of war to telegraphing the position of an enemy etc. It would also be useful in tracking a criminal, for his portrait could be transmitted rapidly from place to place. The method of working will be understood from the illustrations in conjunction with the table The original sketch, Fig. 1, is divided up into square by means of ordinates and abscissæ, and each square is $2 \mathrm{Q} 4-\mathrm{B} 4 \mathrm{Q} 1-\mathrm{B} 4 \mathrm{jQ1}-\mathrm{B} 5 \mathrm{P} 5-\mathrm{B} 5 \mathrm{jP} 5-\mathrm{C} 2 \mathrm{Q1}-\mathrm{C} 4 \mathrm{Q} 1-\mathrm{C} 5 \mathrm{P} 5-$ A3R3-A5R1-B1R1-B2Q4-B4Q1-B4jQl-B5P5-B5jP5-Cن2Q1-C4Q1-C5P5--
D2P4-D3P2-E1O5-E2P5-E2Q1-E3Q3-E3Q5-E5R2-E5R. M5-DjöOi

D2jM5j-D2jF5-D2H5-D2G $5-D 5 G 5-D 5 M ร$

D5M5-E1M3-E3Mj-E5L5-F2L8-F4K5-F5K4
E5K3-E4jI5-Eธ็T4-E
Bj̄P5-B
B5jN2-B2N2-B3N2j-B1jN3j-B3N4j-B2N5-B3jN5-B3jO

B5jO2-B2jO2-B-B2 $\mathrm{jO} 4-\mathrm{B} 3 \mathrm{jO} 4-\mathrm{B} 3 \mathrm{jP} \cdot 2-\mathrm{B} 5 \mathrm{jP} 21$


AN IMPROVED MILL BOOT OR PESTLE.
The illustration herewith represents a boot or pestle mainly designed to be used in mills driven by power for pounding rice, the principal view showing a double pestle will fitted with such a boot or pestle, of which the small figure gives a perspective view. The invention has been patented by N. B. Tilton, Upper Rice Mill, Savannah, Ga. The pestles are adjustable up or down on their stems by means of nuts fitting on screw threads on the stems, to regulate the pounding action of the pestles, whereby the rice grains are wore per-


## TILTON'S MILL BOOT OR PESTLE.

fectly agitated and made to clean one another. The stems, which work through the bottom of the mortars, are connected below with sliding crossheads reciprocated by connecting rods worked by crank disks on a shaft, the cranks being set opposite each other, so that as one pestle is moved up the other will be moved down. At or near the base of each pestle is a flange which, as the pestle rises, carries up some of the rice which, as the pestle rises, carries up some of the rice
from the bottom of the mortar, thus keeping the rice in motion, while all packing is avoided.

## The Planet Mercury

If it be true that the rotation period of Mercury is the same as that of its revolution around the sun, and this does not seem to be at all unreasonable, what strange conditions of affairs must exist upon that planet! One hemisphere in perpetual day, the other in everlasting night! One in perpetual heat, the other in intense and never-ceasing cold! At one point upon the sunward hemisphere the sun is in the zenith, oscillating $23^{\circ} 41^{\prime}$ alternately to the east and west, at others alternately above and below the same point of the horizon, during the period of 88 of our days. Many interesting, although of course useless, questions present themselves to one's mind in contemplating these conditions. Are there living intelligent beings there? On what part of the globe do they live? How do they measure
Foreground cliff,
Stone ramparts (circular)
Watch houses (circular).
Flag staff.
Stone pier.
Light house.
Horizon.
Water line.
Boat.
Distant cliff.
Abbey.
Windows.
Church.
Lower ledge.
Seagull. live? How do they measure
time?-Sidereal Messenger.

## Weighting of silk.

The process of weighting silk by tin salts has been recently described, but this is from another source: The bichloride is reduced by water to $30^{\circ} \mathrm{B}$., which is the strong. est solution that can be em. ployed with safety, stronger would be likely to injure the fiber: at $34^{\circ}$ B. the silk becomes rough and valueless, at $40^{\circ} \mathrm{B}$. the fiber is dissolved. The silk is well worked in the solution until perfectly saturated, left two hours in the liquor, taken out and washed. One dip adds about eight per cent to the weight, three treatments give an increase of about 25 per cent. Bare of about 25 per cent. Bare
hands must not be used in working the goods in hands must not be used in working the goods in
bichloride of tin at $30^{\circ}$ B.; it acts injuriously upon the bichloride of tin at $30^{\circ} \mathrm{B}$.; it acts injuriously upon the
skin from its strong acidity. The silk must be very well washed before it is soaped; any of the tin solution left in would decompose the soap.-O'Neil.

## Keep Busy.

The secret of success in life is to keep busy, to be persevering, patient, and untiring in the pursuit or calling you are following. The busy ones may now and then make mistakes, but it is better to risk these than to be idle and inactive. Keep doing, whether it be at work or seeking recreation. Motion is life, and the busiest are the happiest. Cheerful, active labor is a blessing. An old philosopher says: "The firefly only shines when on the wing; so it is with the mind when once we rest, we darken."--Elmina.

A Helic of Engineering of Many Centuries Ago. How many of the engineering works of the nineteenth century, says a recent writer, will there be in existence in the year 6000? Very few, we fear, and still less those that will continue in the far-off age to serve a useful purpose. Yet there is at least one great undertaking conceived and executed by an engineer which during the space of four thousand years has never ceased it office, on which the life of a feroffice, on which the life of a fer-
tile province absolutely depends tile province absolutely depends
to-day. We refer to the Bahr to-day. We refer to the Bahr
Joussuf-the canal of Joseph-Joussuf-the canal of Joseph-
built, according to tradition, by built, according to tradition, by
the son of Jacob, and which constitutes not the least of the many blessings he conferred on Egypt during the years of his prosperous rule.
This canal took its rise from the Nile at Asiut, and ran almost parallel with it for nearly two hundred and fifty miles, creeping along under the western cliffs of the Nile valley, with many a bend and winding, and at length it gained an eminence, as compared with the river bed, which enabled it to turn westward through a narrow pass and enter a district which was otherwise shut off from the fertilizing floods on which all vegetation in Egypt depends. The ration in Egypt depends. The
northern end stood seventeen northern end stood seventeen
feet above low Nile, while at feet above low Nile, while at the southern end it |ndia, chiefly Bombay, and that the trade seems likely was at an equal elevation with the river. Through
this cut ran a perennial stream, which watered a pro-
dustry takes root here, another act of Congress will be this cut ran a perennial stream, which watered a province named the Fayoum, endowing it with fertility and supporting a large population. In the time of the annual flood a great part of the canal was under the water, and then the river's current would rush in a more direct course into the pass, carrying with it the rich silt which takes the place of manure and keeps the soil in a state of constant productiveness.
All this, with the exception of the traditions that Joseph built it, can be verified today, and it is not mere supposition or rumor. Until eight years ago it was firmly believed that the design has always been limited to an irrigation scheme, larger, no doubt, than that now in operation, as shown by the traces of abandoned canals and by the slow aggregation of waste water which had accumulated in the Birket el Querun, but still essentially the same in character. Many accounts have been written by Greek and Roman historians, such as Herodotus, Strabo, Mutianus, and Pliny, and repeated in monkish legends or portrayed in the maps of the middle ages, which agreed with the folk lore of the district.
These tales explained that the These tales explained that the
canal dug by the ancient Israelite so large that it not only modified the climate, tempering the arid winds of the desert and converting them into the balmy airs which nourished the vines and the olives into a fullness and fragrance unknown in any part of the country, but also added to the food supply of the land such immense quantities of fish that supply of the land such immense quantities of fish that the royal prerogative of the right of piscary at the
great weir was valued at $\$ 250,000$ annually. This lake great weir was valued at $\$ 250,000$ annually. This lake
was said to be 450 miles round, and to be navigated was said to be 450 miles round, and
by a fleet of vessels, and the whole by a fleet of vessels, and the whole
circumference was the scene of circumference was the scene of
great national industry and prosperity.

