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Fig. 4.-THE "MUTOGRAPH" PHOTOGRAPHING THE PENNSYLVANIA LIMITED WHEN RUNNING AT THE RATE OF SIXTY MILES AN HOUR, PHOTOGRAPHY AS AN ADJUNCT TO THEATRICAL REPRESENTATION.-[See page 248.]

# Srientific Ammerian. 

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## trial trip of the battleship iowa.

First-class sea-going battleship Iowa completed her trial trip over the official course on April 7, when she maintained an average speed of 17 knots during a continuous run over a 66 mile course. The run was completed after about eight hours of continuous steaming at the end of which her boilers and machinery were in first-class working condition. The average boiler pressure was 152 pounds per square inch with one inch of air pressure in the stoke hole. The engines averaged about 112 revolutions per minute for the whole run. It is noticeable that the speed was remarkably uniform, and that there was no evidence of the ship making any spurts above her average speed. At the close of the run, the Iowa was tested as to her steering capabilities, and the helm being put hard over, she swung for a complete half circle, first to port and then to starboard She was very quick in answering her helm and proved that she could turn a circle of something under 400 yards. It was noticeable that when the ship was being driven at full speed there was practically no vibration, what little there was being noticeable at the bow and stern. The contract speed for the Iowa was 15 knots per hour, and the builders were to receive a bonus of $\$ 25,000$ for every quarter of a knot in excess a stipulation which will secure to Willian Cramp \& Son, of Philadelphia, the sum of $\$ 200,000$
The Iowa was designed for a speed of 15 knots under an indicated horse power of 11,000 . As the power neces sary to drive a ship varies as the cube of the speed, it is evident that on this occasion she must have indicated some thousands of horse power more than she was designed to do.

## england's naval policy.

The latest advices regarding the proposed increase to the English navy plainly indicate that there is to be no cessation in the activity which has characterized naval shipbuilding in that country for the last few years. The amount of money that has been appro priated for increasing and carrying on the naval establishment is something over $\$ 115,000,000$. During the next few months the government will commence the construction of four battleships of nearly 15,000 tons, three third-class cruisers, two sloops of war, four twin screw gunboats and two torpedo boat destroyers Victoria and Albert, a paddle steamer which has been victoria and Albert, a padate steamer which has for a great many years. It is intend
used used by royalty for a great many years. It is intend-
ed that the new yacht shall be one of the most sumptuous of its kind afloat
The current programme is one of the largest ever laid down by Great Britain, as may be judged from the fact that during the next twelve months she will have built or will be constructing 14 first-class battleships of be tween 13,000 and 15,000 tons displacement, 8 first-clas cruisers of 11,000 tons, 9 second-class cruisers of 5,800 gunboats, 52 torpedo boat destroyers, 8 light draught steamers for river service, besides the royal yacht above mentioned. The list above given represents in the ag gregate 108 vessels, whose total displacement will be
380,000 tons and the total horse power 800,000 . The total number of men in the navy will be increased to over 100,000 . Under the head of improvement of foreign naval stations, provision is made for very extensive dredging, with a view to securing safe anchorage for ships of the deepest draught at all seasons of the year Large docks are to be built at Jamaica, Bermuda and Hong-Kong, and three dry docks are to be constructed at Gibraltar whose length will be respectively 850,550 and 450 feet

## abandonment of a social experiment.

Two schemes for insurance against want of employ ment have existed for two or three years past in Switz erland, one in the canton of Berne and one in that of St. Gall. The former was voluntary, but in St. Gall the laborer was compelled to insure. The American
consuls at Chemnitz and St. Gall have both recently reported on the subject, and the former states that men whose work is steady and likely to continue so complain bitterly that they are compelled to support in idleness others whose labor is uncertain, but who for that very reason, are better paid when they are a work. "It is not in the nature of things for such a system to succeed, even among so loyal, loving, and gentle a folk as the Swiss. The effort is not vain, if it will teach the thoughtless how hard it is to make laws or to institute any system that is to take the place o thrift and economy during the days when work is plen tiful." Some time after this report the consul at St Gall wrote that the experiment has been abandoned at the instance of the laborers themselves. He say they" found that a system which insured against los ness. In fact, a knowledge of the existence of this system of insurance had drawn to St. Gall a consider able number of unemployed from other parts of Switz erland, with the object of obtaining support at th expense of resident laborers." Hence the system dis expense of resident laborers." He
appears on and after June 30 next.

## THE GOVERNMENT'S SCIENTIFIC EXHIBITS AT THE TENNESSEE EXPOSITION.

The preparation of the exhibits to be made by the Smithsonian Institution and its dependencies at the Tennessee Exposition at Nashville is well advanced The exhibit of the National Museum has not yet been fully arranged, but it will consist essentially of a representative exhibit taken from each of its num erous departments, and will probably be confined to this.

The collections of the Smithsonian proper will em brace a complete set of the publications, including the Half Century book, which latter great work will her be seen by the public for the first time, and will also include portraits of James Smithson and Thomas $G$ Hodgkins and a plaster model of Joseph Henry.

