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2.-Crest of Dam, Showing Method of Dovetailing the Blocks.

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## unsuspected peril in elevators

The recent shocking elevator accident in the United States Fire Insurance Company's building, William Street, New York, which resulted in the death of the secretary of the company, Walter H. Griffin, the seri ous injury of Thomas W. Cauldwell, a director, and minor injuries to the other occupants of the car, has opened the eyes of the public to an unsuspected but very grave peril in one of the most common forms of elevator.
Since the epidenic of elevator accidents which visited this city last year, when such noted structures as the American Tract Society building, the Waldorf-Astoria Hotel, and the General Post Office were the scenes of more or less serious breakdowns, New York has been comparatively free from disasters of this kind. The accidents of that period were of such a nature that the cause was easily ascertained, and the lessons which were learned have been put to good account by both the builders and operators of this class of machinery. The United States building accident, however, is o an entirely novel kind, nothing like it, as far as we can learn, having happened before. It has served to show that there are some contingencies that may escape the most careful safeguarding against accident, and it teaches us that in elevator-work involving the constant movement of heavy suspended weights through vertical distances measured by the hundreds of feet, it is well to provide even against those breakdowns which are apparently, in the nature of things, impossible. In the present case the car containing eight people had descended to the ground floor, and the occupants were commencing to leave the car, when several 100 -pound weights became detached from the counterbalance cage at the top of the shaft and fell through the full height of eleven stories upon the roof of the car.
The elevator is of the Otis overbalanced electric type so named because the weight of the car is overbalanced by counterweights, which are attached to the car by wire ropes that pass over pulleys located at the top of the shaft. The counterbaiance weights travel in a vertical guideway at the side of the elevator shaft, and they are placed in two cages or stirrups, placed one above the ther, with a space of a foot or two between theil. Each cage is hung by its own separate ropes. The upper cage contains the weights that counterbalance
the car, and its ropes run directly up over the top pulleys and down to the car. The lower cage contains the counterweights for the live load (passengers), and its ropes pass by the car counterweights over a top pulley and down to the back of the winding drum. A winding rope also passes from the front of the drum, over top pulley, and down to the car.

- The object of the counterweights is to relieve the strain on the car hoisting ropes, due to the sudden starting and stopping. Thus we may state a typical case in which the empty car weighs 2,000 pounds and its counterweight acting on the car 1,500 pounds, while the live load provided for is 2,000 pounds, counterweighted by 1,500 pounds acting on the back of the winding drum. It is evident that the greatest deadweight to be overcome by the electric wotor is never over 1,000 pounds. The motor, when the car is empty, will have to lift 1,000 pounds excess of counterweight, and when the car is full will have to lift 1,000 pounds excess of live load. In the normal condition of working, when the car is half full, the car and load will about balance the combined dead and live load counterweights.
The car is arrested at the top and bottom of the shaft by means of an automatic catch on the motor, which switches off the current at the proper moment. It seems that the catch was ont of place by an amount equivalent to two or three feet of travel of the car ; so that on this particular occasion, instead of the motor stopping when the car reached the bottom, it continued to wind up the lower case of weights, which, as we have stated above, was attached through its ropes to the drum. The lower cage was lifted in the groove until it struck the upper cage, which it carried up with it until the top edge of the upper cage brought up against an iron beam of the overhead grating of the
shaft. The concinued pull of the rope caused the
lower cage to crush and bend open the vertical bars of the upper cage, thereby allowing the loose weights which it carried to fall out and down the shaft.
It should be explained that the cages consist of a solid top and bottom weight connected by two vertical rods. The space between these weights, which are fixed, is filled in with loose weights (used in adjusting the overbalance of the car), which are held in place by notches at their ends which embrace the two verti cal rods, above mentioned, of the carriage. The verti cal rods were only expected to be subjected to a ten ompressed between the upper grating and the lowe car acting under the pull of the motor.
This is the first instance on record oin an accident of this character, and it teaches a very plain lesson, which the makers, not only of this, but of all forms of counter balanced elevators, should make haste to act upon balanced elevators, should make haste to act upon.
The counterweight cages should at once be changed so The counterweight cages should at once be changed so
as to render the spilling of the loose weights an impos as to render the ra bolt should pass down through ever weight or the cage should be made of stout sheet iron or wire netting. Although it has taken nearly a score
of years to reveal the existence of this peril, the terrible of years to reveal the existence of this peril, the terrible onsequences of such an accident render it the daty every maker and owner of such elevators to make the public in future


## It is need less

It is need less to say that the accident emphasizes the necessity for frequent and rigid inspection; for it was the misplaced automatic stop that was the immediate cause of the disaster

## FORTHCOMING IMPROVEMENTS IN UNITED STATES

 NAVAL ORDNANCE.The present fiscal year, 1898-99 promises to be an un usually important one in ordnance development in the United States navy. As a result of the reports received from the various ships which were actually engaged in battle during the past summer, a number of important changes will be made in guns and mounts and in th make-up of the ships' batteries The 13 -inch gun will give place to an improved type of 12 -inch gun as the main armament of battleships, and a more powerful 6 -inch gun will become the standard weapon for the arming of the main rapid-fire batteries. The $1 \%$-inch gun will be a weapon of much greater power than the present type, as installed on the "Iowa," and there is good reason to believe that the wire-wound system, which is in very successful use in the British navy, will be used in this and in the 6 -inch gun. For the present, however, it is premature to announce the use of this system as a settled fact. The new 6 -inch gun will have a velocity of 3.000 feet per second. This enhanced velocity will be effected by an increase in weight and length, but no change will be made in the present specifications for projectiles. The other conspicuous change will be the general substitution of 3 -pounder guns on the heavier ships for 1 -pounders. The 3 pounders may even be expected to largely displace 6 pounders, particularly on the smaller vessels. It is not generally known that the 3 -pounder gun has a longer range than the 6 -pounder. It is a fact, however which is due to the employment of a proportionately arger amount of powder behind the 3 -pounder shell.
The actions at Manila and Santiago have confirmed the lessons taught at Yalu that 1-pounder guns have a questionable value on board battleships and heavy cruisers. The range of these guns is deemed too limited. The action at Santiago was fought out at ranges, generally speaking, beyond 3,200 yards. The 1 -pounder guns have their sight bars cut for only 3,000 yards.
The demand just now is for heavier guns in the sec ondary batteries of battleships, and in the United States navy provision is being made to supply pieces of 12 -pounder and 14 -pounder caiibers. The 12 -pounder was adopted several years ago in the British navy and is a favorite weapon. It not only finds a place in the batteries of battleships and heavy cruisers of that service, but is mounted on vessels of the torpedo-boat destroyer class. The battery arrangement on this last mentioned class is one 12 -pounder and four 6 -pounder guns. The United States destroyers of the Porter ype, mounting four 1-poun
The new 14-pounder gun w
The new 14-pounder gun will have a muzzle velocity of 3,000 foot-seconds. For small vessels of too light construction to mount 4 -inch guns in the extremities, the new 14 -pounder is deemed an ideal weapon.
Assurance is given from a high quarter that all sec-
ondary battery guns for the United States navy of the ondary battery guns for the United States navy of the 3 -pounder and 6 -prounder types will hereafter be built on the semi-automatic principle. The Maxim-Nordenfelt mechanism appears to be the type hit upon. The right to use this principle has been acquired by our naval authorities.
The manufacture of projectiles for secondary battery guns has been carried to that point where there is little difference in the cost of common shell and armor-pierc ing shell. This statement applies particularly to 3 pounder and 6-pounder projectiles. In consequence of this fact, armor-piercing shell, it is announced, will be issued exclusively from now on for the lighter calibers.

The armor-piercing projectiles in calibers below the 4 inch carry explosive charges.
The Maxim-Nordenfelt automatic guns, which were installed in large numbers on board United States ships at the breaking out of the war, did good service. but, from the individual reports of officers, there were a good many instances of jamming at the outset. When the volute springs were well set up and the cartridge cases properly squared, the guns could generally be depended upon to run a belt out without stop, but there was more than one instance of cartridge cases pulling apart from the shells. The ammunition used was of English make, and the opinion has been quite freely expressed that in manufacture it was not up to the best American make. As a prominent ordnance official has expressed it, however, "When these guns did work well, they were ideal." The policy now is to make the 1 -pounder guns of longer barrel and heavier. A rate of fire of 250 shots per minute is counted upon.
While foreign nations are employing high explosives to a large extent in naval shells, the policy in this country appears to be in favor of the retention of black powder charges. The latter can be depended upon to fire wood work, and the action of one of these shells when bursting between decks is more diffusent than in the case of a high explosive charge. It was the black powder in the American shells which so early in the fight at Santiago set the Spanish ships on fire.
The reports from the various ships show that premature explosion of shells in the guns was not an infrequent occurrence during the war. The 5 -inch gun of one vessel is said to have been badly scored by one of these happenings. On the "Manning" there were two instances of premature explosions in action, one a 4 -inch shell, the other a 6 -pounder, but the guns were not even marked. In squadron action kefore Santa Cruz del Sur a shell from a leading ship burst about 100 feet ahead of the "Manning," showing that the trouble in Commander Todd's fleet was not confined to one vessel. On the other hand, the action of the shells on striking on shore was not, according to later discoveries, always certain. Shells were picked up both at Daiquiri and about Santiago which had failed o detonate. In the case of the Maxim ammunition, the shells would often explode on striking the water. The "Manning" had occasion, when attached to Comnander Todd's squadron, to use her Maxims on some thatched huts in the vicinity of Niquero, and it was found that the shells exploded with regularity, even when brought up by these light obstructions.
The attention of the ordnance officials has of late een directed to insuring a greater certainty of action in the fuses of all naval shells, and information at hand is, in effect, that the new fuses are more sensitive, while still possessing a good factor of safety. The trouble occasioned by shells exploding prematurely is ascribed to the doing a way with burster bags. So long as the interior of the shell is given a smooth, lacquered surface, these accidents will doubtless be obviated. The rule now is to crowd as much black powder into a projectile as its interior space will hold. The idea is to obtain as great a mine effect as is possible.
Brown prismatic powder is now a thing of the past. Large contracts for the new smokeless powder are at present being filled, and it is confidently asserted in ordnance circles that there will soon be a sufficient supply on hand to fit out every ship in service. It takes at least one month to commence the delivery of smokeless powder, once a contract has been signed, and in these days of quick wars it is imperative to have a large reserve stock on hand.
The fear is expressed by many leading naval officials that the people will conclude that because this war was so easy, it will always be easy, and that it makes little difference what class of materiel the country has on hand or how much of it. The present policy of Commodore O'Neil, the Chief of Naval Ordnance, is to stock up the navy yards with liberal supplies of ordnance outfits; but as this costs money, the attitude of Congress has to be reckoned on.
The war with Spain has not only tended to ordnance changes, but to radical inuovations in the preparation of ships for battle, and new regulations based upon the experiences of the past summer are promised shortly. From what can be learned, it is proposed to strip ships down hereafter as they have never been stripped before. Woodwork is to be torn out in ruthless fashion, and in those ships where the officers' living quarters are placed well up above the waterline, stateroom bulkheads, closets, and furniture are doomed to go. It is even a question if bunks will be retained. The recourse, in the event of taking out bunks, is hammocks.
There are certain articles carried on the decks of warships which are very convenient, such as chests and lockers, but in time of action these appurtenances only serve as so much fuel for flames. The new rule will be to mark in plain letters "Overboard" all fittings not essential to the working of a battery and which serve only to give off splinters. .t is expected that opportunity will be afforded for ships to stow the greater part of their loose furnishings at the navy yaras
before hostilities break out, but if vessels are brought to action without previous opportunity for prepara tion, the "overboard " practice will be in order.
The action at Santiago brought home more forcibly than any other battle the great danger from fire in time of battle, and forthcoming instructions, it is announced. will lay special stress on precautions to be taken. Not only must hose be led out to every part of a ship, but care must be taken to protect the hose as much as possible from destruction by shell. On several of the Spanish ships hose led along deck was cut to pieces by 6 -pounder shell.
In the matter of carrying small boats in time of action, the naval authorities, it is understood, will leave it largely discretionary with the commanding officers, but the opinion is hazarded that naval captains, as a rule, will strip down to two or three boats. During the civil war the practice sprang up of dropping the small boats clear of the ship on going into action, and the same practice was observed to some extent in the Spanish war. On the larger vessels a steam cutter and a couple of pulling boats, say a whale boat and launch, constituted the outfit. It is contended that, in a prolonged artillery duel between ships, any boats carried in the cradles will be shot to pieces. There will be the danger arising from splinters, to say nothing of adding to combustible material. Even if the boats are not set on fire, they will probably be so badly damaged as to make it impossible to use them The instructions, it is said, will suggest that commanding officers encourage their men to rely upon life preservers.
The war color for warships which most nearly approximates to the horizon and rocks has been found to be a dull gray, with a yellow shade. Lieut. G. L. Carden,