## Standard Torpedo Boats.

Messrs. Yarrow \& Co. have recently completed six first-class torpedo boats of what is now reckoned the standard type. The boats are of galvanized steel, and are 130 feet long and 13 feet 6 inches broad. Their triple expansion engines will indicate about 1,150 horse power, and, with a load of 20 tons on board, will drive the craft at a maximum speed of rather over 23 knots, or nearly $261 / 2$ miles an hour. The boiler is of the loconotive type, and forced draught is not used. The accommodation, both for officers and for men, is marvelously good. The turning capacity is extraordinary, for these boats, without heeling over in the least,
can turn at full speed and in 75 seconds in a circle of some 300 feet in diameter.-Army and Navy Gazette.

## cocoanut Butter.

A new kind of butter is now being made in Germany from cocoanut milk. The Calcutta correspondent of fre London Times says that the cocoanuts required for


Fig. 1.-CHART FOR LOCATING THE POSITION OF LEADING POINTS IN PICTURE.

Fig. 2:-ROUGH OUTINE OF SKEICH TAKEN FROM CHART served to carry the surplus waters of the Nile into $\mid$ the distribution of electric energy for light and power an extensive lake lying south of the Fayoum, and $\quad$ in towns of Great Britain shall be by underground


Fig. 2.-ROUGH OUTLINE OF SKETCH TAKEN FROM CHART ment has already replaced nearly all the aerial tele graph wires of the larger cities by underground con ductors.
Sir William continues: "The telephone wires alone remain in the air, long may they hold their place there, they are perfectly harmless to the general public, and they are enormously less expensive where they are than they are enormously less expensive whe
they could be if placed underground."


Fig. 3.-COMPLETED PICTURE SHADED IN ACCORDANCE WITH MESSAGE.

Towing without a Rope.
As an instance of negative hydraulic pressure or relative vacuum in the wake of a moving vessel, the following extract from Mr. P. G. Hamerton's yachting tour on the Saone, says the Engineer, is interesting. The mall sailing yacht or "catamaran" Arar is a double boat, built on the principle of the Calais-Douvres. Re urning against the stream in the wake of a huge barg arning against the stream in the wake of a huge barge towed by a small steam tug, Mr.
Hamerton remarks: Hamerton remarks:
the barge, I found the close to less fatiguing, but the motion thing was this-the the curious followed without a hawser There was, in fact, no necessity for a rope, as our boat was propelled by the back water behind the barge. The Arar kept the noses of her two hulls at a distance of about three inches from the stern of the boat before her and that with marvelous steadi ness. For some time the two hawsers hung idly in festoons. but they were entirely detached before we came to the bridge at Macon, yet the Arar followed under the arch against the gen eral current of the river, though, in reality, on the rapid counter current of the back water. How can a steamer tug a small boat without either increase of power or diminution of speed? The question appears insoluble, yet here is a solution of it-the steamer's motion may create a back water behind a flat-sterned barge that she is towing, and the small boat may follow on the back water without imposing the slightest extra tax upon the tug."

Mr. Hamerton omits to notice that the negative pressure at the stern of the barge may have been increased \begin{tabular}{l|l|l}
Sir William Thomson, in the course of an article on \& sure at the stern of the barge may have been increased <br>
"Electric Lighting and Public Safety," published in \& by the deviation of the back water past the sides of the <br>
the current issue of the North American Review, says \& Arar; but he is perfectly right in stating that, but for

 

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that it may be considered as definitely resolved that
\end{tabular}

would for the most part have represented a loss of power.
Coagulants and Non-Coagulants. At a recent clinic given at the New York Dental College, Dr. A. W. Harlan, Chicago, Ill., demon strated the action of coagulants and non-coagulants on egg albumen. These experiments, says the Dental Cosmos, were undertaken to show, first, the coagulating proper ties of carbolic acid, creosote, re sorcin, alcohol, peroxide of hydro gen, chloride of zinc, 1 to 1,000 solu tion bichloride of mercury, guaiacol, aromatic sulphuric acid, and synthetic carbolic acid, also to de monstrate the non-coagulating pro perties of the following named drugs: Oil of cassia, oil of gaultheria, oil of camphor, oil of cajeput, tereben, myrtol, eugenol, oil of cloves, eucalyptol ethereal solution of iodoform. terpinol, oil of sassafras, and a few others. Dr. Harlan stated that non-coagulants were the ideal medicaments to be used for disinfecting pulpless teeth, on account of their non-coagulating properties. When introduced into the root canal they would not cook a serous exudate or pus canal, they would not cook a serous exudate, or pus flowing from a delicate canals would be filled with cooked albumen, clogging them and preventing the introduction of fine instruments. When a coagulant is used under such circumstances, aibuminous matters, filling the root or draining through the root, are inevitably cooked at once, thereby rendering the removal of the coagulated albumen from the delicate canals a matter of impossibility. This was very satisfactorily demonstrated by experiments made before the spectators, and in every case where noncoagulants were used, it was shown that they remained in contact with the albumen product without any coagulating effect.

Cannot some inventor contri re a street cleaning machine which shall do more than simply brush the dirt to one side or the other of the street and leave it in windrows? There is demanded something which will take the dirt up bodily and put it into a box to be carried with it until the machine has reached the end of the route or the box is full.

## Lead Poison in water

Lead poisoning having occurred at Dessau in 92 cases, a commission was issued to discover the cause, which was immediately traceable to the wherther th. water was originally poisonous; but it was soon found to have acquired this quality in the course of found to have acquired this quality in the course of
distribution through the lead service pipes used in the distribution through the lead service pipes used in the
town. Experiments showed the water to be extremely soft; and when its hardness was increased by the addition of finely powdered limestone, it ceased to corrode lead. Further inquiry demonstrated that it was not the hardness that rendered the water innocuous, but the deprivation, by agitation with the limestone, of the carbonic acid originally contained in the water, and which attacked the lead. To permanently cure the evil, an apparatus has been set up at the water works to mix automatically a definite quantity of powdered limestone with a certain proportion of the water passed through the works. The mixture is then, after agitation, returned to the bulk of the supply ; and the result is a complete cure of the mischief-not a single case of lead poisoning having occurred since the apparatus was set in regular operation. The quantity of powdered limestone required for this service at Dessau is about 200 cubic centimeters every two minutes.