The Bureau of American Ethnology will concentrate its energies on a Kiowa camping circle, and this will be one of the most interesting features of the govern ment's exhibits. The Kiowa Indians, together with an affiliated branch of the Apaches, have a highly elabo rate social organization which is embodied and expressed in the grouping of their tepees and mode o camp life. All this will be exhibited in miniature and with great fidelity to nature. The exhibit will include all the objects of the handiwork of these Indians.
The National Zoological Park at Washington is to be reproduced with accuracy of detail in the form of a model about seven feet square, the work of a local modeler. Photographs of important features of the park, which is a very beautiful tract, including groups f animals, etc., will be shown
The Bureau of International Exchanges, in the Smithsonian building, will exhibit a map of the world showing the number and location of its branches in all countries, these branches being in nearly every corner of the globe. One set of government docu ments will show the number of publications annually sent abroad, and this, together with a bound list of the foreign correspondents, will show how extensive are the bureau's activities.
The exhibit of the astro-physical observatory will be quite interesting, including, among other objects, photographs of the spectrum showing the progress of the observatory, photographs of apparatus, and the bolometer, the marvelous invention so invaluable to astro-physics. Prof. Langley's aerodrome, or air ship will be shown only by photographs.
The exhibit of the United States Geological Survey will embrace two cases of minerals and a case of fossils. It will also include a suite of the rocks of the educational series. The last named is worthy of especial note. It is one of a number of duplicate suites, each consisting of 156 typical rocks which the Geological Survey has been preparing for a number of years, to be distributed to the great universities and colleges of the land for purposes of instruction. Its exhibition at Nashville will serve to announce its practical com pletion, as it will there be seen for the first time as an entirety. In addition to the above the survey wil show twelve or fifteen relief models, most of them very ine, and a large collection of the topographic map and geologic folios, as well as a number of transpar encies and pictures of various kinds.
W. T. Morsell

## BUSINESS CHANGES.

An elderly gentleman engaged in business for some twenty years past in New York and its vicinity, and which requires him to visit various lines of trade, said recently: "I find in the last few months that I am obliged to begin all over again. I go into a concern with which I have had dealings for years, and am sur prised to find that the man with whom I have been transacting my business no longer sits at the desk. I ask for him and am told that he is no longer with the concern. Another, and in many cases a younger, man is there instead. It is almost like presenting my busi ess anew. There is a perceptible interruption to rela tions, and an immense amount of new work to be done before I can get back to the position I occupied unde the old management. This I meet almost universally Some establishments have seized upon the present opportunity to rid themselves of dead wood. Others have hired cheaper help. Others have seen the oppor tunity of pensioning men long in their employ and superseding their somewhat old-fogy management by hat of younger men up to date. Were I to tell you the number of cases in which these circumstances come to light, you would be astonished."-Business.

## BAZIN'S ROLLER STEAMBOAT.

Dispatches from London, dated April 3, say that the reports of the recent trial trips of the roller steamer at Rouen have been discouraging, the engines not prov ing powerful enough. Their power was nearly trebled, but the increased weight submerges the rollers so deep that they only turn ten times a minute instead of forty. The rollers throw up such quantities of wate behind that each acts like a brake and reduces the thirty knots an hour to six or seven. Rubber scrap ers are being experimented with to prevent the up heaval of the water.

## THE HON. BENJAMIN BUTTERWORTH

The appointment, and confirmation on April 6 by the United States Senate, of the Hon. Benjamin Butterworth to the responsible office of Commissioner of Patents will, we feel sure, receive the unqualified approval of all practitioners before the Patent Office.
The new Commissioner of Patents accepted the com missionership at the urgent request of President McKinley. Great pressure was also brought to bear upon Mr. Butterworth by the bar of the country without regard to politics, and it is not without considerable pecuniary sacrifice that he takes the position, for which he is so eminently qualified.
Mr. Butterworth is fifty-nine years old and was born in Ohio. He was admitted to the bar in 1861 and commenced the practice of law in Cincinnati, The first public position which he held was that of United States District Attorney for the Southern District of Ohio. He was elected a member of the Ohio Senate, and subsequently, in 1878, was sent to Congress from his district, which was normally Democratic. He was reelected to the next Congress.
He was Commissioner of Patents during the administration of Chester A. Arthur and made a good record as an incorruptible and efficient commissioner. He served until he resigned to become a member of the Fortyninth Congress. He was elected afterward to the Fiftieth and Fifty-first Congresses and declined the nomination for the Fifty-second Congress. While in Congress Mr. Butterworth was ad mittedly one of the readiest and ablest debaters on the floor of the House and was always the champion of good government and pure politics. Mr. Butterworth was president of the commission sent by the United States government to Europe, to induce the foreign governments to take part in the Chicago World's Fair. After terminating his connection with the Exposition, he gave his entire attention to the practice of law in connection with Mr. Julian C. Dowell. The law firm of Butterworth \& Dowell have offices in Washington and Cincinnati. During his tenure of office as Commissioner of Patents Mr. Butterworth compiled a most comprehensive work on "The Growth of Industrial Art." This work gives the history of two hundred of the arts from the rude beginnings up to the most complicated examples of the modern inventors' skill
Mr. Butterworth's deep interest in the promotion of all public enterprises, industries and inventions, his liberal-mindednes 3 toward inventors and his influence with the representatives of the national legislature, all portend for good in the future, the pos sible reform of abuses and the placing of the Patent Office on a higher plane of usefulness.