Ordnance Officer, U. S. S. "Manning."
CHIEF CONSTRUCTOR PHILIP HICHBORN. When we consider the brilliant naval vic tories of Manila Bay and Santiago, we are apt to forget the labors of those who made the success possible. The truth of the mat ter is that the victories were gained months and years previously in the draughting rooms in the State, War and Navy building at Washington. We do not wish to discount in any way the bravery and skill of the line and engineer officers who navigated and fought the ships with such success. At the same time the bureau chiefs and their subordinate officers who toiled all through the spring and early summer, buying new vessels, converting them from peaceful to warlike use, making and shipping supplies and attending to all of the manifold wants of an enormous fleet of 312 vessels, should not be forgotten. The good work accomplished by the Bureaus of Yards and Docks, Equipment, Navigation, Arms, Crnstruction and Repair, and Steam Engineering, will ever remain one of the most pleasing and satisfactory remembrances ot the war
The subject of our sketch is Commodore Philip Hichborn, Chief Naval Constructor U. S. N. A great deal of the hardest work which was done in the navy in the prepara tion of vessels for active service during the war was accomplished by the bureau over which Commodore Hichborn presides. and we have already, on another occasion, given an outline of the volume of work periormed, and the results of the blockading fleets and the fighting speaks for the quality of work performed.
Commodore Philip Hichborn was born at Charlestown in 1839, and graduated from the Boston High School in 1855. He then entered French's Mercantile College and graduated from it in 1859. At the age of fifteen he acted as assistant secretary to Admiral 'T. H. Gregory, the commander of the Boston navy yard, and a year later he was indentured to the government as shipwright apprentice. During his apprenticeship of five years he successfully mastered every detail of the shipwright's trade, so that he has a knowledge of not only the modern. but the old system of shipbuilding. In recognition of his merit, Secretary Toucey ordered that he should receive a course of theoretical training, and he made remarkable progress in ship designing and calculations in another two years' course of theoretical training under Prof. Molle. ln 1861 Mr. Hichborn obtained a position as carpenter of the clipper ship "Dashing Wave," bound for San Francisco. The voyage was a tedious and tempestuous one of some one hundred and fifty days. The third mate became ill, and Mr. Hichborn was required to act in his place, and he performed the duties of that officer with remarkable success. Upon arriving in San Francisco he worked for the Pacific Mail Company and the California Steam Navigation Company, and then once more entered into the employ of the government at Mare Island. He had various positions at this yard, and in 1862 was appointed master shipwright, which was a very responsible position for a man twenty-three years of


COMMODORE PHILIP HICHBORN, CHIEF NAVAL CONSTRUCTOR, U. S. N.
age, for he had at times the direction of over one thousand men. Two years later he declined the position of Assistant Naval Constructor, but in 1869 he made ap plication for appointment, and in May of the same year, after passing a severe examination, he was appointed as Assistant Naval Constructor, U. S. N., with the relative rank of Lieutenant. The training Mr Hichborn had received in the yard and drawing office made the performance of his new duties comparatively easy. In 18i0 he was sent to Portsmouth, N. H. A farewell ball and procession were given in his honor a $V$ allejo before he left. At Portsmouth Mr. Hichborn passed years of fruitful experience in building and re pairing vessels. In 1875 he received his commission a Naval Constructor, having passed a competitive ex amination at the navy yard, in which he succeeded in distancing all his competitors. In December, 18i5, he reported for duty at the Portsmouth navy yard. At this time the yard was being abandoned and the machinery stored and prepared to be transported to the new yard at League Island. A large share of this im portant work devolved upon Mr. Hichborn. He was always a strong advocate of the natural advantage of the island as a steel shipbuilding yard for the navy and during the nine years he was on duty there he did all in his power to put it in condition for government work. He completed and repaired a large number vessels at this yard
In 1880 he was selected as a member of the first Ad
In 1880 he was selected as a member of the first Ad- in
of the Bureau Chiefs and have since been adopted for the "Amphitrite" and "Monadnock" and other ves sels. Mr. Hichborn is a member of a number of socie ties devoted to the interest of shipbuilding. and he has devoted much time to literary work. chiefly upon sub jects of a professional nature. His ad vocacy of sheathed ships is gaining in favor among men in the nary He has also given great attention to life saving appara tus. His practical and inventive genius has contribut ed many valuable improvements in shipbuilding, such as the utilization of steel bitts as ventilators. In conclusion, it.may be said that professionally Mr. Hich born is always kind and sympathetic in his treatment of his subordinates and is ever ready to recognize thei merit. He is a thorough master of his profession and has won the respect and confidence of his men, and without requesting it, he has at all times received the ull measure of praise from the various Secretaries of the Navy as the result of his excellent management and executive ability

## GLAZED BOOK PAPER BAD FOR THE EYES

The effect of glazed papers on the eyesight has re ently occupied the attention of some (ierman doctors One authority examines the causes of the changes in he general reading and writing habits of the nation and explains that in the earlier part of the century the old rag papers then in use, both for writing and print ing purposes, were mostly of a dull gray or blue color d were coarse-grained, so that thick letters had to be used by writers with quill pens or by printers on their old slow presses. With the introduction of more modern fibers, pape received a smoother surface. steel pens could be employed, and the printing paper could travel over quicker printing presses. 'The fashion for brilliant colors and elaborate typesetting has been carried to such a state of perfection that a reflection is often created which could never arise from the rougher surface. Now, what is the effect upou the reader's eye? In the old books or letters with a mild and soothing light. the surface contrasted easily from the thicker and darke type or writing characters ; now the highly glazed surface offers reflections of the light which, with the more elaborate and thinne type, produce a lot of shades and lights that are most trying to the eye. The paper ha often to be turned in various directions to be seen more clearly in order to distinguish the gray (or, may be, other shades) of the type from the shining white of the paper This is similar in effect as to the result of trying to decipher writing in the durk. An experiment would soon prove this. Take an old edition, say, of Shakerpeare, and a new magazine on highly grlazed paper, and compare the sensation in the eveafter hat an hour's reading. The doctors, therefore propose that the public inspectors of shools should order the use of sallitary paper for the eyes, by which they mean that a , grlazed or highly polished surface should be food ed, and the colors chosen should rather be gray or light blue, but no white, and in fact, no brilliant colors at all. The type should be clear and simple, and not too thin.' The children, whose eyes require protection, and
the first impulse to naval reconstruction. In adaition to his regular duties at the yard, he had charge of the completion of the "Terror" and "Amphitrite" and superintended the launching of these vessels. In 1884 he was selected by the Secretary of the Navy for special duty in Europe, and, in accordance with the orders of the department, made a tour of the dockyards of Europe, and upon his return he submitted a valuable report to the department, which is considered a standard work upon the subject. In November of the same ear Mr. Hichborn was ordered to the Navy Department at Washington as assistant to the Chief of the Bureau of Construction and Repair, and also as Naval Constructor at the navy yard, Washington. He was also a member of the Board of Inspection and Survey The duties of these very responsible positions, which he performed simultaneously, were rather trying, but his professional knowledge, sound judgment, and executive ability enabled him to perform the duty of these offices with great satisfaction to the department. Since his appointment as a member of the Advisory Board, in 1881. he has been prominently associated with mat ters affecting designing and construction of our new naval vessels. Mr. Hichborn was appointed Chief of the Bureau of Construction and Repair in September 1893 , and he now holds the relative rank of Commodore while he occupies this office. His position is compar able to that of the Chief of Naval Construction in England. He was reappointed for a second term on Sep tember 7, 1897. He redesigned the armorclad "'Ferror,' converting her from a single turret monitor of doubtful utility into a double barbette turreted coast defense ves sel of a very formidable type. Thesehighly efficient bar bette turrets were unanimously approved by the board
through them the parents, should be taught to demand their favorite books and papers to be printed. in the right style, and the excesses of a falsely guided taste should be avoided. It is suggested that a few rears of such policy would soon improve the eyesight.-Invention.

RADIOGRAPHY AND THE PHYSIOLOGY OF THE HEART
M. Bouchard, at a recent meeting of the Academy o Sciences, reported some observations he hat made upon the thoracic organs by means of the X-rays Among other things he has been enabled to assert the existence of a marked dilatation of the auricles when the intra-thoracic blood-pressure is raised during in spiration. This condition is artificially brought about by endeavoring to inspire with the glottis shut, and is naturally brought about by the violent inspirations during a paroxysm of whooping-cough. M. Bouchard has also discovered that a clear horizontal space exists during forced inspiration between the shadow of the heart and that of the diaphragm. but during normal inspiration there is no space visible. This phenomenon, which is remarkable considering that the diaphragm and the pericardium are attached to one another, is explained by $\mathbf{M}$. Bouchard in the following way. During the forced descent of the diaphragm in a large inspiration the inferior surface of the heart i in contact with the diaphragm to a very limited ex tent. The pericardium tucks itself into the space ex isting between itself and the heart, forming in front and behind a gutter into which in turn the pulmonary tissue is packed, thus forming a layer of tissue much nore penetrable by the X rays than those which make up the heart and the diaphragm.-Lancet.

## A SIMPLE ELECTRIC BICYCLE-LAMP

In most portable electric lamps the battery-cells used are placed one upon another, and two inclosing conducting casings are employed in completing the circuit between the battery-electrodes and the lamp terminals. A lamp made by the United States Battery Company, of 258 West Twenty-third Street, New York city, is an improvement upon this form, in so far as it ases but a single tubular casing which acts as a support for the lamp and its reflector, and as a conductor from one electrode of the inclosed battery to complete the circuit. As shown in Fig. 1, the tubular casing in question is provided with screw caps at each end, and with an insulated lining sur with an insulated lining surrounding storage battery cells placed one over the other. The cells are each provided with a
cylindrical copper casing constituting a negative electrode, and with a projecting button constituting a positive electrode. The upper negative electrode is in electrical contact with the lower positive electrode. The lower negative electrode is in contact with the outer casing. An incandescent lamp and reflector are secured within a metal ring surrounding the tubular casing. A screw-threaded knob is secured to the upper cap and is provided with an insulating washer.


Fig. 1.-An Electric Bicycle-lamp Fig. 2.-An Electric House-lamp. in Partial Section.
'rarragut' made successful trial run of one hour with one turn. Average revolutions, $419 \frac{8}{10}$ per minute. Everything worked smoothly."
The Union Iron Works, builders of the vessel, tele graphed to the Secretary as follows:
"'Farragut' made successful run yesterday. Speed, . 18 knots."
Under the contract the "Farragut" was required to make 30 knots, and naval officials are greatly pleased to hear that she exceeded the requirement.

The armament of the "Farragut" will be powerfu for a vessel of her size. It will consist of four 6 -pound er rapid-fire guns and two 18 -inch torpedo discharge tubes. Two of the guns will be mounted on the forward platforms surrounding the conning tower and two on the main deck. Her complement of men will be forty in number. The steering of the vessel, which was perfect in all her preliminary trials, is effected by a double cylinder engine secured in the bulkhead abaft the engines. There are altogether twenty-nine steam cylinders in the vessel. A test of the time required to rais steam in the boilers resulted very satisfactorily, and the easy main tenance of high pressure, even when at the highest speeds, was demonstrated.

No Restraint of Trade.
An attempt on the part of J. W. Goddard \& Sons, manu facturers of Feder's Brush Skir Protector, to retard the introduction of all similar articles by securing a monopoly of the advertising, has been defeated by the Supreme Court of New York State.

The method employed by this firm consisted of efforts to make contracts with advertising mediums, in which it was provided that these publications should

## VARIOUS FORMS OF A SIMPLE ELECTRIC LAMP

On her return, in places where the water was deep she made over 32 knots.
'The trials of the "Farragut" have been closely ob served by the people of San Francisco, and the wonderful speed of the curious craft has been satisfactory to every one who loves the navy and who notes the addition of a new protective machine with great interest. Her appearance upon the bay, while tearing along at full speed, was highly interesting. She cu through the water like a razor, raising scarcely any wave and leaving only a moderate swell behind.
The "Farragut" was launched on July 16, 1898, and her cost to the government was $\$ 227,500$. She is the first destroyer completed and the speediest of her class yet built. The dimensions of the new torpedo boat destroyer are : Length over all, 213 feet 6 inches; beam 20 feet; depth, 13 feet 4 inches; and her draught is 6 feet. Ordinary displacement is 240 tons; when in commission, her displacement is $2 \pi 0$ tons. She will carry 85 tons of coal, sufficient for 2,000 miles at a speed of 10 knots.
The engines of the "Farragut" are four cylinde triple expansion and are rated at 5,600 horse power
refuse to admit to their columns the advertisements of compet ing firms, thus securing for themselves the exclusive adver
ig. 3.-An Electr
Carriage-lamp. tising privileges for skirt protectors. Through a mis understanding on his part, Mr. D. J. Kelley, man ager of The American Queen, was induced last July to sign one of these exclusive contracts on behalf of his magazine, but as soon as he discovered the real nature of the agreement he at once refused to carry it out. The Goddards' advertisement was accordingly omitted from the September number of The American Queen, while an advertisement for a shirt protector manufactured by the Stewart, Howe \& May Company appeared therein. The result was that the Goddard obtained a temporary injunction against the marazin and the Stewart, Howe \& May Company. Their triumph was short lived, however, for, when the mo tion to make the injunction permanent was heard Supreme Court Judge Dugro promptly denied it and dissolved the injunction.
This outcome of the affair indicates conclusively that the judiciary of the United States will notsanction any procedure on the part of publishers or advertiser tending to the restraint of trade. In fact, it is possible that the matter will go yet further, and publications

the twin screw torpedo boat destroyer "farragut" on her trial trip.
struction October 6 the same year, received her official trial on November 11, and is reported as having developed extraordinary speed. On the builders' preliminary trial trip of November 8 the "Farragut" made $31 \cdot 76$ knots under 404 revolutions of her propellers The official figures are said to slightly exceed this achievement.
The Secretary of the Navy received a telegram on December 3 from Lieutenant-Commander F. J. Drake president of the board appointed to conduct the tria of the torpedo boat "Farragut " in San Francisco Bay as follows:

The cylinders are 20 and 29 inches in diameter re spectively, with two compressors 30 inches each. The troke of her engines is 18 inches and the speed of her propellers 400 revolutions. The propellers are of com position, with three blades each, and are 6 feet inches in diameter, with a pitch of 8 feet 9 inches. The boilers are the Thornycroft tubular, three in number and 15 feet in length. Each has an area of 65 square feet and 4,020 square feet of heating surface, and are calculated for a pressure of 240 pounds. Amidships the sheathing is of 6 -pound boiler plate, at the ex tremities of 4 -pound.
making such exclusive contracts be excluded from second-class mail rates.