## Hindoo Magic-the China Duck Trick

In 1878 I was stopping in the city of Allahabad, near the center of India, on the Indian Peninsular Rail way, giving performances in the Railway Theater, says a traveler. Every day a party of native jugglers were in the habit of visiting our hotel and exhibiting their skill on the plaza in front of the building. One day I was particularly attracted by an old Hindoo, his son, and daughter, who squatted down on the ground and wait ed for the crowd of sightseers to gather round. They did not have long to wait. When enough spectators had come to make the performance profitable, the old fellow drew from the bag that all Indian jugglers use to convey their "properties" in a small earthenware jar filled with muddy water. He first sprinkled a few drops of water on the ground and then placed the jar upon three small stones, which he also took from the bag.
He then produced a small china duck and gave it to me for inspection. I found nothing noticeable about immediately me to put it in water. I did so, a from the bag a small tom-tom, a little musical instrument that emite a drumming sound when the handle is turned, and began waving it around the jar. Instantly the duck arose to the surface. He told me to touch it. I tried to do so, when the bird again disappeared, to reappear again and again at the juggler's will. I must confess that I was mystified. There was apparently no cause for the strange actions of the little bird. It was only after the third or fourth visit of the conjuror that I discovered the secret of the trick
It was a particularly bright, sunny day. and I had chosen a place among the spectators slightly nearer than the others were allowed. I was behind the scenes as it were. While attentively watching the trick, I noticed in the sunshine the sparkle of a long hair that extended from the tom-tom to the bottom of the jar. The moment I saw this I divined the juggler's secret, and I afterward found that my theory wascorrect. The jar already contained a china duck precisely similar to the one I had examined, save that it was buoyant. Attached to the breast of this duck was the hair. This hair came through a tiny hole in the bottom of the jar The water was sprinkled on the ground to conceal an leakage. When the jar was placed upon the ground the hair was fastened so that the duck could not rise to the surface.
As the juggler picked up his tom-tom it was an easy matter for him to fasten the end of the hair to it by means of a bit of wax. After this was arranged you can see how easily he was able to make this counterfeit duck bob up and down at the word of command. Pottery Gazette.

## Exploration on Greenland.

The Frankfurter Zeitung publishes a letter from its Copenhagen correspondent, stating that a new expe dition for exploring Greenland will start next summer from Denmark. The plan of work has been arranged by the naval lieutenant Ryder. The party will consist of nine persorts, with three boats, and a steamer to convey them to the eastern coast as soon as the condition of the ice will allow of a landing. It is proposed to ex plore in the course of the summer the region lying between $66^{\circ}$ and $73^{\circ}$ north latitude, pushing as far as possible into the interior. Sleds will be employed during the winter, going over as much ground as possible. The expedition will be provisioned and equipped for two years, at the end of which time the steamer will return to take them away, cruising along the east coast till they get down to the shore. The expenses have been estimated at about $\$ 80,000$, and the project is so popular, and looked on so favorably by the government, that it is practically certain that the Diet wil grant the money.

How the Work of the Cle
As many are entirely unfamiliar with the detail o he work carried on at a great clearing house like that of New York, we print below an article in full upon that subject, by George O. Brown, in the New York Star :
There is situated at the corner of Pine and Nassau Streets, within a stone's throw of the New York Stock Exchange, an unpretentious brownstone building, known to very few outside of bank messengers and clerks, and possibly a few business men. At certain hours of the day, however, should one take the trouble to climb a long, winding flight of stone stairs, a scene as busy as anything ever witnessed on the floor of the Stock Exchange presents itself.
Should the visitor be fortunate and gain admittance beyond the heavy swinging doors and the attendants, he finds himself at the end of a large, well-lighted room, divided into sections by tall wire screens. Long rows of high desks extend the length of the room, and these desks are also separated by screens.
At each portion of the desks so divided stands a clerk whose sole object in life seems to be to add up a seem ingly endless column of figures as rapidly as possible. The scratching of pens and the rustle of crisp Treasury notes, varied now and then by the rattle of silver or gold coin, are the only sounds to be heard.
At the opposite end of the room, on a high platform, frow which he can overlook the entire room and it army of workers, stands a shrewd, "business-looking" man with a number of assistants, also busy on long columns of figures.
Such is the daily scene at the New York Clearing House during the time from 10 o'clock until 11 or 11:30 The clerks at the desks in the room are representatives of all the banks in the city, and the man who is on the platform, keeping a general oversight over all the work and noticing each detail, is Mr. W. A. Camp, the man ager of the Clearing House.
This association of banks is a comparatively new in stitution, being only about thirty-six years old ; but so rapid has been the increase of business in New York City, that to-day the New York Clearing House is the largest institution of its kind in the world-greate even than the Bank of England.
When the Clearing House was first organized in 1853, there were in the association fifty-five banks, and fo the year ending September 30, 1854, the daily exchanges averaged $\$ 19,104,504.94$. At the present time there are ixty-four banks in the association, and last year the daily average of exchange at the Clearing House wa $101,192,415.11$. So, during the time which it has been n existence, the total exchanges amount to $\$ 843,806$, $456,478.62$, and the total transactions amount to
$\$ 881,135,273,210.16$. In order to form some idea of how vast this amount is, it may be stated thatit would take nearly six thousand years to count it, at the rate o two hundred and forty a minute, day and night.
The largest transaction for any one day through the Clearing House amounted to $\$ 295,822,422.37$, and the smallest daily transaction was $\$ 8,300,694.82$. So large are these figures, however, that one can scarcely ealize the amount of money which they represent and yet, to the credit of the management of the Clear ng House, be it noted that since the first day when it opened for business, so much as a penny has neve been lost, nor has a mistake ever occurred.
One quite naturally asks how all this business is ransacted during one or, at the most, two hours daily, making exchanges of notes, bills, and drafts between the eighty-odd banks in the city, and never a mistake made. The answer is simple enough, and the work appears quite easy when one really knows exactly how it is done.
In the first place, each bank in the association sends wo representatives to the Clearing House promptly at
0 o'clock each day, the few banks not in the associa 10 o'clock each day, the few banks not in the associa
tion making their exchanges through some bank belonging thereto. When all the clerks are in thei places in the big hall of the Clearing House, exactly at 10 o'clock the manager comes in and a gong sound the signal that work is to begin at once.
One cerk from is
One clerk from each bank is known as a-settling clerk, and the second as the delivery clerk. It is the duty of the settling clerk to receive from the delivery clerk from each of the other banks whatever exchanges here may be on his own bank-drafts, notes, checks, tc. When the various delivery clerks have handed to the settling clerks of other banks all outstanding items, the settling clerk records them as received, crediting each bank with its proper amount. A proof of this sheet is then delivered to the proof clerk, as are also ittle slips from each bank showing exactly the amoun which it has sent to the Clearing House. Thes ickets, known as credit or debit tickets, as the cas may be, should, and always do, as a matter of fact,
In case an error is made by some clerk in recording the amount received from or paid to some bank, the slip at once shows where the mistake is, and a correction ticket is at once sent to the proof clerk, who rectifies the error. So rapidly are the exchanges made that
it takes only about ten minutes for the delivery clerks to make the entire rounds, thus practically having visit ed every bank in the city, and making the necessary exchanges, and over four thousand packages of checks have been distributed and receipted for by the proper representatives of the banks.
After the exchanges are all made and the proofs are found correct, the delivery clerk takes each to his own bank the amount received in exchange, while the set ling clerk remains to complete his proof sheet and compare it with that of the proof clerk on the plat orm, who works under the direct supervision of the manager. Thus within an hour work has been done which, before the institution of the Clearing House used to occupy three and four hours daily, and after ward, as business increased, used to be done only once a week.
Under the present system, each bank has deposited as a fund in the Clearing House an amount propor tionate to its capital, thus enabling each bank to make its exchanges at once and in the Clearing House. The greatest balance resulting from any one day's trans action at the Clearing House amounted to $\$ 12,505,134.15$ The greatest amount of exchanges ever made through the institution in any one day by any one bank wa $\$ 31,772,391.51$. The least balance paid by the Clearing House to any one bank was ten cents, and the least balance paid to the Clearing House by any one bank was paid on September 22,1862, when a certain city was paid on September 22,1862 , when a certain city
bank scrupulously sent around and paid a balance of oank scru
At one time gold was largely used in payment of set tlement of balances, and on November 11, 1879, the sum of $\$ 8,315,000$ in gold, weighing about fifteen and a half tons, was received in payment of balances; bu since the latter part of 1882 the government has issued cold certificates, so that now there is very little gold coin received in settlement.
There are clearing houses in all the principal cities of the United States, doing a yearly business amount ing to over $\$ 52,000,000,000$, while the total amount done by English clearing houses is about $\$ 38,000,000,000$. As howing what an amount of money is represented by the New York Clearing House, the amount of money handed through that institution during the past yea was over $\$ 33,000,000,000$, while the London Clearing House did over a billion of dollars less business
Such is a brief outline of the work which is done each day through this institution, and shows in a meaure the most complete system of banking exchange in the world.

## Fast Railroading.

A fast run was made on the New York division of the Reading Railroad on March 10. A firm of Philadelphia stock brokers was anxious to send a lot of stock the New York market, and it was very important that the stock should be in New York before the close of business on the Exchange, as there was a big specu ative "corner" in the stock. A special train was ar anged for in Philadelphia, and was ready to star within fifteen minutes from the time of the call. The tart was made from the Ninth and Green Street Sta tion, Philadelphia, at 11:38 A. M., and the train rolled into Jersey City at three minutes after one o'clock. thus making the entire distance of ninety miles in ighty-five minutes, being in round numbers at the ate of $631 / 2$ miles per hour
On the same day two other very fast runs were made ver the Pennsylvania Railroad between New York and Washington. A whole theater company was taken to Washington to give a special performance in the afternoon, and the same train brought the company back to give their regular performance in New York in the evening. The distance is 227 miles, and the trip rom New York to Washington was made in 258 minutes, being almost at the rate of 53 miles per hour The return was made in 259 minutes.

## Perils of Winter Railroading among the Mountains.

A great snowslide recently occurred near Wheeler, Col., at what is known as Wall Cut, on the High Line Division of the South Park Railroad, in which two passenger trains came near being swept away. The train going west was running in sections. The first section got stuck in the snow at Wall Cut, and the second section came up with two powerful engines to pull out the first section. Roadmaster Dobbins was standing in front of the head engine, superintending the work, when in an instant an avalanche of snow came down, swooping him away. He was completely covered by the flying mass of snow and carried a distance of several thousand feet, entirely across the river and on to the Rio Grande tracks, where he managed to extricate himself with great difficulty. He was severely injured. The tremendous volume of snow was piled entirely over the four engines, putting out the fires, and completely huried the mail cars, in which was the mail agent, George Roberts, and Baggagemaster Mason, of Denver. It took some time to extricate the men, but neither was injured. Fireman Culbertson was badly scalded.

## recently patented inventions.

 Engineering.Locomotive attachment. - Robert L. Stevens, Columbus, Neb. This invention consists an extensible folding arm, preferably counected to the locomotive tender, for the moving of cars upon adjacent tracks to the one upon which the engine is running,
thus avoiding the necessity of backing on to a siding to thus avoiding the
move such cars.
Circulator and feed Water Heater.--Elmer C. Jordan, Sacramento, Cal. A from near the rear end into the leg of the boilen whin feed water pipe passing through the smoke box dis charges into the channel at its rear end, serving to create a complete circulation of the water in the boiler

Oil Feed for Burners.--Charles T , St. Aubin and Archibald Y. Comstock, New Yort City. This invention relates to an apparatus for feed ing oil to burners, by forcing the oil, or other liquic pressure from a tank urface of the ground, and located at any distance from the place of combustion.

## Electrical.

Time Alarm and Annunciator. Nathan H. Suren, Fort Worth, Texas. Combined with a clock and an electric generator is a series of circuits may be formed for each branch of the circuit simulaneously, by which any number of signals can be sent utomatically or manually and various signals receive hrough the annunciator
Printing Telegraph Receiver.Henry Mahnken, New York City. This invention reharacters are printed by two type wheels rotating in different planes, and provides means for securin greater certainty in the action of the escapement and nison mechanism, avoiding delicate adjusting an liability to get out of repair.

## Railway Appliances

Car Wheel and Axle.-Thomas S. Churchman, Sacramento, Cal. The asle is made with sleeved plate is bolted to the inner face of the whee and the collar on the axle is fitted into a recess or bear ng formed partly in the loose wheel and partly in the the track to the right or left

## Mechanical

Grindstone Tool Holder. - Alex ander H. Dick, Cramer's Hill, N. J. This device h an arm carrying a tool clamp, with a support adjust nd mounted on the arm to receive and sapport the evel on the tool, and of moving it transversely desire the periphery of the stone, the invention being an improvement on a former patented invention of the same

Wrench. - Joseph Tomlinson, Sr., Folsom, Cal. This invention covers an improvemen the parts being so arranged that the jaws will clos squarely upon a nut placed anywhere between them.