Car couplings have perhaps as much attention paid o them by different inventors as any other apparatus In a late invention, the coupling is of somewhat differ ent pattern than usual, the old link and pin being done away with, as in the improved form of couplers, and so arranged that the striking together of the couplers serves to lock them securely together, and to separate them it is only necessary to pull a lever in an upward direction and the deed is done.

AN IMPROVEMENT IN ROTARY ENGINES.
The rotary engine illustrated herewith consists principally of a cylinder, in which a revolving piston is mounted; a spring-pressed abutment fitted to slide in the cylinder; cams which move the abutment outwardly against the tension of the springs; and valves which control the inlet and exhaust ports.
Of the accompanying illustrations, Fig. 1 is a per-


AN IMPROVED ROTARY ENGINE.
spective view of the engine; Fig. 2 a cross section; and Fig. 3 a side elevation of the piston.

The piston is duplex in form and turns concentrically with the cylinder. The two piston-heads are arranged diametrically opposite each other, and are pressed outwardly into the working chamber by means of springs, as shown in Fig. 2. Abutments placed at the top of the cylinder and provided with friction-rollers at their inner ends slide in a radially disposed guideway. As indicated in Fig. 3, one abutment operates in conjunction with one piston and its head, while the other abutment coacts with the other piston and its head. The abutment-rollers are pressed firmly into engagement with their respective pistons by means of springs (Figs. 2 and 3). Each abutment, as its corresponding piston head approaches, will be moved outwardly against the tension of its spring by a cam formed on the piston, and will be returned to its normal position by the spring after the head has passed Two chambers are, hence, al ways formed between the cor responding abutment and piston in each working chamber. As indicated in Fig. 2, two sets of ports and cut-off valves are provided, one for each working chamber.

In a lever connected with the valves, a slide-block is carried which is connected with an ec centric on the main shaft, and which is controlled by the gov ernor-stem (Fig. 1). When the engine is in operation, the ec centric will rock the lever and the valves, in order to cut off or admit steam, the amount of cut off depending upon the position of the slide-block controlled by the governor-stem and lever. In this manner the engine can b automatically caused to main tain a uniform speed

The engine has been patented by its inventor, Charles G. Tay lor, of Burlingame, Kans.

## Acetylene for Stree

 Lighting.The city of Wabash, Ind., is soon to be lighted by an acetylene gas plant, now being install ed by the Logansport and Wa bash Valley Gas Company, otherwise known as the Deitrich Syndicate, says The Railway Review. The machinery and ma terials are now on the ground and the city authorities inform us that the street lights will probably be in operation shortly The city has heretofore been lighted by artificial gas, in the usual way, and the substitution of acetylene for street lighting is an experiment which has been but little tried.

home life building after the fire.
ticular case the building has proved to possess all the fireproof qualities which the architects aimed to give it The building stands on Broadway, facing the City Hall Park. To the south of it on the same block is the Postal Telegraph building, a modern fireproof struc ture, while to the north of it, on the corner of the block, was a five-storied building occupied by Roger: Peet\& Company. The latter building was erected man-


STODDARD'S WAGON-JACK.
In the partial destruction by fire on the night of December 4 of the Home Life building. New York the fire-resisting qualities of the tall skeleton building have been put to about as severe a test as could well be devised. Although this is by no means the first time that the skeleton-frame system of construction has been tested by fire, it is the first occasion on which a truly representative "sky-scraper" has been burnt out by a fierce fire, and the results of the trial are be ing noted carefully by all whose inte ay affected by this class of building
By the courtesy of the New York Fire Department we were given an early opportunity to visit the burned building, and, after a careful inspection of every floor from the eighth to the top, we must admit that it has fully demonstrated its fireproof qualities. Of course the term fireproof is an elastic one; but in this par
years ago before the era of fireproof steel construction. It had the solid walls, wood floors, and cast iron col umns common in earlier construction. The fire started in the basement of this building at $9: 50 \mathrm{P}$. M., and spread with such rapidity that by 10:30 the roof had allen in and the whole corner was one huge blazing furnace, the flames and heat from which were drivel against the north wall of the sixteen-story Home Life building. The plan of the latter structure is in the form of the letter $E$, with the center of the letter removed. The open well or shaft thus formed was directly facing the fire, and up this shaft the flames of the adjacent burning building were drawn, setting fire to the woodwork of the windows, and starting fires on every floor from the eighth to the top. The heat of the fire was intensified by the fact that the heaviest gale of wind yet recorded in this vicinity was blowing from the northeast, the wind reaching a velocity of eighty miles an hour shortly be fore the fire started. Blowing from the northeast, the wind would come from the point of view at which our photograph was taken, and with this fact in mind the reader can understand to what a searching test the vast northern face of the Home Life building was subjected.
Not one of the windows on this side was protected by iron shutters, and the entrance of the fire through the windows on the several floors was only a question of time. The exposed upper portion of the building withstood the fire for about half an hour but at $10: 25$ the flames ignited the woodwork of the windows, cracked the glass, and set fire to the office furniture. The firemen were able to do very little in the north and east of the build ing, the fierce gale driving the flames in upon them, and from the time the fire first gained a foothold until the combustible contents of the various floors had been burned out, the conflagra tion burnt with very little beyond the fireproof construction of the building to obstruct it.
The fireproofing was of the standard type and was fairly well representative of the best modern practice. The franle consisted of steel columns and girders incased in hollow, terra cotta fireproofing, and the floors consisted of steel I-beams filled in with hollow, fireproof bricks, which overlapped and protected the bottom flanges of the I beams. The sleepers upon which the wooden floor was laid were so placed that in case of a fire it would be impossible for any draughts of air to circulate
across and beneath the wooden floors and assist them in taking fire. In buildings of a later date this has been improved upon by filling in the voids between the brick arches and the wood floor with ash concrete. The combustible material consisted of the floors, the doors, the windows, and such office furniture, books, etc., as the various rooms contained. This was completely burnt away without, as far as can be judged seriously affecting the shell of the building. In no case have the main columns of the building moved out of plumb, nor is there any evidence of the girders or Ibeaus of the floor systems having deflected. In only one case, as far as we could find, had the brick arching of the floors given way, and in this case the collapse was due to an unusually heavy safe, which seems to have been standing exactly between two I-beams. The hollow fire-brick partitioning between the rooms ha fallen down in sorne cases, but in many of the rooms it is intact. The móst serious damage has been done to the outside walls. The Broadway fagade, which was built of marble, has been badly calcined from the eighth story to the top, and this upper half will probably have to be rebuilt. The northern brick wall has been badly disintegrated by the fire and will also need repairs, if not replacing.
The fire has demonstrated the truth of the prediction made by Chief Bonner of the Fire Department that if the upper half of a tall building such as this caught fire, the firemen could do very little to save it from be ing burnt out. It is his opinion that the height should be limited to 150 feet, since it is impossible to bring effective streams of water to play upon a fire above this level.
While the burning of the Home Life building teaches us no new lessons, it strongly emphasizes several facts which were well known but little heeded several facts whire
before the fire:

1. Thai all the windows of such a structure that are above and overlook the roof of an adjoining building should be provided with either metal or metal-cased shutters. The presence of these would undoubtedly have kept the fire out of the Home Life building
2. That, to render each floor fireproof, the window sashes and frames, the doors and door frames, the floor and all kinds of finish that is now in wood should be of metal, or of wood metal-cased.
3. The elevators and the stairways at each floor should be provided with sliding or folding trapdoors by which all communication could be shut off between by which all communication could be shat off between
the various floors, and a fire confined to the floor on which it started.
4. A tank of liberal capacity should be located at the top of all lofty buildings, and the service should be such as could readily cope with an outbreak on any of the floors. In the present instance, the hydrants were not far from the elevators, and they could not be used because of the terrific gale that drove the flames and heat in through the broken windows of the elevator heatt.

Taken altogether, and bearing in mind the fact that the absence of shutters and the pressure of a terrific gale of wind laid the whole side of the building open to the fiercest kind of attack, the behavior of the Home Life building is an indorsement of the fireproofing methods adopted by our architects. The term fire-
proof, as we have said, is relative. As applied merely proof, as we have said, is relative. As applied merely
to the shell of the building, we may use it in speaking of this building. But neither this nor any other building in this city is absolutely incombustible in whole as well as in part. If, however, a building were put up which embodied the four features enumerated above as none of them do at present, it would be absolutely unburnable either from within or from without. I such a structure were burnt out, the combustibles would have to be brought into the building in the shape of the furniture, books, papers, or commercial wares of the tenants.

Concrete Facing on a Sandstone Bluff.
The use of concrete as a substitute for stone masonry has been conspicuous in several notable pieces of rail way engineering now in progress or completed during the past season. The Railway Age recently illus trated an interesting use of concrete for facing a sandstone bluff at St. Paul. The line of the Chicago Milwaukee \& St. Paul Railway, at St. Paul, extends over an ascending grade along the face of the bluff This bluff is of a character common to the Mississipp River bluffs in that vicinity, and is composed of soft sandstone capped with an irregularly broken ledge o friable sandstone above, mixed with loose sand, gravel and bowlders. This sandstone disintegrates readily, and is so soft that it wears away rapidly under the inand is so soft that it wears away rapidy under the in-
fluence of the weather. The detritus from the bluff has frequently to be removed or it would cover the railway tracks. The wearing away of sandstone un-
dercuts the limestone ledge, threatening the safety of the trains on the track below. It has been found necessary to build masonry walls on the face of this bluff for the protection of the railway tracks.
In the summer of 1897 it was decided to protect an additional stretch of the bluff, and the Engineer of Bridges and Buildings, Mr. Bates, decided to use a con-
crete facing instead of cut stone masonry. He assumed
that the stability of sandstone would be secured if it was protected from the rain or frost, and that a facing of concrete or brickwork would furnish protection equal to that of cut stone masonry, at a great saving of equal to that of cut stone masonry, at a great face of the
cost material was removed from the face bluff and brick pilasters were built under the angular outcrop of the limestone bluff. The pilasters varied from $6 \times 12$ feet wide and between 4 and 5 feet thick. The foundation for the pilasters and concrete facing is in the sandstone, 4 feet below the base of the rails. Sup porting frames for the concrete between the pilaster were built as follows: Bolts were let into the sandstone at a distance of 8 feet apart horizontally and verticaly
With special augers holes were bored in the sandstone of from 4 to 5 feet deep, inclining downward, so that the bolts were perpendicular to the face. The holes around the bolts were filled with mortar and they were allowed to project 18 inches beyond the face of the sandstone. They served to hold the plank uprights in place.
The uprights consist of two planks with the bolt passing between them. The planking supported the concrete work, which was placed against the inner edges of the uprights. This framework was built in horizontal sections, the uprights and planking used at the bottom being afterward used again higher up on the wall. To remove the planking it was only neces sary to unscrew the nuts which held the uprights. The bolts which were necessary to secure the concrete
frames were allowed to remain in the sandstone, and the value they gave in holding the concrete in place was gained without extra cost. It should be said that the great bolts had a second extension section secured to them with the aid of a nut. This section was, o course, removed, as it only held the planks. The concrete facing was continued from the top of the lime stone ledge to the top of the bluff, and special care was taken to make the work tight to the top, so that water would not get in behind the concrete. No attempt was made to put in the concrete with uniform slope and it was allowed to follow the formation of the bluff. The total cost of the wall, which was 256 feet 6 inches long was $\$ 6,787.36$. The work was expensive, on account of the limited space for working between the railway and the bluff and the necessarily expensive nature of the concrete frames, but the cost per yard was less than if cut stone masonry had been used. The work has been in place for a year and no faultsappear in it: The dam shown in this issue of the Scientific American is
also built of concrete, and a comparison is useful, as showing how in the dam the concrete is made in piece and joined together, while in the sandstone bluff th concrete was made in position.

## A Chance for Inventors.

SISAL FIBER SEPARATION MAChine Wanted. Another Eli Whitney is in demand. The growers of sisal "hemp" are waiting for a machine that will be of as much benefit to them as the cotton gin with th outhern farmers.
Sisal "hemp "is the fiber of the Agave sisalona, a plant that belongs to the same family as the cen ury plant, and which looks very much like it. The ful grown plant has leaves from 4 to 6 feet long, thick a the base and tapering toward the spine-tipped points. Sisal is a distinct production of Yucatan; in fact, it takes its name from one of the cities of the peniusula It has been grown with some success in Cuba, Porto Rico, Jamaica, and Southern Florida. The Hon Joseph Chamberlain has a plantation on the Baha mas devoted to sisal. The plant does not need rich soil ; indeed, it grows hest on barren, rocky land that is useless for other purposes. It is not affected by drought, except almost inappreciably.
But it has one drawback. There has not yet been invented a perfect machine for separaling the fiber from the pulp of the leaves. The last bulletin of the Bureau of the American Republics describes the present machine, its work, and its imperfections:
'The machine in use at the present time consists of horizontal wheel, on the face of which brass strips are transversely placed, forming dull knives. The eaf is introduced so as to bring one side in contact with the revolving wheel, which is run by a small en-
gine. A brake then presses the leaf against the scrapers, while the butt is firmly held by a pair of pincers The scrapers remove the outer surface and some of the oft tissues; then the leaf is taken out and turned and the other side undergoes the same operation, until only he fibers are left. These are then shaken out and hung in the sun for a few hours to dry. The result is rather coarse fiber of much strength. The finest quality is nearly white, while the inferior grades are yellowish in color. In order to produce the best qual ty in fiber the leaves must be cleaned as soon as possi ble after being cut. One of the principal obstacles in the way of cheaper fiber is the need of a good machine or decorticating. Although much skill and mone have been spent in attempts to invent a better machine as yet such efforts have been unsuccessful."
The growing of sisal and the separation of the fiber
an important industry. The English Admiralty hav
adopted the sisal in preference to the hemp cable The United States, in the fiscal year ended June 30 1898, imported from Mexico over $\$ 5,000,000$ worth of sisal, against $\$ 3,000,000$ worth of hemp from the Philip pines
The French charge d'affaires in Mexico has recently addressed a report to his government relative to the growing importance of the sisal fiber, which he state is very difficult for European houses to secure, as the United States practically monopolizes the trade in this article.
There is here certainly a chance for some American inventor to step into the breech and distinguish himself. Americans have invented pretty nearly every thing they have attempted to, and it seems a pity tha they cannot improve on a little brass-shod wheel in Yucatan.-The Hartford Courant.