## Agricultural

Cotton Picker.-James W. Wallis, Birmingham, Ala. This a tricycle cotton harvester,
adapted to be pushed and operated by hand power, one adapted to be pushed and operated by hand power, one
or more laborers pushing the machine while another otates a shaft which operates the pickers, the arm ing the cotton, and this box with its attachments bein wung back and forth at right angles to the direction of motion of the machine, carrying the arms and the pickers alternately into and out of the cotton plants.
Hay Sling. - Joseph Unterbrink, Ottawa, Ohio. This is a trip frame latch device to which cords are attached to sustain the load, the cords
having knots at their upper ends by which they may be suspended from the slot portion of a plate held by an verhead carrier, to allow the loaded sling to be raised by pulley and then moved to where the load i
dumped by simply pulling the string of a latch.

## Miscellaneou

Fire Escape.-Henry C. Rose, Leadville, Col. The mechanism of this fire escape is con-
tained in a casing to be secured in a room below a indow, or on the wall just outside, the escape rop being secured to a drum axle, the weight of the person ncoiling the rope, while a brake apparatus reguate the person on the rope, the device being completely matic and not employing springs or weights.
Driving Rein. - Matthew S. Dickinson, Los Angeles, Cal. This invention covers an im-
provement on a former patented invention of the same inventor, in driving reins for a double team, designed o dispense with the ordinary check reins, pulleys being employed, with short rein sections, connected to the rearends of the same overdraw, which, while causing horses to carry high heads, will allow more freedom to the animals to stretch out their necks and lower
their heads, etc.
Toy Bank.--William R. Christie, New York City. This is a registering bank, to receive
pennies, nickels, or other coin, the amount of which repennies, nickels, or other coin, the amount of which re-
ceived will be recorded and rendered visible from the ceived will be recorded and rendered visible from the
outer face of the bank, means being also provided for soundi
bank.

Automatic Grain Scales. - Henry Earle, Canon City, Col. Cond into two compartments, the drum having diametrically opposite openings, one for each compartment, and the ends of the drum having trunnions by which it is
journaled in the beam, the construction being provide journaled in the beam, the
with a recording device.
Bake Oven.-John Rayney, Brooklyn N. Y. This is a revolving reel oven, designed to be
strong and durable and not sag, while it is compact shallow vertically to allow its use on a reel of smaller size for pans of like area or capacity than has hereto-
fore been provided, thus reducing the height of the ore been provided, thus reaucing the height of the one floor of ordinary buildings.
Manufacture of Pulleys.-Joseph . Mitchell, Shelbyville, method of constructing a section of monld fo partially filling between the patterns with sand, plac ing removable boss patterus on previously prepared sookes, and inserting spokes and boss patterns in the lask with boss patterns abutting the hub and rim patterns, filling the flask above the spokes and boss
patterns with sand, and removing the hub, rim, and oss patterns.
Brake for Vehicles. - Christoph Wening, Neuendettelsau, Bavaria, Germany. This is n automatic brake adapted for application to a great on a raising or level ground, but self-applied in going down hill, a draw rod secured to the shafts or pole and moving in a longitudinal direction, applying the brake blocks to the tires of the wheels with greater or less
pressure according to the extent of the declivity on pressure according to the extent
which the vehicle may be traveling.
Barrel Truck. - George P. Clark Windsor Locks, Conn. This truck has three separate supports to receive the chine of a barrel, each provide with a caster, in combination with connecting link pivoted at their ends to the supports, while the fron urned and moved in any direction without friction and without straining the truck.
Can Cover and Lock. - George H. Littlewood and Orson D. Phillips, Lisle, N. Y. Combined with a flanged lid is a spring encircling the
fange, and means for contracting and expanding the spring, whereby, when the cover is upon the can body the flange of the cover can be forced to a firm frictional contact
thereto.

Churn. - Homer G. Cronk, Apopka Fla. This invention provides a specially formed re movable agitator frame located in the cream chamber, with a novel latching bar, the cream receptacle or
chamber being pivotally supported, and by dashin chamber being pivotally supported, and by dashing
Oil Stave. - Edward B. Finch, New
Oil the contents produce butter York City. Two patents in this class have been issued
to this inventor, one of which provides for an arrangement of the passages, chambers, and dampers to distri ate heat from the center to all parts of the top, whic direct it to the sides, while the other provides an a pace and chamber in the lower part of the stove, the air for combastion entering at the base in contact with the oil tank and keeping it cool, while there are transverse air chambers between the burners where the ar ocomes heated before issuing into the working parts when only one or a part of the burners are lighted, ob-

Tether. - Benjamin E. Sergeant, Greensborough, N. C. The tethering stake is preferably fitled a bracket in the shape of a rectangularfram with a lug on its upper end at one side, to which pivoted an arm holding a tethering pole, the arm being hela to.bear the pole up to a suitable angle by means of attached to a lug on the brecket
Chec -Samuel Osborn, Witton, Connering Device ment whereby the check rein may be slackened o tightened without the driver leaving the seat of the ehicle, the check rein being connected by means of a
ring and link with a strap passing to the driver heneath one of the lines, and there being a check hook atuched to the saddle on to which the ring on the check rein

Fence.-George W. Alexander, Holly Springs, La. This is a fence in which only the end posts of a panel enter the ground, there being intermediate posts and cross bars held above the ground, the upper part of the fence being preferably formed of
barbed wire, with a bottom plank held just above the ground to prevent small animals getting through the The.

Theatrical Appliance. - Charles | barnard, Stamford, Conn. This invention consists of |
| :--- |
| a pedal wheel vehicle, such as a bicycle or velocipede | to be used on the stage of a theater, and which, while it is mounted and worked by the actor to give the desired scenic effect, is independently slid or drawn over the stage to give to it its required trave,

Language Game. - Effie E. Young, Orange, N. J. This is a game in which a number of
cards are used, each having a word of a language printed on one side and the phonetic equivalent of such word in another language, the word and its equivalent being printed in different colors, or different colored card may be used, each color representing different parts of
speech, the design being to facilitate the acquisition of a large and correct vocabulary in one's own or another

Forming Shirt Bosoms. - Maurice chine adapted to turn and press the edges of shirt bosoms in forming the seams, ard provides means
whereby the marginal edges, having a curved, pointed,
or irregular lower end or sides, may be expeditiousl conveniently, and evenly laid and fixed ready for

Pen Holder. - Ferdinand Knade, Breslau, Prussia, Germany. This invention provides, at the end of the holder which carries the pen, a longitudinally movable spring-pressed sleeve, to prevent
soiling the user's fingers by ink taken up by the pen soiling the user's fingers by ink take
when dipped into the ink receptacle.

NEW BOOKS AND PUBLICATIONS. American Railroad Bridges. By Publishing Company, New York. Pp. 60. Price $\$ 2$.

Theodore Cooper is well known as one of the engineers of the Washington Bridge of this city, which has areary been several times illustrated in our columns.
The treatise which we are considering was publish. originally in the Transactions of the American Societ of Civil Engineers, and received a medal for its merit It is a work which all civil engineers should study. It of which many very interesting illingtrations are given, and after a rapid review of them, comes to statement in regard to the most recent practice. A series of illusrationsare given of the various forms of trusses, and xhaustive tabular statements of the strength of bridge components as proved by recent tests of full sized members are included in the work. It should be understood that the plates, of which there are nearly thirty are not
included in the paging of the book, so that it forms guite an extensive treatise.
The Development of the Philosophy OF THE Steam Engine. By Robert Wiley \& Sons. 1889. Pp. v, 48 . With some slight modifications this work represents
paper read in 1884, at the Montreal meeting of the British Association for Advancement of Science. The author has won much distinction in the field of mechanical engineering, especially in that part of it relat-
ing to the steam engine. The title sufficienty indicates what the little work is devoted to, and the history given in its pages really includes a statement of the advanced

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clusively accurate. F. A. Gardner, 108 Liberty St., N. $\mathbf{Y}$. Wanted-Correspondence with some one who would like to furnish capital to develop some inventions, for a uitable interest in the town. Brown Co., Neb.
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will send their pamphlet, describing water works mawill send their pamphlet, describing water works ma-
chinery, and containing reports of tests, on application. Tuerk water motors at 12 Cortlandt St., New York. Screw machines, milling machines, and drill presses. C. E. Billings' Patent Surface Gauge. Drop Forgings. Bronze Forgings. Billings \& Spencer Co., Hartford, Conn. The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon. 24 Columbia St., New York.
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mooth. The D. Frisbie Co.. 112 Liberty St., New York. Tight and Slack Barrel Machinery a specialty. John Acme engine Acme, 1 to 5 H. P. Seendv. hext inue. Send for new and complete catalogue of Scientific
and other Books for sale by Munn \& Co.. 361 Broadway. New York. Free on application.

Hedest (0, unifs

(1978) C. H. H. writes: I have a fountain with a glass globe ball to which a brass jet is atbecomes detached from the globe. Can you inform me of any kind of cement which will not be affected by the water which passes throagh the jet and which will fasten the glass globe and the metal jet together. If so, please inform me. A. Sealing wax melted up with about $1-10$ its weight of beeswax is pretty good. The
following is better: resin, 5 oz.; beeswax, 1 oz ; red following is better: resin, 5 oz.; beeswax, 1 oz.; red
ocher in powder, 1 oz . Melt together and have the surfaces hot before application. see query 2018.
(1979) R. W. T. asks: What to put nto benzine, in order to deodorize it, without other wise changing its nature? A. Agitate with oil of
vitriol and chromic acid or bichromate of potash. After it has settled, decant and distill.
(1980) A. F. G. asks: How to make cheap and at reasonable cost about one gallon of Eau oxygenee, or peroxide of hydrogen, such as usted for bleaching hair, etc. A. Mix 64 oz. binoxide of
barium with same weight of water. Mix 37 oz. oil of vitriol with 64 oz . of water. Let it cool perfectly Then gradually pour, with constant stirring, the acid into the other mixture. Wher all is added, test with
litmus paper. If still acid, add a little more binoxide of barium in powder. Finally decant and filer if ne cessary. Keep in bottles with glass stoppers or with
cole cessary. Keep in botles with glass stoppers or with
tight corks. It is well to keep the solutions cool by ice during the mixing operations.
(1981) M. G. asks the best means of We recommend freshly made solution of gum tragaWe recommend freshly made solution of gum traga-
(1982) J. O. M. writes : I want to make a liquid glue of the best quality, if possible, withou
using acid. A. The following is recommended by some White glue, 16 oz:; white lead dry and in finest powder oz.; rain water, 2 pints. Dissolve in a clean glue po
constantly stirring. Then stir in 4 oz. alcohol, and heat for a few minutes longer. Bottle while hot As rule, liquid glue formule specify some kind of acia.
(1983) R. W. W. is referred to our SUPPL, हMEN
many kinds.
(1984) R. J. R. asks for (1) a receipt for making a preparation for coloring light leather black,
so it will not rub off. A. Simple treatment with solution of iron sulphate or copperas will dye eeather black. Acetate of ron may be used instead of above with advantage. The leather may first be mordanted with solution of logwood extract. 2. Can a person 1. ar
ventriloquism or does it come naturally? A. Ventrio quism can be learned to some extent by any one, but refer you to our SUPPLEMENT, No. 555 , for a paper the subject.
(1985) O. B. writes: 1. I want sometransparent. Will you please inform me what fulfills these conditions the nearest? A. Tracing cloth, gelatine, and celluloid films are the nearest to your requirements.
2. I should like biographies of the more eminent scientists of the last few centuriee. In what form can get them? A. Consult the Scientipic American
Supplement, in which we have published many illus Supplement, in
trated biographies.
(1986) D. B. H. asks for the formula used in making artificial ice. A. Many ways of
making artificiali ice have been applied. The following are freezing
degrees Fahr.

##  <br>  <br> Nitrate of ammon <br> from $50^{\circ}$ to $-14^{\circ}$

Even nitrate of ammonia and water produce a con minonium produces still more, but is objectionable from danger of poisoning. For many mechanical processes, see our Supplement, Nos. 32, 35, 73, 171, and many others.
(1987) J. B. asks: 1. How should the terminals of an induction coil be connected so as to get
variety of currents? As, for instance, the primar urrent alone, the secondary current alone, and th primary and secondary currents combined? A. For induction coil construction we refer you to our Supple
MENT, Nos. 160 and 569 . To get the primary current you merely need to connect your electrodes to the terminals of the battery. 2. How is a mercury break o interrupter constructed? A. It is a steel or iron cup
about $2 / 4 \mathrm{in}$. diameter. One wire connects with it. It s filled with mercury,and the other terminal is arrange with a spring so as to dip into it when drawn down-
ward, the whole operating like the ordinary make and ward, the whole
(1988) L. S. W. asks (1) how to tell lum ber that is dry from lumber that is partly dry, white
oak and white ash. A. There is no way of distinguish oak and white ash. A. There is no way of distinguishing dry from partly dry lumber, further than by the
seasoning checks, which method is of no value if the seasoning checks, which method is of no value if the
lumber is exposed to rain. Use judgment. 2. How to deodorize alcohol on a small scale, from 1 to 5 galounces of nitrate of silver to each 2.000 gallons of crude alcohol, and then to rectify. The nitrate of silver may be dissolved in water first. The foilowing process is
also given : $\mathbf{1}$ pound of animal charcoal is covered with ater and mixed with $1 / 4$ ounce of oil of vitriol, with con Mix the spirit with $3 / 4$ ounce ammonia to the gallon and pour over the bone black. After standing decant, filtering and distilling if necessary. Magnesia equal to one-
tenth the weight of animal charcoai may be added enth
(1989) F. H. G. says : An eminent New York dentist makes use of the term "a blind vacuum," in speaking of the phenomenon by which artificial teeth
are retained in the mouth. Another writer on the same subject speaks of a "vacuum by contact." As a stuent of dentistry I wish to ascertain the scientific exto find anything bearing on the subject. A. The word sure from 0 to 1477 pounds per square inch. The words
s. "blind vacuum" may be very proper in view of the act that you do not see it, while the words "vacaum by contact " are equally applicable as implying the conditions for producing a partial vacuum by the adhesion
of surfaces by wet contact, as so well illustrated by the ucker leather used by boys for liftung cobble stones. We used to call it suction. There is no vacuum under the leather, nor in the mouth between the surfaces, until an effort is made to lift the leather or remove the plate. The adhesion of the wet surfaces in the leather sucker allows the central portion to separate under sufficient tion does not take place with the dental plate, the ame effect is produced to make the ad partial vacuum along the edge of the plate, which is kept, without constant effort, by the adhesion of wet surfaces.
(1990) F. L. S. writes : I have a bear skin killed over a year ago, which was not touched unt11 mount, is as hard as a board, as also is the greater portion of the skin. How can I soften it so that I can
mount the head and use the skin as a rug? A. It is very likely that portions of the skin became spoiled be-
it up, which is the first thing to be done, it will be