## Explorations Among the Ruined Cities in Iontezuma Valley.

Mr. George H. Pepper, of the Department of Anthro pology of the American Museum of Natural History recently returned after a five months' tour of the South west, bringing a large quantity of specimens which he cathered during the summer. This is Mr. Pepper's third trip among the wonders of this comparatively ittle known country. A large quantity of photographs were also taken. He was accompanied by two youn men of Boston, who went for purposes of study, and Richard Wetherill, one of the cowboys who were fam ous as the discoverers of nearly all of the marvelous ruined cities left by the mysterious cliff dwellers of Colorado. Days were spent in the famous cliff palaces near the Montezuma Valley. Here they found skele tóns, stone utensils, and half a dozen bells of soft copper which are the only metal objects which have been dis covered in these ancient settlements. They were pre erved by the dryness of the air in the great cavern ity. The party rode 400 miles on bronchos to see the nake dance of the Moqui Indians, which lasted twenty even minutes, andithey secured some excellent photo raphs of the filthy, painted savages dancing around with live rattlesnakes hanging from their jaws. Afte the dance, the snakes are set at liberty. The perform ance is really a public prayer for rain.

## The Population of Egyp

'During the last hundred, years the population of Egypt has shown a constant increase," says The Journal of the Society of Arts. "In 1800 it consisted of $2,460,200$ souls, in 1846 this number had increased to $4,476,440$, and in 1882 to $6.813,919$. At the present time the population is estimated at $9,734,405$, and if it con tinues to increase in the future in the same proportion as in the past, it will amount by the year 1912 to abou $12,000,000$. As regards the distribution of the sexes there are $4,947,850$ males and $4,786,555$ females, and these figures include 112,526 foreigners. France ha supplied 14,155, the United Kingdom 19,557. The most numerous of the foreign inhabitants are the Greeks who number 38,172 , then come the Italians 24,467 , and after the French and English) Austrians 7,117, Russian 3,193: Persians 1,301, Germans 1,277, Spaniards 765, Swiss 472, Americans 291, Belgians 256, Dutch 247 Portuguese 151, Swedes and Norwegians 107. Danes 72 and 923 of other nationalities. In lower Egypt ther are $5,676,109$ inhabitants and in upper Egypt 4,058, 296. Public instruction leaves much to be desired or of the entire population only 467.886 persons ar able to read and write ; there are, therefore, $9,266,819$ inhabitants, or 95 per cent of the aggregate population, completely illiterate. What is even more extra ordinary is the fact that $6,486,498$ persons, or about two-thirds of the entire population, are without an trade or profession."

## The Acanthus Column at Delph

M. Homolle, in the issue of the Bulletin de Corr Hellénique, gives a detailed analysis and discussion of the remarkable acanthus column surmounted by danc ing caryatids. The column, it will be remembered was published in the Gazette des Beaux Arts, 1895 but since that publication many fragments have been added, and the monument is now certainly one of the most curious and interesting architectural discoverie nade of recent years. M. Homolle thinks the style cannot be earlier than the second half of the fifth cen tury B. C.; certain archaic peculiarities in the treat ment of hair, eyelids, and chin in the faces of the dancers prevent its being dated any later. The ques tion remains of its explanation and the motive of its dedication. It seems to have stood on the terrace of the temple of Apollo. The figures of the dancers in heir short chitons are thoroughly Dorian, and sugges Sparta. They must be of the type of the Lacæna saltantes. The acanthus plant, by the sort of heraldic pun so popular among the Greeks, suggests the Thra cian city of Acanthus, and M. Homolle is probably righ in seeing in this curious and beautiful column an ex voto in memory of the alliance concludedjbetween the during his Thracian campaign.

## Sorrespondence

## Wind Pressur

To the Editor of the Scientific American :
A recent number of the Scientific American, in an editorial on Sir T. W. Barry's remarks, at the meeting of the British Association at Bristol, anent the want of agreement between the results and conclusions of experiments on a small scale and the working of nature on a more extended basis, alludes to the fact, among others, that as far as wind pressures are concerned, while at the great Forth Bridge in Scotland 58 pounds to the square foot were allowed for, based on the indications of ordinary anemometers, the result of an experiment on a 300 foot surface under like conditions showed a falling off of very nearly 40 per cent. Again, at the Tower Bridge, London, while conclusions based on anemometrical readings indicated a pressure of 6 to 9 pounds per square foot, experiments conducted on the bascules of the bridge, whose area is 5,000 feet, showed only from 1 to $11 / 2$ pounds wind pressure under absolutely similar conditions.
These glaring differences are accounted for on the assumption that a gale of wind presents areas of maximum pressure which are far in excess of the average pressure. Now, I am in a position to say that this mere surmise of the editor of the Scientific AmeriCAN is a matter of fact; and to proof: While in a gale, at Quebee, the mere galvanized iron roof sheeting of four of the octagonal kiosks on Dufferin Terrace remained untorn, which it had been on other occasions of severe gales, the fifth kiosk, situated in the midst of the other four, not only had its sheeting curled up and twisted and torn off, but the entire roof framing, all of cast iron and bolted together, was bodily wrenched from its eight supporting columns, the confining bolts of each of which were broken off, and the whole roof, some $21 / 2$ tons in weight, carried up a height of say 40 feet and over a distance of some 300 feet and deposited in a broken and demoralized condition on the glacis in rear of the terrace.
Now it is evident that in this case there was, within the general stream of easterly wind blowing up the St. Lawrence and striking the terrace, an intensified current which struck the demolished structure-a stream within a stream, so to say, as with the Gulf Stream time (some ten years ago or less), and found that while the anemometer at the Quebec observatory, on the occasion, indicated only 59 pounds, the stress on the roof of the kiosk, thus to tear it away and hurl it to such a distance, must have had a cyclonic force of not less than 100 to 120 pounds to the square foot.
The same thing occurred in the United States a few years ago, when, as I then showed in a letter on the subject, published in The Engineering Record, of New York, while the general go of the wind storm was insufficient to do the mischief, there must have been within the moving river of air, the rush of air in motion, a more intensified stream, which struck and over threw two of the 500 foot spans of the Jeffersonville Bridge, each of which weighed not less than 1,000 tons. But this does not explain nor in any way account for the difference, hereinabove alluded to, of the effect of
wind currents on areas of varied extent. I think, Mr. Editor, I can account for this. It will be remembered that I was the first at the time, or for some months after the attention of the world at large had been called to the apparent paradox, to explain the so-called bal] nozzle mystery, which I did by showing that the issu ing circumferential jet of water carried with it by friction the water in the rear of the ball, thus creating a vacuum against which the pressure of the atmo sphere reacted to keep the ball in place
Now precisely the same thing happens with the ane mometer, and the more so the larger its surface or extent. The wind, passing around its periphery, sucks out the air from in rear of it, creating a vacuum against
which the atmospheric pressure on the opposite side reacts.
It will be noticed that, while in the case of the Forth Bridge. as set forth, the larger area of experimenta tion, 300 feet, gave a wind pressure of only 40 per cent less than that indicated by the ordinary anemometer, in the case of the Tower Bridge, the 5,000 feet area of the bascule experimented on reduced the anemometrical pressure of from 6 to 9 pounds down to from 1 to $1 \frac{1}{2}$ pounds, or not only by 40 per cent, but by 600 per cent. this difference being due to the proportional circumferential or linear peripheries of the surfaces experimented on, in comparison with the areas at play, the peripheries varying only as the linea those dimensions.
For instance, if the anemometer were a foot square its area would be but 1 foot, while its periphery wa 4 feet; or the area to the circumferential dimensions
in the proportion of $1 / 4$ to 1 . With a surface of $10 \times 10$ feet, the area would be 100 feet and the periphery 40 . or area to circumference as $21 / 2$ to 1 . Again, if the sur
face played on by the wind were $100 \times 100$ feet, the area
would be 10,000 square feet, while the periphery was only 400 feet, or the ratio of area to circumference that of 25 to 1 , leaving the wind to act on or around edges of 4, 40 , and 100 feet respectively, while the atmospheric pressure was exercised against areas of 1.100 , and 10,000 square feet, and thus explanatory of the fact that the greater the area acted on, the greater the reduced per ntage of pressure indicated by the larger surface

Charles Boellarge, Consulting Enginee
Quebec. October 7, 1898.

## The German Toy-industry-Its History and Development.

Although the little Thüringian town of Sonneberg the center of the modern toy-industry, says Uhland's Wochenschrift, is commonly considered as the birth place of toy-making, it cannot be denied that the first attempts in the art were made by the village of Judenbach, situated further to the northeast. By reason of its favorable situation near the Nürnberg-Sächsische Geleitsstrasse, a road much frequented ever since the
thirteenth century, and the only means of communicating with Leipsic and Nuremberg, the village could always readily dispose of its crude wooden, house and kitchen utensils, and later, of its little chairs, tables, animals, cross-bows, swords, guns, and musical instru ments.
Eren long after the art of making wooden ware had been introduced in Sonneberg, Nuremberg was still the market for these peasant-products and continued to make the most by the transaction. Not without reason did the city call Sonueberg its Goldtöchterlein (little gold daugnter). Not until the Thirty Years' War had destroyed all the regular trade-communications, did the Sonneberg tradesmen themselves begin to travel about with their wares. The inhabitants of Judenbach, on the other hand, could never conclude to leave their native village in order to sell their products. While in Judenbach the toy-industry did not attain great proportions, in Sonneberg, the trade, as early as the seventeenth century, had grown to such an extent that, when public markets were established in Frank fort-on-the-Main, the merchants of Sonneberg were granted equal exemption from taxes and duties with The merchants of Nuremberg.
Till the eighteenth century, toys were colored with poisonous bismuth paints. An important step in the
development of the industry was the endeavor to make development of the industry was the endeavor to make
those parts which were with difficulty carved of some doughy substance (rye flour mixed with lime water) But this substance softened and mildewed when moistened. A decided advance can therefore be re corded only when Friedrich Müller, a citizen of Sonne berg, began to use papier maché, a substance of which he had heard from a French soldier. The figures were no longer modeled as before, but the plastic mass was
now pressed into shape by moulds. By means of this new substance Sonneberg produced its wares with almost mechanical rapidity. Toys were no longer made in the houses of peasants, but in factories. The cost of these new wares was, moreover, considerably re duced
toys.
Stra
Strange to say, in the making of dolls but little progress was made. Not until a new method was intro duced into Sonneberg, which came from China, by way of England, can any great improvement be recorded From the first Chinese dolls of 1852, with their mova ble limbs strung together by cords drawn through the joints, developed the so-called "jointed dolls." In coloring the faces of these dolls, white lead, a poisonous its use was prohibited. Nowadays the innocuous zinc oxide and similar harmless colors are used. The hair of dolls, after many failures with other material, is now made of mohair and the fur of Angora goats.

In this manner the toy-industry slowly developed to its present state. How numerous are the varieties of toys now made may be inferred when it is considered
that the design room of a Sonneberg factory contains that the design room of a Sonneberg fact
trom twelve to eighteen thousand designs.