| found that the hair will come off and portions of the |
| :--- |
| skin will be putrid. If this is not so, and the hair is | skin will be putrid. If this is not so, and the hair is it on the fiesh side a mixture of about equal parts of salt and powdered alum, leaving enough on the surface to well cover it, and roll it up in a close package, leaving it thus for a week. Then shake out well, and repeat the peration with a mixture of two-thirds alum to one hird salt, and leave for about a week. A third appli wation might be necessary for a heavy skin, but this shaking out and beating, the skin should be very thoroughly worked on the flesh side with a blunt-faced hand tool, to soften it. To properly mount the head the skin

should be removed from the skull, the skin and bon sructure thoronghly cleaned,and all the parts as well a he skin treated with an arsenical powder composed ollows: Arsenic and burnt alum one pound each eplace the skin on the bone structure, supplying frame for any natural portions omitted as well as for i
(1991) M. S. asks what to use on musk ins to make the hair remain on and make the fle de soft. so that it can be used for caps and gloves. only the time required will be considerably less.
(1992) I. C. G. asks for the formula for aking universal German pomade for polishing meta
. The following is given as the formula for put

## Oxalic acid. Oxide of iron

Oxide of iron
Rotten stone
Palm oil
Vaseline
.1
.25
.20
. .60
.4
The oxide of iron may be Venetian red. Both it and oxalic acid is poisonous.
(1993) L. L. B. asks : 1. How many re olutions does the armature of the simple electric mo
or make in one minute? A. From 2,500 to 3,000 . 2 Does the simple electric motor make as many revolutions when the plates are plunged an inch as when they
are plunged the full length? A. When the motor is conare plunged the full length? A. When the motor is connected as a shunt machine, it regulates itself very well
but when it is connected as a zeries marhine, its speed increases with the current. 3. I have made the armature of this motor of strips of zinc same size and thick ness instead of No. 18 soft iron wire. Will it make any difference in the power of the motor or in any other way? A. Zinc will not answer; you must use iron in ome form. Wire is preferable. 4. Is the power taken direct from the pulley of the hub of this motor? A.
Yes. 5 . How many volts of electricity is equal to horse power? A. Voltage is only one element in the calculation of electrical horse power $\frac{\mathrm{E} \times \mathrm{C}}{746}$
or electrical horse power, i.e., the electromotive forc in volts multiplied by the current in amperes divided by . What is mber of watts equi valent to one horse power . What is meant by the amperes? A. The ampere is
heunit of the current. 7. What is meant by electro plating? A. The deposition of metals by an electric is it made and for what is it used? A A battery which may be so changed chemically by A battery which may be so changed chemically by the passage of an giving out a current. 9. Is there any way of removing rust from from nickel? If so, please give me receipt. A. Try dilute sulphuric acid. 1G. Have you ever pub-
lished a full description how to make a small dy namo for electric lighting? A. Consult Supplement No. 600. 11. What is the best book for a boy 17 o 8 years old to learn all about the science of electricity mail, post paid, \$4. 12. What is the best paint for bicycle, also is there anything that will keep it from
rusting? A. Asphaltum varnish is sold by bicycle dealers. A. Asphaltum varnish is sold by bicycle med "enameling" by the trade, for this purpose. (1994) D. M. S. asks: What can I use to ive the black, velvety appearance to buckskin shoes which have lost their black appearance from age? A First wet the surface well with strong alum water, oiled and filtered to which is added a little logetao iron. The skin will not be as soft as it originally was
(1995) F. D. asks how to make rubber tamps. A. The India rubber, unvulcanized iut mixed
with the proper amount of sulphur, is placed in the mould and heated and pressed into all the caviues. It is held thus pressed and is heated in a vulcanizer. The details of India rubber working are given in our Supplement, Nos. 249, 251, 252 . The intaglio from which the letters are cast may be in plaster of Paris, type
(1996) W. M. writes: Will you kindly ive receipt for making concentrated ye (solid)? A Concentrated lye is simply solid caustic soda. It may be melted and poured into iron cans and hermetically dition of lime and then after decantation may be orated to dryness.
(1997) E. M. writes : 1. I have made a couple of cells of electric light carbon battery decribed by you in your paper of December 17. 188\%, and
they work admirably. I use them on open circuit, and should be glad if you would inform me how to lieep them in good order. I have added a little sal-ammoniac occasionally, and replaced the water lost by evaporazincs are used up, or can they be used indefinitely? A. You are giving it all the care required. From time to time the water should be poured off and replaced by
fresh water with sal-ammoniac. It is also well to coat edges of the iar with paraffin. For open circuit work one zinc is enough; the great point is to have plenty of carbons. 2. I have a small quantity of waste gold
mised chiefly with lime; have tried to recover it by melting it with almost every kind of flux, but without success. Can you inform me of a simple way to recover all the gold? A. Moisten the lime with water, then dis-
(1998) E. H. I. asks: With what fore (1998) E. H. I. asks: With what forc will a two hundred pound weight strike if it fall three height? A. Divide the distance fallen by the distance passed through after impact, and multiply the weight by this factor for average force of impact. If your weight after impact descends $1 / 4$ inch, the average force will be $21,600 \mathrm{lb}$.
(1999) San Francisco asks : If a perforted piece of circular iron be subjected to heat, will the
holes become larger or smaller? A. Heating tends to
(2000) R. H. asks : 1. Can you explain ow rheumatism may be cured by wearing brass chains round the wrists or ankles? A. It cannot be so cured Will you please give me the composition of methyl volet? A. One part by weight of rosaniline, 2 par adide of ethyl, and about 2 parts of strong methyl of the rosaniline is replaced by methyl. There are number of methyl violets, whose compositio
The above is a typical method of preparation
(2001) C. F. J. writes: Trautwine's Ensineer's Pocket Book says a man can exert from onesixth to one-tenth of a horse power. The small motors made to run sewing machines are rated at one-eighth horse power. Would one of these motors with primary battery propel an ordinary rowboat three miles an
hour? A. Yes, if you have battery enough. The ar-
(2002) Quiz asks for a formula for computing internal resistance of any battery in which the of soda and acidified with sulphuric acid Plates 1 zinc between 2 carbons, all of equal size. A. Take area of both sides of zinc plate in square inches and divide by 3; multiply this by the distance from zinc to carbon . inserce in pretice rapidy runs up.
(2003) H. K. asks: 1. How can the "sbine" on coats and pants be removed without washng same? A. It is said that skillful tailors remove the hine in the process of pressing by creating steam apidly withnn the fabric by means of the iron, and immediately removing the latter. W. I have an electric
bell, the electro-magnet being wound with No. 32 in bell, the electro-magnet being wound with No. 32 in
sulated wire. What kind of battery would be the cheapest, and how many cells are necessary to ring it? A. This is rather fine wire for a bell. You will probarate it.
(2004) E. A. W. writes : Please give description in Scientific American how to construct a may have already been described and overlooked. For description with w rking drawings of above, w
(2005) F. M. S. asks: Can you give a formula for a good coating paint that will stand the heal in furnace stacks? A. A paint made with ground painting smokestacks and boiler fronts. If too thick thin the mixture with turpentine. Make the ground graphite from a quarter to one-half the bu!k of the coal
(2006) W. A. D. asks for information as to how to make whitewash that will not rub off. A. To
$1 / 2$ bushel best lime, slaked with boiling water, add 8 quarts salt previously dissolved in hot water, $1 / 2 / 2$ pound whiting, $21 / 2$ pounds ground rice boiled to a thin paste,
1 pound clean white glue dissolved and boiled. Thin with hot water and boil the whole. Apply warm.
(2007) R. R. S. writes: The rece disaster in Arizona is, it seems to us, another example you will give your readers the benefit of whatever in formation there may be to be derived from this catastrophe. Having personally been in charge of a large reservoir (some twelve hundred acres) at the head of Farmington river, in the State of Massachusetts, for the past fifteen years, we have realized the dangers, and any instruction which can be obtained we are of course
very thankful for. A. A very large percentage of the reservoir dums throughout the United Stage of the made in view of the contingencies of extraordinary Hood or the future change in the condition of the surrounding country for holding back flood water. Every
dam that has burst in recent times has had the element dam that has burst in recent times has had the element
of cheapness or ignorance of responsibility as its most prominent feature. The neglect of the proper width of dams. Long foot slopes, broad and high crests, with pills of suitable length and strength for tornado clouc together with honest packing in the water wall, are necessities of safety that should be applied to hundreds of dams now in jeopardy. Riprap and soil dams
should not be tolerated unless thoroughly supported. A few hundred dollars spent in strengthening a cheap (2008) F. C. asks : 1. Why is not the omach itself digested? A. The act of digestion is no completed in the stomach, and the vital force, with its has the power of accomplishing some of the early stage of digestion of dead matter. 2. What is the use of the spleen? A. It is uncertain. According to the most probable view, it contributes some constituent to the
blood; possibly the red corpuscles. Animals can live thout it; its extirpation has been performed
(2009) G. G. writes: Can yon tell me the process for bleaching the harr? A. The hair is
sponged with " bleach," which is a solution of binoxide of hydrogen. See query 1980. A little ammonis
(2010) S. M. writes : How do you find the area of a segment of a hyperbola? A. You will
find the rule in Haswell's "Mechanic's ard Engineer's
is too long for us to quote here. It is deduced by
calculus, under quadratures of curves.
(2011) B. F. C. asks : If a thermometer be held in a running stream, will it indicate the same
temperature that it would in a pailful of the same water? A. It will. The motion of the water does not
(2012) D. asks for a recipe for a black dressing for saddles and bridles. A. Many formule re given. Try the following: Muton suet, 2 oz.; 2 oz.; lampblack, $21 / 2$ oz.: indigo powdered, $1 / 2 \mathrm{oz}$. (2013) Art asks: How to bleach orange gum shellac white. A. Rub up with and dissolve in 2 lb. water 2 lb . chloride of lime. Add to above 4 oz . caustic potash in 1 lb . of water. Digest 2 lb . of the
shellac in 1 gallon of alcohol for a few days, Add the shellac in 1 gallon of alcohol for a few days, Add the
above flaid then with constant stirring, and after half above flaid then with constant stirring, and after half
an hour add excess of hydrochloric acid. Pour off the an hour add excess of hydrochloric acid. Pour off the
fluid after the sheliac has separated, wash the shellac with boiling water until the latter comes off clear, place

(2014) W. A. M. writes: I want to get abstract of title work, which, as you well know, demands the very best staying quallties. Will you kindly furnish some formulæई A. Blue ink: Dissolve 2 parts
Prussian blue, previously washed with hydrochloric acid and followed by and followed by water, in 32 parts water with addition
of as little oxalic acid as will effect the solution, say 1 part. A little gum arabic may be added. Or dissolve 1 part sulphate of indigo in 32 parts water. Violet ink:
Dissolve 38 parte logwood extract in 550 parts boiling water. Then, using a small portion of this solution, dis solve in four separate vessels: $a, 20$ parts alum; $b, 11 / 4$ sole
cream of tartar: $c, 15$ of gum arabic; $d, 1 / 3$ of crystallized verdigris. Add these in the order named to the
original solution, and mix with a very little creosote or
(2015) L. R. D. writes : In your issue of February 1, you state that "in all wheeled vehicles
he upper part of the wheel moves at a greater velocity the upper part of the wheel moves at a greatel velocity
than the lower, or part touching the ground." Would you kindly explain why that is? A. See Scientific merican Supplement,
(2016) R. W. H. asks: Is it possible to run one electric lamp by the aid of batteries? How candle pories would it take to run a lamp of or 15 lamp of that power? A. This is possible, but it does not pay. It would take 25 or 30 cells of bichromate battery. The lamp is worth 75 cents.
(2017) H. F. W. writes: I have seen a certain kind of tissue paper which serves as a kind of barometer. The changes of the weather cause the
paper to change color. Will you please give me the receipt? A. The paper is saturated with a solution of
(2018) F. G. R. asks : 1. What kind of cement is good for aftixing brass to glass? A. Copal
varnish, 15 parts; lineed oil varnish, 5 parts; oil of turpentine, 5 parts; glue, 5 parts. Mix and dissolve on
a water bath. When solution is complete, add slaked lime, 10 parts. Or use ordinary sealing wax. 2. How can I procure a phonograph? A. You cannot buy a
satisfactory phonograph. They are only rented. The original ones are only of scientific interest, but have no practical value. Address the North American Phono graph Company, of this city, for terms of rental. They
will show you the capabilities of the phonograph if you call upon them. See query 1978.

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