In order to maintain the position which they have reached, toy-makers are compelled constantly to bring forth new models and to adapt their products to the ago, the chairman of the Sonneberg Chamber of Commerce and Industry proposed the collection of toys made by foreign manufacturers, in order that Sonneberg toy-makers might thus be able to acquaint them-
selves with the wants and peculiarities of foreign marselves with the wants and peculiarities of foreign mar-
kets. Such a collection of models has now been made and does good service for the manufacturers, as well as for the students at the various industrial schools of Thüringia.
The toys at present made may be divided into the following groups: 1. Wares made entirely of wood, such as cross bows, guns, violins, flutes, chess and draught boards, rattles, jumping manikins, nut-crackrs, soldiers, ninepins, rocking horses. 2. Articles made mostly of wood, such as doll-houses, kitchens, shops,
furniture, Punch-and-Judy shows furniture, Punch-and-Judy shows. 3. Mechanical toys. 4. Papier maché articles, such as harlequins,
riders, caricatures of national types, animals covered
with felt or leather, shepherds' houses, menageries figures of Santa Claus. 5. Animals covered with fur. 6. Metal toys, such as tin figures, toy trumpets, china, burnt clay, stone, and glass. Among these tors may be mentioned toy dishes, marbles, and articles o various kinds made of blown glass. 8. Christmas tree decorations of glass, metal, and wax. In Lauscha wix is the material most used. 9. Dolls with appurtenan wagons, chairs, and swings.
Besides Sonneberg, the towns and villages of Watter hausen, Friedrichsroda, Ohrdruf, Ilmenau, Hildburg hausen, Schleusingen, and Coburg are engaged in the industry. Toy-factories are now scattered more or less over half of Germany : they are distributed from the Black Forest and the Palatinate to the Sudetic Moun tains and the province of Brandenburg. Of particular importance are the Erzgebirge of Saxony, which, on ac count of their forests and abundant water-power, have enabled the manufacturers of Saxony to produce many of the more common toys formerly made in Sonneberg.
The most recent statistics show that Germany has exported $40.500,000$ marks' $(\$ 10,125,000)$ worth of toys while in 1895 but $30,000,000$ marks' ( $\$ 7,500,000$ ) worth were sent abroad. Including the toys sold in Germany, the product of the entire German industry is probably worth $50,000,000$ marks ( $\$ 12,500,000$ ), from which 750,000 marks ( $\$ 187,500$ ), representing the value of toys imported from foreign countries, must be deducted. Sonneberg undeniably produces half the toys made in Germany. The two largest buyers of German toys are the United States and England. Last year, the United States imported German toys to the value of $1,000,000$ marks ( $\$ 2.750,000$ ), England to the value o $17,000,000$ marks $(\$ 3.750,000)$. Of the products exported to the United States, $6,500,000$ marks' $(\$ 1,625,000)$ worth were supplied by Sonneberg. A similar proportion holds good for England. To the development of toy manufacture and to the rise of doll-making is due the increase in the number of export houses in Sonne berg. In the sixties there were about thirty export firms. By 1880 the number had increased to forty-eight and by 1896 to seventy. According to the latest statistics, there are 40,829 persons engaged in German toy manufactories, of which number 44 per cent are ell ployed in Sachsen-Meinigen. In the region abou Sonneberg about 34 per cent of the population are engaged in toy-making, not including those who, in addition, are otherwise employed.

## Luminous Sugar.

There are phenomena attending the formation of crystals which are apparently quite distinct from chemical action, says The Lancet. When, for example hot saturated solution of arsenious acid is allowed to cool, the act of crystallization is accompanied by a flash of light. As each crystal forms there is a short, sharp glow, indicating the release of a certain amount of latent energy in the form of light radiation. A related phenomenon would seem to be the case when two pieces of cane sugar are quickly rubbed together. The flash is perfectly distinct and bluish-white in color, the light extending into the substance itself far below the surface. Some interesting experiments on this manifestation have recently been made by Mr. John Burke M.A., the results of which were communicated to the ecent meeting of the British Association of Science at Bristol. By mounting disks of loaf sugar on a lathe and projecting a hammer on the rotating surface an almost continuous luminosity was obtained. The wearing away of the sugar is compensated for by ar ranging a gradual approach of the piece to the hammer in exact accordance with the amount of sugar scraped away. In this way the spectrum has been observed and photographed. From these observations it would appear that the luminosity cannot be due to
it it would appear that the luminosity cannot be due to by the impacts, the indication being that the light produced is due either to some change in the con figuration of the crystals of sugar or to some sort o chemical action set up between the sugar and the surrounding air at the freshly formed surface. The act, however, that the surrounding medium does no seem to affect either the color or intensity of the luminosity suggests that the effect is not due to any influence of a chemical nature of the surrounding medium on the sugar, but favors the former hypothesis that he luminosity is due to some structural disturbance in the sugar itself. This ingenious and pretty study is being pursued further and the result should lead to some interesting observations. Light is so often manifestation of physical change that it is probable some day we shall derive it for illuminating purpose in a totally different, much simpler, and less clumsy way than obtains at present.
A. Gautier finds that free hydrogen is a constant constituent of the atmosphere: it is only present in very minute quantities, from 11 to 18 c. c. in 100 liter of air, or on an average about 0.015 per cent by volume Its volume is, therefore, nearly one-half that of the normal amount of carbonic anhydride present in pure

## a GREAT CALIFORNIA DAM

The largest concrete structure in the world, and the highest dam in the United States as well, is located five miles west of San Mateo, Cal., a suburb of San Francisco, from which it is distant about twenty miles. The Crystal Springs dam is celebrated among engineers for its magnitude as wel as for the original methods and prin ciples which are involved in its construction. It was determined to avoid the difficul ties met with in dams of even wuch smaller di mensions, con structed on the monolith plan from the shrink age and cracking of the concrete and the engineer of the company, Mr. Yerman Schussler devised Schussler, a dam of large d posed of individ ua! blocks, build ing each block separately, so as to give the block an opportunity to set and harden by themselves.
The site for a great artificial reservoir at this point could not of mountains which start from the Golden Gate and $\quad$ itself into the rock base. In order to insure that the finished to its present height. In all, 500 of these traverse San Mateo County from north to south here foundation should be absolutely watertight, a trench blocks were used. approach the lower bay of San Francisco, and at the 17 feet deep, 10 feet across at the top, and 5 feet wide For their construction, a framework of varying di-
dam site the rocky walls of the canon, rising to a the bottom, following the center line of the dam height of over 200 feet above the bed of the creek, meet from end to end, was hewed out of the rock base down within 700 feet, inclosing a valley of large dimensions to the absolutely watertight ledge below. The excathat spreads out in either direction for long distances, vation will be noticed in the hillside at each end of the and with the dam at its present height, 145 feet, forms dam, in illustrations 6 and 7 . This trench was then an artificial lake nearly nine miles in length. The filled with concrete and heavily rammed.
task, therefore, of this great structure is to restrain an The bed rock foundation having been thus carefully enormous body of water, and to withstand, perpetually, prepared, the laying of the concrete blocks to form the a pressure of 130,000 tons against its face at its present beight.

The present height of the dam is 145 feet. At the base it is 176 feet thick. On the summit it is about 700 feet long and 40 feet thick. The plans contemplate an addition of 30 feet to its present height, making a total of 175 feet in extreme height, with a totallength of about 830 feet. The lake thus occasioned will contain 29,000 million gallons of water.
Fortunately, the geological formation of the locality was favorable to securing a reliable foundation. The rock is hard blue sandstone, extremely dense and compact, and entirely free from cracks or fissures. The site for the dam was scientifically exploited, and hundreds of borings, some to a borings, some to a
depth of 100 feet,

7.-Staging and Platforms Used in Preparing and Mixing the Ooncrete and Wheeling it to the Dam. CONSTRUCTION OF THE CRYSTAL SPRINGS DAM, CALIFORNIA mensions and irregular in outline, according to the shape of the block required, was built up at its proper place on the dam. Concrete was gradually dumped into this mould until at last it was filled. As fast as it was thrown in it was carefully spread out and rammed down with heavy iron rammers into a compact mass. The block was allowed to remain in the framework for The block was allowed to remain in the framework for
several days, or until the moisture had evaporated, by which time it had become as hard as the rock upon which it stood This method was followed with each block. No two blocks were identical in shape or size, each inter locking with its neighbors and contributing com bined support to all of the others The device of building this dam with a large num ber of separate blocks, instead of as one great mas of concrete, is th distinguishing feature of its con struction, and pro vides the elast city which secures it from damage in the event of shrinkage.

The sand used in mixing with the concrete wa procured at North Beach, San Fran cisco. Rock of the required den sity and strength was procured in unlimited quanti ties, only a mile away from the were driven into the rocky sides of the cañon. All re-|superstructure began. The bed rock was first cleaned|dam, from a quarry owned by the company. Me quired conditions were found at the site selected. Pre- from all debris and dirt and thoroughly hosed. These paratory to laying the foundation the whole bottom and sides of the canon were cleared of all soil and vege tation until the bed rock was uncovered. The entire
from all debris and dirt and thoroughly hosed. These
blocks (see Plate 1) averaged 40 feet in length, 30 feet in width, and 8 feet in thickness, and each was a day's work in itself. Two such blocks were built daily.
chanical devices for making the concrete and trans porting it around the dam were employed whenever it was possible.
A great framework consisting of three platforms was
first erected (see Figs. 6 and 7.) On the first platform the great rock-breaker was placed, which reduced the rock to about the size of a walnut. On the platform below was stored the sand and cement. The broken rock, after being washed, was dumped through a chute into a large iron drum holding six barrels or about twenty-two cubic feet. A car holding two barrels of sand and one barrel of cement was brought forward, and in this proportion the whole was dumped through a chute into a mixer placed on the platform below, water for the concrete being fed in proper quan tities through a nozzle in the axle of the mixer.
Power for operations was supplied by three detached engines situated on the lowest platform. After the sand, rock, and cement were thoroughly mixed, the material was dropped into cars running upon a trestle and carried over the dam where the last block was being formed, each car load being dumped through a large pipe to a platform, and thence by wheelbarrow (see Plate 7) into the frame on the dam site where the block was to be stationed. This plan was followed successively until the dam was completed. The capacity of the concrete machines was 450 barrels, or about 10,000 cubic feet, daily. The amount of material consumed gives some indication of the great size of the work. It included 205,000 barrels of the best Portland cement, 410,000 barrels of sand, and $1,230,000$ barrels of rock.

The front slope of the dam is 1 foot horizontal to 4 feet vertical; the rear slope commences 1 foot vertical to 1 foot horizontal, ending in the upper 60 feet with a slope 2 feet vertical to 1 foot horizontal, the two rear slopes being connected by a curve of about 300 feet radius. The convex side of the dam, which is up stream, is curved with a radius of 637 feet.

Enos Brown.
GUNS RECOVERED FROM THE SPANISH CRUISERS
There has recently heen brought up from Cuba, and unloaded at the Washington navy yard, a considerable amount of
by the wrecking by the wrecking companies from the wrecks of Cervera's fleet. It is a miscellaneous collection. of guns, gun shields, guns, gun shields, projectiles, chains, ship stores, and general fittings.
The most conspicuous part of the salvage is the breechloading rifles, from the secondary batteries of the Spanish cruisers, and the shields and mount which accompany them.
Our illustrations arefrom photographs taken at the Washington navy yard, soon after the material had been unloaded from the United States collier "Leonidas," and it will be seen that the trophies carry upon them the unmistakable mark of the two agents, shell fire and conflagration, which

1.-A $51 / 2$-INCH GUN FROM THE "OQUENDO."

Shieli penetrated by shell at Santiago. Saddle of 13 -inch gun for the "Kearsarge " seen to the right.
brought about the speedy destruction of t Spanish fleet.

The guns shown in our illustrations have been recovered from one or other of the three sister ships, "Vizcaya," "Maria Teresa," and "Oquendo." These vessels carried as their main armament two 11inch rifles and ten $51 / 2$-inch breechloading rifles. The 11-inch guns were in two turrets, one forward, one aft, while the $51 / 2$-inch guns were arranged in broadside, amidships on the main deck In the cain deck. In the case

3.-SPANISH GUNS, WITH THEIR MOUNTS AND SHIELDS, AT THE WASHINGTON NAVY YARD, TAKEN FROM THE SPANISH WRECKS AT SANTIAGO.
per and lower carriage, the turn-table, and the rack, without the casing, of one of these mounts, are shown in the lower right-hand corner of cut No. 1.
The gun is traversed to right or left by ineans of the hand wheel to the left of the breech, which, by means of a worm, worm-wheel, vertical shaft, and a pinion engaging the circular rack, rotates the carriage about the rack, the latter, of course, being bolted to the stationary foundation plate. The elevation and depression of the gun is accomplished through another hand wheel which acts on a pinion and a circular vertical rack attached to the gun.
Two of the circular racks are shown in Fig. 3, resting upon a dismounted Spanish gun.
All of the guns were provided with shields of compar atively light construction, the thickness, even at the vertical front end, not being over one inch. They are car ried on the bottom carriage, to which they are attached by bolting at the front end, and by means of a square frame of angle-iron, which passes round the interior of the shield and extends inwardly to meet the carriage to which it is bolted. These shields are of sufficient size and thickness to protect the gun crew from machine bullets at close quarters, and from one and sixpounders at long range; but, for protection against any thing above a machine gun at close range, or above a six pounder at any fighting range, these light shields are worse than useless. They cannot keep out the shells, and they merely serve to afford sufficient shock to burst a shell, which, but for the shield, might pass harmlessly by without striking any of the gun crew In any case, it is not likely that more than one mem ber of the detachment would be struck, whereas a shell that burst in passing through the shield, migh kill every man at the gun.
or pattern, of the year 1883 . They have a total length of about 17 feet, the length of the bore being 35 calibers. The total weight of the gun is 4.1 tons, and
it fires an armor-piercing projectile weighing 86 pounds and a common shell weighing 75 pounds. For the armor-piercing projecpounds of powder, which gives the shell a muzzle velocity of 2,001 feet per second, equivalent to a muzzle energy of 2,386 foottons. At the muzzle the penetration would be about 14 inches of iron. The mounting is seen very clearly in the illusration (Fig. 2), showing he breech and inside of the shield of one of these guns of the slow-fire pattern. The gun is trunnioned in a top carriage, which travels during the recoil upon the slides of the lower carriage. The trunnions are formed on the gun, as is usual in all slow-fire weapons, and they can be seen on any of the dismounted guns shown in our various engravings. The lower carriage rotates upon a circular bed of rollers, below which, encircling the foundation plate of the mount, is a circular verticalrack, the rollers and rack being protected from projectiles by a circular casing which is bolted to the carriage and rotates with it. The up-

2.-VIEW showing breech and mounting of a $5 \frac{1}{2}$-inch gun. The third shield (from the "Vizcaya") shows effect of shell passing through from the iaside.

Bright red spectacles accompanied by internal doses of calomel form a new German specific against seasickness. It is deduced from Epstein's investigations on the influence of color on the blood vessels in the brain. Seasickness is due to lack of blood in the brain, while red sends blood to the brain with a rush. By looking at one point for some time through the red glasses, the patient is cured radically.
The number of bacteria in London crude sewage is $3,899,000$ per cubic centimeter, at the Barking outfall, and $3,527,000$ at the Crossness outfalls, according to the average of a number of recent counts by Dr. A. C. Houston, made early this year, under the direction of Dr. Frank Clowes, Chemist of the London County Council. The range at Barking was from 7,260,000 on May 3 to 513,000 on April 15; and at Cross
$5,290,000$ on March 2 to $2,410,000$ on April 20.
According to The Druggists' Circular and Chemical Gazette, the expensiveness and want of durability in the ordinary rubber bottles and ice bags which have been so essential in the sick chamber have long been a perplexing problem. Experiment with rice paper, cov ered inside and out with a coating of Japanese lacquer,
led Prof. Jaco bsohn to recommend this material to the led Prof. Jaco bsohn to recommend this material to the
Berlin Society of Internal Medicine as far superior to rubber. In strength, flexibility, imperviousness, light ness, and durability it is said that this bottle leaves little to be desired.
The increasing use of acetylene as an illuminating gas and the objection made to it in some quarters on the score of hygienic considerations lend particular interest to a number of experiments recently made on animals, says The Pharmaceutical Era. Dogs were kept for some time in an atmosphere containing 20 per cent of acetylene without deleterious effect, and it would appear that living beings are not injured by breathing an atmosphere so contaminated. A dog kept in an atmosphere containing 40 per cent of acetylene, however, succumbed after breathing 110 liters of the mixture. The danger from acety lene is smaller than from ordinary illuminating gas, and its intense odor makes it readily noticed when escaping into the air. There is no risk of explo
sion until the air contains one-twelfth of its volume of acetylene. It is particularly adapted to illumina tion, because of the slight heating effect as compared with its illuminating power, and the removal of but little oxygen from the atmosphere. The heat of com bustion with an acetylene flame does not rise above $900^{\prime}$ C., while the heat from an ordinary gas flame may reach $1,300^{\circ} \mathrm{C}$.

It chanced that the birth-rate began to decline in France sooner than in other great countries of Europe, and that the decline has been more rapid. But, as the figures of the Registrar-General show, the same tendency is now very strongly marked in England, and is plainly visible in nearly every European country. It is quite conceivable that a couple of generations hence Frenchmen may find that their birth-rate is no longer the lowest in Europe. The truth is that the present rapid growth in European populations is a phenomenon which is almost entirely confined to the
last 150 years. Through some of the grandest periods of our history the population of England was almost stationary, and the same statement applies to France. If this decrease is due to non-natural causes, it is not a matter for congratulation; but if it means that
European peoples are ceasing to contract reckless and European peoples are ceasing to contract reckless and improvident marriages and are showing more care and discrimination in the begetting of children, it is a healthy sign of the times. Large families are no necessarily an evil, but if the members composing them are diseased and degenerate, they become a
standing danger to the welfare of the body politic. -The Humanitarian.

In a recent paper on "The Accepted Altitude of the Aurora Borealis," read by Prof. Cleveland Abbe before the American Philosophical Society, he stated that some observers have seen the light in such posi tions between themselves and neighboring object as to demonstrate that the aurora, like the lightning, may be entirely confined to the lowest stratum. Others have seen it so located among the clouds that its origin must be placed at or below their level, and therefore within a few thousand feet of the earth's surface. On the other hand, those who have calculated the altitudes of specific beams by trigonometrical or equi valent methods have deduced heights of twenty to a hundred miles; Dr. Boller has even quoted an altitude of 1243 miles. Prof. Abbe remarks that, after reviewing the literature of the subject since the time of Halley, he finds that all methods agree in one fundamental assumption that the observed beams and arches have an individual existence and a definite locus. But this assumption is negatived by the equal frequency of negrative and positive parallaxes wherever the parallax method is applied. The only conclusion possible is that the observers do not see the same object, partly because the aurora is too low down, and partly because there are optical illusions due to alignment.

## Perfumed Ammonia Scouring Water.-Perfumed am

 monia scouring water is prepared by mixingSpirit of sal ammoniac
Finely scraped soap
Cologne water.
illed water, enough to make up 460 parts of liquid.
-Neueste Erfindungen und Erfahrungen.
Improving the Air in Work Rooms, etc.-For one liter bottle of well water, take a spoonful of oil of turpen tine, shake the liquid diligently until it becomes dim or white and distribute in the room, by means of an
atomizer. One may also mix a few drops of acetic atomizer. One may also mix a few drops of acetic
ether with the oil of turpentine. The refreshing effect of the quickly spreading, pleasant odor is astonishing -Kraft und Licht.
To Render Fine Fissures in Tools, etc., Visible.-In order to make the extent of fine cracks in tools, etc. visible, it is recommended to moisten the surface of the cracked article with petroleum, to rub off clean and to wipe off the surface with chalk. The petroleum hich has entered the fine cracks Searr Zeitschrift fuer Berg- und Huettenwesen.
Lustrous shoe grease is obtained as follows, according to Technische Berichte : Alcohol, 126 parts; camphor 11 parts; Venetian turpentine, 16 parts; shellac, 36 parts dyestuff, 32 parts. The latter may either be aniline blue, of which it is best to use 15 parts, or Bismarck brown (phenyl brown), likewise 15 parts; both coloring substances are dissolved in 800 parts alcohol. This polish is best suited for walking boots and shoes, since it possesses a fine, silky (not a lacquered or mirror-like)

## ppearance.

Technical Value of Acacia Wood.-The fact that the locust tree attains in twenty-five to thirty years the same thickness as the pine in fifty and the oak in one hundred years caused L. Kausch to conduct experiments with this variety of wood. The author gained the conviction that acacia wood has an important uture, especially as regards its use for mining pur poses. Acacia timber excels by great firmness and du ability, and is, therefore, also well suited for many other purposes, such as wheels, bungs, ladder steps, etc. The locust tree thrives in the poorest soil, even
in the rubbish of sandstone quarries and in slaty de clivities. All that is necessary is to make a little hole in the latter, to fill it with mother soil, and to plant he young tree therein. In wet soil the locust tree does not thrive.-Glück Auf.
New Painting Ground.-Since notable connoisseurs ascribe the subsequent darkening and defective lu minosity of many paintings to the composition of th grounding with which the canvas is prepared, J. L Schudt, in the Polytechnisches Zentralblatt, proposes in place of the mixture now employed, consisting of chalk, glue, and oil, a new composition, which he pre pares as follows: Slake burnt lime with a little water add to the mixture, while still hot, beeswax and linseed oil, and grind the whole in a paint mill with $11 / 4$ t $1 / 2$ times its weight of white cheese. The mass is applied on the canvas saturated with milk and smoothed Another advantage claimed for this new painting oundation is that it does not allow cracks and fissure o form as readily as with the one heretofore in use.
Water Lacquers.-The group of the water lacquers embraces only a few, little used lacquers. Below ar some receipts.

1. Shellac Water Lacquer.-Boil 28.5 grammes of shellac and 42.75 grammes of borax in 0.564 liter of water until the shellac has dissolved. If bleached hellac is used, a white color is obtained, with orange shellac a light brown one. This varnish gives a good binding agent for water colors and is also a useful paper varnish. It dries with a handsome luster and hard surface which is water proof. By the addition of aniline colors soluble in water, the lacquer can be tinted a desired.
2. Enamel Lacquer.-Mix $0 \cdot 564$ liter of albumen with $0 \cdot 564$ liter of water. For preservation, add a little car bolic acid or salicylic acid. Instead of the albumen dried albumen may be employed, of which $28^{\circ} 5$ grammes are dissolved in 0.564 liter of water, but the color is less clear. This varnish dries with good gloss By drying in hot air it becomes more resistive to water
3. Glue Lacquer.-Dissolve 1 pound of good pale glue in 9 liters of water, the color being entirely dependent on the quality of the glue. Good white gelatine gives a white color, while brown glue yields a yellow one Solution accomplished, add'(but only directly before use) 28.5 grammes of potassium bichromate, which renders the surface watertight. As said, the potassiunu should only be added closely before use, else the solution will be converted into a gelatinous, stiff mass. This mixture constitutes the basis of many leather varnishes. Fo preservation the addition of a little thymol or borax is commendable.
4. Crystal Water Lacquer.-Dissolve 450 grammes of 1,629 liters of water This solution dries hard and glossy.-Färben Zeitung.

## PATRICK COUNTY, VA., AND ITS CURIOUS "FAIRY

 STONES."The Blue Ridge and the Alleghany Mountains unite little north of the county of Patrick, Virginia, and a little north of the county of Patrick, Virginia, and hence in that county they constitute only one moun-
tain.
Stuart, a pretty little town seventy-five miles west of Stuart, a pretty little town seventy-five miles west of Danville, is the county ance from Stuart to the top of the mountain is ten miles, over an admirably constructed turnpike, and the scenery all along the road is exceedingly pictur esque. When the traveler reaches the summit of the mountain, 3,000 feet above the level of the sea, he naturally expects to descend on the other side; but, reatly to his surprise, he finds himself in a compara ively level country, the soil of which is well adapted to the cultivation of grain, grass, and vegetables.
That portion of this remarkable plateau which lies in the county of Patrick is called the Meadows of Dan In the meadows are innumerable springs of pure water the temperature of which is 50 degrees in summer. In less than fifteen miles the traveler crosses twelve differ ent streams, all rising on the top of the mountain, and all flowing through these beautiful tablelands. One of hese streams (the river Dan) joins the Staunton and forms the Roanoke, which empties into Albemarle Sound. Another (the Ararat) flows into the Yadkin which joins the Great Pee Dee, in South Carolina, and with this runs into the Atlantic Ocean. The waters of another empty into New River and finally reach the Gulf of Mexico.
So it appears that these streams, which rise so near together, are wide apart before they reach the ocean.
The Dan, making its way down the mountain, is a very great natural curiosity. After flowing about ten miles through meadows, it reaches the declivity of the nountain and begins to descend, making innumerable picturesque waterfalls in its downward course. One f these is known as the Big Falls. There the wate flows between two high mountains and falls in a beau tiful, smooth sheet over a huge rock 40 feet high. At the base of the falls is a basin of water, clear as crys al and extending 25 feet under the rock over which the water falls. This basin is nearly round and is 60 feet in diameter. The beauty of the falls, together with the wildness of the scenery, make it a very romantic place. But the most remarkable thing about the passage of the Dan down the mountain is the marvel us zigzag course which the river takes in making its descent. The distance in a straight line is only five miles, but, following the river, as it winds round the deep gorges, hernmed in on all sides by high moun tains, it is at least twenty miles.
One mile below the Big Falls are the Pinnacles-t wo immense natural pyramids in the shape of a sugar loaf, rising to a level with the surrounding mountains. The summit of the highest one is about 20 feet square, and rom it a view may be obtained which will amply repay the visitor for the labor of climbing, although that abor is very great
The Dan runs entirely round the Pinnacles, taking one at a time. The distance straight across is only half a mile; but, following the river, it is at least two miles. When the river reaches the foot of the moun tain the scene is suddenly changed, the waters becom ing calm and placid, and the visitor, who has seen the mad rush and heard the mighty roar, has the inex pressible feeling of quiet which is experienced by one who has passed through a terrible storm.
The Pinnacles are frequently visited; but, owing to the difficulty in getting to the river and following it, few have ever visited the falls of the Dan.
Smith's River is one of the streams which rise in the meadows. Unlike the Dan, in descending the mountain it runs in aimost a straight line, and following it is an arduous, though by no means an impracticable undertaking. Many pretty cascades are to be seen one in particular being especially attractive. This is down deep in a mountain gorge, where the river flows over a large rock, at the base of which is a little leve spot, large enough for about a dozen persons to stand and admire the scene. As the rock is not perpen dicular, the water does not make such a loud noise as at the Big Falls of the Dan, but instead a low, murmuring, melancholy sound, which is as soothing to the soul as the softest, sweetest strains of music. Such a retreat is not only attractive to the romantic youth but it is refreshing to men of mature years who may be in need of rest from the cares and responsibilities of business.
In the meadows, near the head waters of Smith's River, rock crystal is found, out of which the Indians manufactured their prettiest arrow heads. The writer has one made of that material which is so perfectly transparent that the smallest print may be read through it. The writer has seen many arrow heads which were made of white flint, but this is the only one he ever saw which was made of rock crystal.
In the same vicinity there is a quarry of very fine soapstone. Near it was recently found a large bowl, which some Indian sculptor had made of that material ;
also a soapstone pipe and stem, handsomely finished, was picked up in that neighborhood. How the Indians, who knew nothing of the use of iron tools, made such a pipe and such a beautifully shaped arrow head, is a question which has never been satisfactorily answered. Nuch relics should be carefully preserved, for they are the only memorials we have of the race which first inhabited this country, the race from which sprang Pocahontas, the gentlest savage that ever lived.
All the things that I have enumerated are highly interesting, but nothing that I have seen in Patrick County has interested me so much as its fairy stones.

These curious little crystals are found in only three other States besides Virginia, in no other county in Virginia but Patrick, and nowhere else in Patrick but on and along Bull Mountain, a spur of the Blue Ridge running twenty miles through the county. The fairy stones found elsewhere judging from the specimens exhibited at the Atlanta and Nashville expositions, are not at all comparable to those found on Bull Mountain. To a few of the people of Patrick they have been known for a long time, but not until about ten years ago did they come into public notice. Some of these stones which have been analyzed contained titanite, tourmaline, garnet, alumi num, and steatite, titanite being the principal material.

Geologists say that they are crystals. Most of them have crosses, some what is called the Roman; some, the Maltese; some, the St. Andrew's ; and some, crosses for which there are no names. Those which have no crosses are pretty stones of different forms. Frequently two, sometimes three or four, are joined, making a most curious com bination. Possibly a person skilled in the use of the chisel might imitate what might be styled the plain work of the fairies; but it would be impossible for the most skillful sculptor to imitate their fancy work. On many of these stones there are crosses exactly alike on opposite sides. Some of the stones are not larger than the head of a pin, while others weigh as much as an ounce and a half. No two are alike. Nature seems to have tried her hand at variety in making them, as she does in making the leaves on the Otahite mulberry tree. And they are of every shade of color. A number of them placed upon a cardboard make a picture as novel as it is strange and beautiful. No adequate conception can be formed of what a great curiosity fairy stones are without seeing a great many of them together.
Hunting for fairy stones is a new and charming diversion. A walk of two and a half miles from Stuart will take you to where they are found. You wil have to climb the mountain, but the scenery along the route is so picturesque that you will forget you are going uphill. And, besides, you will be constantly thinking : What shall I find? Will it be a Roman, a Maltese, or a St. Andrew's? Or will it be a Roman joined to a Maltese or a Maltese joined to a S.t. Andrew's? or a St. Andrew's joined to one of the crosses for which there is no name? Of one thing you may rest assured, and that is, that every stone that you may find will be different from any that you have ever seen.

When you arrive at the place (it is only about in spots on Bull Mountain that fairy stonesare found), you will begin at once the search. You will find them from two to four inches under the ground, and the best instrument to use in digging them up is a small trowel. You will find them in abundance; but the really pretty ones, such as are used by ladies for scarf
pins and by gentlemen for watch charms, are scarce All of them, however, are interesting specimens of the most curious form of crystallization.
When you have filled your pockets, you start back but you will not go far before you will be tempted to take a seat on one of the large, flat rocks on the side of the road-not to rest, for it is now facilis descensus -but to gratify the curiosity which you are sure to have to look over your treasure. Taking out your fairy stones and inspecting them, one by one, you will discover in many of them beauties which escaped your notice while you were digging them out of the ground.

Having gratified your curiosity, you resume you walk, and are soon back again at Stuart.

## A CURIOUS CASE OF MALFORMATION

Through the courtesy of Mr. W. O. McCurdy, pub lisher of The Beeville Bee, of Beeville, Texas, we are enabled to present our readers with one of the most remarkable curiosities in the way of animal malformation that we have seen for years. The cow shown in our engraving is five years old and is the property of W. J. Miller, a ranchman of Bee County, Texas. Since its first year its hoofs have been growing until they are now about fourteen inches in length and shaped as shown in the photograph. As it may be supposed in cattle-growing countries, the ranchmen have been very much interested in this strange-looking animal and they are unanimous in stating that this is the first in-
stance on record of such a malformation. The cow has stance on record of such a malformation. The cow has


CURIOUS CASE OF MALFORMATION IN A COW
who also appoints the librarian. The library is sus tained by voluntary contributions of money and litera ture from the officers and employes of the railway com pany and outside friends interested in their welfare. The circulation increased steadily from 16,120 volume in 1885 to 39,505 volumes, loaned to 2,500 borrowers, in 1896. The figures for the last two years are not a hand. The circulation of books of fiction has decreased from 64 per cent of the total circulation the first yea to less than 53 per cent at present.

## Elastic Leather Varnish.

Elastic leather varnish which does not break is prepared as follows: Colophony, 30 parts; thick tur pentine, 30 parts; oil of turpentine, 30 parts; sandarac 60 parts : shellac, 120 parts; alcohol ( 90 per cent), 900 parts. After all is dissolved, filte the liquid and, if black varnish is desired mix with 15 parts of fine lampblack, which is previously ground with a little alcohol. If another shade than black is desired, use instead of the lampblack a sufficient quan tity of some other color, such as Krems or zinc white, ultramarine, chrome yellow, or vermilion. - Neueste Erfindungen und Erfanrungen.

A Market for our Meats.
Germany's meat famine is spreading apace. In many places, notably in Saxony cats and dogs are being slaughtered and eaten by the poor. In some villages sev eral families club together and buy a fat dog, to be killed and divided among them The consumption of horseflesh is increasing phenomenally. Horseflesh butcheries are being established in towns where they hav never existed before. There has been a con tinuous increase of arrests and convictions for selling unwholesome ordinary meat since the frontiers have been closed against foreign cattle and swine. On the other given birth to one calf, which has in no way inherited hand, there is a great and thriving trade in pre the peculiarity of its mother.

## A Traveling Railway Library.

The Baltimore and Ohio Railway has a traveling library for the exclusive use of its employes and their amilies, containing 14,000 volumes. This library wa started in 1885 with 4,500 volumes, 3,000 of which had been purchased, the remainder donated. The headquarters of the library is in Baltimore, from which current periodicals and standard works on science general literature, poetry, history, and other books of practical utility to railway employes are distributed to any point on the B. \& O. lines. The books are deliv ered to borrowers through local agents. The average time from the placing of an order for a book in the hands'of an agent until the book is in his hands for delivery is officially stated to be less than twenty-fou hours for the entire system, which comprises 674 agen

 served American meats, despite the government' obstacles at the instance of the Agrarians. The tinned American meats imported during the first seven month of 1898 amounted to $1,964,800$ kilogrammes [a kilo gramme is about $2 \frac{1}{5}$ pounds], against $1,414,900$ in the corresponding months of 1897. Of fresh pork the impor tation was $6,758,800$, against $3.955,500$; of pickled pork $3,369,900$, against $1,859,800$; of bacon, 15,948,300, agains $7,139,300$; and of lard, $64,356,400$, against $47,446,600$ The demand for all of these still exceeds the supply and if the general mass of Germans can be convinced that American meats are always of standard quality and can be had at a reasonable price, the sales can be extended fivefold.

## The Current Supplement

The current Supplement, No. 1198. is commenced with an illustrated description of the Argentine cruiser "General Belgrano,' which is a handsome and highly efficient armored cruiser of the latest type "The Stean Yacht as a Naval Auxiliary," by W P. Stephens, is an inter esting article. "Roman Construction," by G. W Percy, is an archæologi cal and engineering pa per. "The Use of Aluminum in Warfare" is a paper of value. "The paper of value.
Opening of the First Ser Opening of the First Ser.
tion of the Jungfrau Rail tion of the Jungfrau Rail-
way" describes the pro gress which has been made on this important engi neering work. "In the Land of Ginger-Jamai ca," is a paper by F. B. Kilmer. "The Races of the Philippine Archipelago" is an illustrated pape by Dr. Daniel G. Brinton
cies, extending over 3,000 miles of line, through eight States, and as far west as the Mississippi River. Ac cording to the rules of the library, a book may be retained two weeks, after which it will be once renewed for a like period, upon request, if no other application for it is on file. There is a fine of one cent per day for books kept over time, a margin of three days being allowed to cover the time consumed in transit. Upon leaving the service of the company all books must be returned before pay vouchers are cashed; otherwise the price of the book is deducted from the wages of the employe. The management of the library is in trusted to a committee composed of two members of the relief department of the road and a representative
of the railway company appointed by the president,
and is of great interest
W. O. Atwater's "Dietary Studies" complete the paper.


RECENTLY PATENTED INVENTIONS

## Agricuitural Implements.

CUlTIVATOR.-Louia W. Grauerholz, Kensing ton, Kans. The purpose of this invention is to provide a
machine especially adapted for the cultivation of corn which machine is so constructed that two rows of corn may be cultivated at one passage of the machine across th field. The invention enables any desired number of he use of a single set of plows, if desired. The plows may furthermore, be adjusted relatively to the ground an
may be speedily returned to the soil, shouid they mee with an obstruction, the return taking place alimost in stantly after the obstruction has been passed.

## Bicycle Appliances.

Bicycle-attachment. - Jozeph W. Satter tewarte, Mingo Junction, Ohio. The attachment forming the subject of this invention may be secured at the
front of the bicccle, and comprises a frame capable front of the bicycle, and comprises a frame capable
of being removed and secured to the bicycle handle ars and steering-head. The frame has a support upo which a child or any other load may be carried.
Sociable bicycle.-Wiliam F. Williams, Lon don, England. This bicycle has a single central mai rame on which a transverse laterally-ad.justable frame which supports seats for passengers or receptacles for
goods, is mounted to slide. A rack-bar couples the saddle-supports so that these supports may be move together. A self-locking pinion effects the lateral ad
justment of the saddles and retains them in position. A supporter is provided to hold the bicycle in an uprigh position when the riders are mounting or dismounting
The weight of the riders and load may be adjusted s as to balance unequal weights.

Engineering Improvements.
Rotary engine.-William Mohr, Kurtz, Ind The rotary engine of this inventor comprises a continu ous cylinder having a steam-chest and a separate ex haust-chamber. A rotating piston extends with it
rim into-an annular slot in the cylinder-wall, and is pro vil.ed with oppositely-arranged perts, one of which the inlet-port. A piston-head is carried by the piston
and extends into the cylinder. In the cylinders abut ments slide. A reversing valve on one face of the piston the steam-chest, to allow the steam to pass through the moreored port into the cylinder. The reversing valve moreover, is formed at its inner face with a cavity for
connecting the covered-up piston-port with an exhaust ort formed in the piston and leading to the exhaust

## Railway Appliances.

switch.-George A. and Thomas F. Penros points operated by an ordinary switch-stand, but con ructed without the usual frog, the switch having, in stead, means for lifting the wheels of the car from one
ail to another. With the main and switch rails are onnected a swinging wheel-lifting rail, forming a con inuation of one of the switch-rails and overhanging th adjacent main rail. Two guard-rails are mounted to ail, the connections converging and extending to a com mon point on the wheel-lifting rail, at which point the connections are pivoted to the wheel-lifting rail, whereby
the movement is directly transmitted to the wheel-liftin ail. A train passing over the tracks will be caused to tak the switch by the action of two switch-points, the on the other serving to lift the corresponding wheels up the other serving to lift
from one rail to the other.

## Mechanical Devices.

machine for constructing irrigating OR OTHER FLUMES.-Joseph H. MARTIN and Da vided a mold for the flume, a hopper connected with the fume, a paddle mounted in the hopper and adapted distribute the concrete delivered by the hopper in the mold, and a plunger monnted to slide in the body and in the mold-section, and operated by a lever to pack the he hoper. he hopper. The plunger's being resisted by the conmoved on.
MORTISING OR GANG-DRILLING MACHINE.brabam an Wagner, New Yark ciiy. It has bee cost and yet so effective in operation, that small unprovided with the usual large, costly mortising ma chines, may be enabled to produce work far more quickl than has heretofore been done by hand. The devic The edges of the top member have guides which receive bars carrying the operating mechanism. Upon the to nember an adjustable knee adapted to support the work, is secured. In order that the drills may be raise lever is provided, pivoted npon a bracket and connected with two links. The drill sockets are made to turn all in one direction by means of a series of pinion rotated by a
ENVELOP MOISTENING, SEALING, AND Chicago, IIl. On the water-tank of this machine is ars anged a guided moistener to dampen the envelop-flap. Aiter having been moistened, the flap is sealed by a de vice consisting of two yieldingly mounted plates, locatea between side bars. Springs bear between the plates and
he side bars ; and a presser mounted to swing between the plates presses the flap against one of the yielding plates to seal the envelop. After the envelop has been sealed,
plied.
PRINTING AND FOLDING MACHINE - John A of a printing mechanism and a folding mechanism. The printing mechanism consists of a plunger by means of which the printing is accomplished. The type having
been inked, the plunger is raised, and a piece of paper
placed in position. After having been imprinted, the
paper is acted upon by a folding strip controlled hy aper is acted upon by a folding strip controller iv the paper to assist the folding strip in folding the paper in any desired shape. Although the machine is designed print and fold labels used on mail-pouches or sacks, it he like.
TRACtion-Wheel. - Jeremiah J. Gillinger Quitman, Mo. In this traction-wheel, the opposit abs of the main wheel are connected with a shaft e y-wheel betwe the shaft and main wheel power may be derived from electricity, gasoline, or an other motive agent.

## Miscellaneous Inventions.

DEVICE FOR REMOVING DRILLS FROM WELLS -Frank M. Kiser, Parkersburg, West Va. This in ention provides a device designed to assist in the re covery of drilling tools when they have become bound
in wells by the caving of the walls. The device used fo of the well-casing. face at its bottom acting in connection with a clutchog. This dog is forced between the tool and the wedge surface so as to bind the two together in order to euable
the tool to be raised.
PRAYING OR CONFESSIONAL STAND.-HERMAN . Nerr, New York city. The stand of this inventor so constructed that the praying bench may be adjusted
expeditiously and conveniently to suit all requirements. The reading desk may be adjusted to or from the occupant of the stand. The body-portion of the stand, or that portion which supports the praying bench, may be
aised or lowered. The front and rear supports for the stand are arranged so that they may always be main ined in a vertical position or paraliel with one anothe n attachment for the reading desk is provided where bs screen may be elevated from the desk at the front for hen the screen is not required, it may
Calendar-tellurian. - Grant b. Nichol Wapakoneta, Ohio. This calendar-tellurian comprises enresenting the elliptical path of the earth around the n. The apertures correspond in number with the da of the year. A ball or globe representing the eart is held on a pin standing for the erth's axis and
dapted to be set in one of the apertures. An electri lamp carried by an inclined support is secured to the board at the center of the earth's orbit and repre sents the sun. Pointers are mounted to turn upon the central portion of the support and point to the
name of the month and the day of the month, the names and days corresponding with sections of $t$ earth's orbit. The calendar is arranged to indicate the earth relative to the sun on each day of the year, and the position of the earth in the zodiac. By means of the lamp, day and night may be correctly represented on the ball standing for the earth.
CARBURETER.-Elijar D. Parrott, Golden Dale, Wash. A gasoline supply-tank is provided in this ap n air supply-pipe is connected with the gasoline-pip. A burner heats the pipes. Water is used to cool th
cas. An air-pump forces the gas into the gasomete Throughout the generating process the gas is meter ained of the samestrength. The gasoline is uniforml consumed according to the number of lights in Frost cannot form on the inside of the generating ap paratus, and freezing of the gas-mains between the ghts and the carbureter is prevented.
Jack.-George A. and Thomas F. Penrose, Mere dith, Ark. The purpose of this invention is to provid jack designed for or equalize the joints. The jact bas two clamps, each with a key for fastening them to adjacent rails. A bar is pivoted on one of the clamp nd is fitted to slide in the other. A lever is fut crumed on the clamp in which the bar slides. A link pivotally connected with the lever. A grip engage he bar in such a manner that, when standing at an angle hereto, it grips the bar, and, when moving at a right holds the grip in a slidable position.
waist-belt.-Samurl Bienenzucht, New York which, A waist-belt has been patented by this invento se of a yielding and a rigid material for alternate link A yielding binding is used for the links, which binding is provided with integral eyes adapted for flexible connection with eyes formed upon the rigid links. The the figure
material.
oil Can. - arthur C. Hersberger, Poolesville Md. The body of this can has a neck, the npper end of washer being by the lottom plate of the spout opposite sides of a downwardly extended peripheral flange of the plate, eyes or links are attached, to which a
fastening device, consisting of a loop, is secured. By manipulating the loop, the spout-plate may be drawn tightly against the neck or removed laterally to permit
the can to be filled. The invention does away with the old operation of unscrewing the parts in order to fill the can and is, hence, of especial
nection with farm-machinery.

ChURN.-Leroy Drare, Shelton, Neb. This invention is an improvement in those churns which are made to rotate or oscillate, whereby the cream is al-
ternately thrown from one end to the other and is caused to pass through a fixed, reticulated diaphragm for the purpose of quickly breaking the oily globules and in-
ducing the formation of butter ducing the formation of butter. The inventor of the
present churn has devised an improved attachment for such churns, which attachment is in the nature of a collapsible diaphragm comprising two reticulated semicircular parts flexioly connected. The diaphragm firmly yet detachabiy held by means of a locking bar
nUT-LOCK.-Silas Chambers, Sterling City, T NUT-LOCK.-Silas Ceambers, Sterling City, Tex.
In the nut-lock forming the subject of this patent, a
simple washer or locking-plate is provided, which con-
sists of a tongue formed with inner and both of which are .provided with openings for the op rating tool whereby the tool may bear in both opening at the same time. The invention's especial merits are the ease of application and operation of the locking d
amalgamator. - Minnie h. MacClay, Louis ille, Ky. With a flxed frame, an ore-feed block having he passage and comprising a metal frame, are con ected an oscillating mercury-box arranged beneath an the block. to scour and grind the ore. Hangers are provided for the box, and have knife-edge supports.
bottle-cap. - louisa g. Flanigan, Baltimore d. This invention furnishes a cap formed with a ci cumferential in turned flange around its upper and oute
dge, which is adapted to receive the end of a tool t pry off the cap and which also makes a strong reinforce dge or crown for the bottle-mouth. With the cap lange and llaving a projecting thumb-piece or lug b which the use
picker-stick attachment. - Francis m utchinson, Mayfield, Ky. The picker-stick attachent for looms provided by this inventor has a pivote
asing adapted to receive a picker-stick. A formed on the casing for the passage of a return strap. hook formed on the casing above the loop receives the readily inserted in the casing and fostened therein after the desired adjustment is made.
Note.-Copies of any of these patents will be furnthe name of the patentee, title of the invention, and dat of this paper.

## NEW BOOKS, ETC

Manual of the Canvas Canoe. It
Construction. By F. R. Webb, ${ }^{\text {ithe }}$ The
Commodore." New York: Forest and
1898.
Stream
Pp. 115.
Publishing
Price $\$ 1.25$.
We are always glad to review a book which gives prac ical directions for making things, and the prese volume gives explicit directions for making an excellen anoe at an expense of $\$ 12$ to $\$ 15$. Full specification nd elaborate working drawings, numbering seventy i in, are given. The canoe proper is not only describe ences, camp cooking, etc, are also treated, conven cellent little book will be hailed with delight by all

Hitting versus Missing with the ShotGuN. By S. T. Haminond
New York: Forest and Stream Pub lishing Company. 1898. Pp. 170 Price $\$ 1$.
This book might be termed "The Hammond System of Shooting," for Mr. Hammond enjoys among his field companions the repute of being an unusually good sho cult branch of antand shooting the pur grouse or partridge. This prompted the suggestion that he should write for by which his skill was acquired. The result is the original manual before us. We term it original because the hapters will show tbe author was self-taught; the expedients and dens aded and the forms of practice followed were his own. The volume will be warmly
welcomed by sportsmen.
Commercial Relations of the United States with Foreign Countries
During the Years 1896 and 1897. In two volumes. Voluine I. Issued merce Department of State Wasb ington: Government Printing Office 1898.

Commercial relations of the United States with for eign countries is a very important subject at the presen
ime, in view of the fact of our present export trade which is constantly increasing. The volume is fille re carefully classified and are thoroughly reliable. The Statistical Year Book of CANADA FOR 1897. Thirteenth Year of Agriculture. Ottawa: Govern
ment Printing Bureau. 1898. Pp 554.

The annual volume issued by the Department of Agriculture, termed the "Statistical Year Book of Canada,
contains a short history of Canada, and then treats of its constitution and government, land regulations, events of the past year, agriculture, minerals, trade and commerce,
currency and banking, railways and canals, post office, inance, insurance, education, Indians, patents, vital s tistics, criminal statistics. and the organization of the present government. It is a valuable manual for all who
are interested in any way in Canada.

We have just received the Fiftieth Anniversary number of our excellent contemporary, "The Independent. Having bad a Fiftieth Annivereary ourselves three years century of a successful newspaper. "The Independent" is always a welcome visitor to office or home. It is but matter of the highest class. It is published in convenient magazine form, and the price for a single copy is 5 cents, and the subscription price is $\$ 2$. The present universary number contanns valuable articles by R. S. Storrs, Francis J. Higginson, Richard H. Stoddard,
William Hayes Ward, Thomas Wentworth Higginso Thiliam Hayes Ward, Thomas Wentworth Higginson,
Theodore L. Cuyler, Elizabeth Stuart Yhelps. Ed ward Everett Hale, Cesare Lombroso, John La Farge Justin McCarthy, Maurice Thompson and others. It would hardly be possible to obtain a more representa-
tive collection of writers. We heartily congratulate tive collection of - writers. We heartily congr
our contemporary on its Fiftieth Anniversary.
ⓤsiness and ஹersonal.
he charge for insertion under this head is One Dollar a
line for each insertion; about eioht words to a line. Advertisements must be received at publication offic s early as Thursday morning to appearin the follow ubers isu.

For hoisting engines. J. S. Mundy, Newark, N. J.
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machine work. Garvin Machine Co., 141 Varick St., N. Y FERracuTE Machine Co., Bridgeton, N. J. Full
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Appleton. 6u cents. Snow \& Farnham, Providence, R. I Hub, spoke, wheel, bending, and handle machinery Machine Works, Deflance, Ohio, U. S. A.
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Arroundings in home and factory life at Elgin have all conduced to the success that has ever marked the Elgin National Watch Company.
The Chicago Times-Herald, in its issue of Septembe
1898, speaking of the employes at the Elgin factors.
 operatives and their confldence in their employer based upon long years of fair treatment," and adds,
"It is perhaps not too much to say that the It is perhaps not too much to say that the employes ers, are the equal in every respect of any factory operatives in the country. Certain it is that they are far
superior to ordinary factory workmen. One can tell superior to ordinary factory workmen. One can tell
therr quality in a moment if he but takes the trouble to
watch the stream of men the main gateway at the hour of commencing labor.
The close and friendly relations which for so many ears have existed between employers and employ record of thirty-four abears without either strike to a

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HINTS TO CORRESPONDEN'SS.
Names and Address must accompany all letters
or no attention will be paid thereto. This is for ous

 some answers require not a little research, and,
though we encieavor to reply to toll either by lettet
or in this department. each must take his turn. Bu yers wishng to porrchase any article not addertised
in our columns will be furnished with addresses of houses manufacturing or carrying the same.
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to may be had at the office. Prre 10 cents each.
Books referred to promptly supplied on receipt of Books referren to prompty suppied on receipt of
micer.
marked or labeled.
markination should be distinctly
(7529) F. E. J. asks: 1. Can an electric arc be produced in a vacuum? A. We reply in general,
an electric arc cannot be produced in a vacuum, if by it you mean an arc light such as is used for light-
ing ; but in the low vacuum of a Geisser arc of purple light may be produced several feet long. In the vacuum of a Crookes or $\mathbf{X}$ ray tube no
electric discharge can take place, and a tube may be o perfectly exhausted that no discharge will pass between terminals only $1 / /$ inch apart. 2. Will it burn as
bright as though produced in air? A. No. When the vacuum, is low enough for an arc to form, the light of it is of a purplish tint and is visible only in the dark. 3 . Would ordinary glass answer for a globe for an electric
arc in vacuum? A. Ordinary glass is used for the bulbs or in vacuum? A. Ordinary glass is used for the bulbs 4. Would it require more power to produce an arc in a vacuum than in the open air? A. Certainly; more powe is required to drive the electric discharge across a given gap as the air is removed from it, ntill the point is reached when the discharge ceases to pass the gap at all. Moore's system of lighting employs the discharge through
${ }^{(7530)} \mathrm{H}$. B. C. asks: 1 What kind of varnish can I nse to coat a wading suit with? It must
be perfectly watertight and flexible. A. Dissolve 1 ounce
of beeswax in 1 pint of the best boiled linseed oil over a ge:tile fire. applying of the best boid with a piece of rag, rub-
bing one bing it well in and afterward hanging up to dry, which
will take four or five days; or paint with boiled linsed oil colored to suit. It must be done in very hot room or in a bright sunlight. A shoebrush is the best for apply
ing it. A little patent drier may be added. It is said that the Chinese use a mixture of 1 ounce each of beeswax and soft soap with the oil, which is then boiled
down. If the surface seems tacky, varnish with shellac varnish. In any case, apply the oil as thin as possible and let it dry perfectly between successive coats. 2 pulley? A. All the best beltmakerssay rungrain side to the pulley, and it is claimed that 3 per flesh side nex the pulley. The grain of the leather has a velvety surface, which enables it to hug the pulley closer than will the
bard flesh side. Some users run the flesh side to the pulley for small belts. and then daub and stick up the belt
with beessax or resin to make it take hold, but this is with beeswax or resin to make it take hold, but this is
not economical for the life of a belt, is unworkmanlike, and there is alvays more or less fussiness in running ma running for years without any attention, as they will sometimes do when run gr ain side to the pulley, and of
proper size to transmit the desired power.
(7531) D. L. (F. asks how to adapt an arc lamp suited for 52 volts and 12 ) amperes to a circuit
carrying 60 amperes at 104 volts. A. The arc lamp in question, when run on the 52 volt circuit, used probabl wound so that it was put on the circuit directly at 52 Such a lamp can be put on a circuit of 104 volts by sup plying it with a rheostat whose resistance can be varied
It will require the same voltage and amperes as before The other 59 to 54 volts will be taken up by the rheo
stat. This rheostat requires 200 feet of No. 12 (B. \& S. German silver wire. It should be arranged so that the coils can be cut out one br one to the last one, and then
the current can be adjusted to the lamp. We advise you
(7532) J. J. W. asks: Could you advise the adoption of the storage battery instead of the trolle the country? A. We regret to say that the storage bat cities it is not used, since it cannot compete in cos with the trolley. The trolley system is much cheaper for the storage battery. There never been any chance the best possible mode of electrical traction. In cities sidered the best. On leaving the town this is
the overhead trolley, as in Washington, D. C.
(7533) W. W. asks: For an electri heater on wire is suitable? A. If you wish to make
man silver with small heater to use about 1 ampere of current with Ger
man silver wire, get 1,300 feet of No. 18 B. \& S . gage For a heater using about as much current as an arc light,
get No. 12 B \& s . wire and about 50 fat get No. 12 B. \& S . wire and about 500 feet of it. Fo
articles on electric heaters see Scientipic America SUPPLEMENT, Nos. 513, 825, 1112, 1185, ten cents each.

## An experience of fifty years. and the preparation of more than one hundred thausand appications for patentsat home and abroade enable us to understand





INDEX OF INVENTIONS For which Letters Patent of the United States were Granted DECEMBER 6, 1898,

## AND EACH BEARING THAT DATE.

## Advertising device, J. W. Lynch. Air and gas mixer, J. F. Barker Air brake, railway



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Back Page, each insertion, - $\mathbf{\$ 1 . 0 0}$ a line Higher rates are requasses of Advertisements, Special and The above are charges per agate line-about eipht
word per line. This notioe showsthe wattof the ine.
and is set in


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B-Lathes, etc. SENECA FALLS MFG. COMPANTY. AMERICAN PATENTS. - AN INTER esting and valuable table showing the number of patent
grante tor the various subjects upon which petition
have been fled from the beinning down to Decembe

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Che Pratt \& wuhitney Eo., Eartford, Conn.


 ACETYLENE GAS AND CARBIDE OF








 Headight reffector. A Metternich.
Heater. See Feen water heater.
Heemmer. R. Irwin .
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