## NO BIDS FOR ARMOR PLATE.

There were a number of surprised people at the Navy Department on April 8, when bids were opened for supplying the government with 8,000 tons of armor for the battle ships Alabama, Illinois, and Wisconsin. It was the first opportunity of the department to test the attitude of the armor plate manufacturers with regard to the stipulation in the Naval Appropriation bill that the aver age cost of armor to the government should not be more than $\$ 300$ a ton. Secretary Long presided at the opening of the bids, and he announced that one bid only had been received. When the so-called bid was examined, it was found to be in the form of two propositions from the Illinois Steel Company, a Chicago concern, neither of a regular character in conformity with the advertisement. Both of these propositions will be rejected.
The company offered to furnish the 8,000 tons at $\$ 300$ a ton, on condition that Congress would award it a contract for the entire wants of the United States government for armor plate for twenty years. If this were done, the firm would furnish the material at $\$ 240$ a ton, provided it did not have to manufacture less than 6,000 tons and more than 12,000 tons annually. The other proposition was curious. It contemplated the erection by the government of its own plant, the Illinois Steel Company to lease it the ground at a nominal figure for ninety-nine years and to furnish open hearth ingots suitable for armor plates.
What the government will do in view of the setback given by the refusals to bid has not been decided. Congress will have to untangle the knot. Meanwhile Secretary Long has reserved his opinion.

According to Cosmos the following method has been adopted for testing the hardness of steel balls. A plate of glass is inclined to the horizontal and the balls dropped on this one by one from a definite height. The rebound of the ball, if properly tempered, is sufficient to carry it into the hopper, where the hard balls are thus automatically collected. Soft balls, rebounding less, fall into another receptacle.

## THE POPULATION OF SWITZERLAND.

The population of Switzerland at the last census 1888) was $2,917,000$, and the average increase of popu lation from $1850-88$ was $5 \cdot 1$ per 1,000 inhabitants. The same conditions, however, appear to exist in that country as in others, namely, that the population of the industrial districts increases, while that of the agricultural districts tends to decrease. According to the secretary of legation at Berne, the death rate averaged $17 \cdot 6$ per 1,000 in the towns in 1894. Influenza was responsible for 2,275 deaths, as compared with 2,669 in 1890, and only 268 in 1891. The average of deaths from alcoholism was 6.5 per cent of the total. In 1888 there were 229,650 foreigners resident in Switzerland, of whom 112,342 were Germans, 13,000 Austrians, 53,000 French, and 41,000 Italians. The English who come into the country, and who do so much to support the hotel industry, would seem therefore to be mostly of the tourist class, as there were only 2,577 residents. The emigration of Swiss has diminished from 13,502 in 1883 to 3,849 in 1894, and of these 3,285 went to the United States, of whom 1,273 were agriculturists. These official figures do not include the army of Swiss waiters and hotel servants who go abroad annually for the winter months, to the Riviera or elsewhere, and who return home for the summer tourist season. The average number of suicides per 100,000 inhabitants was $22 \cdot 5$, as compared with 7.5 in England and Wales. A


THE HON. BENJAMIN BUTTERWORTH, COMMISSIONER OF PATENTS.
method are (1) that the burning defiles the air, causes rain and wind, and is not practicable in a wet sum-

It may be of historical interest to collect other references to the connection between large fires and subse quent rainfall, says the Monthly Weather Review.

PRACTICAL DIRECTIONS FOR SOLDERING ALUMINUM. Opinions on the best method of soldering aluminum are always of interest, and the following communica tion from "Solderer" to the Metal Worker is pronounced by aluminum experts to contain some excel ent practical directions for soldering aluminum. The Solderer" says
I notice the pictures accompanying the article on the "Specimens of Aluminum Soldering," but my attention, however, was more particularly attracted to the statement that the samples shown had not been subjected to the test of 'time, which has in a number of instances destroyed the hopes of those who thought they had successfully solved the problem of soldering aluminum by a simple method. I have not solved this problem, but have accumulated quite a bit of infor mation on the subject, which may be of interest to those who are laboring in this field. When exposed to the atmosphere an electrical action or chemical action, as it is sometimes called, begins, and either the alumi num or the metals in the solder start oxidizing, which eventually results in a separation of the solder from the aluminum. This action is more rapid when aluninum has been used to manufacture a vessel to contain water. It can readily be seen from this that it is absolutely necessary that the surface of the aluminum must be thoroughly tinned, or protected as far as possible from atmospheric influence, in order to solder readily, and if the joint is to be a lasting one, the protection to the surface of the aluminum must be of a permanent nature. The difficulty in soldering aluminum has been to keep the sur face entirely free from oxidation, the fluxe used in soldering other metals not being adapted for it.
Solders that are best adapted for use with aluminum contain a percentage of zinc, or spelter, and those who wish to demonstrate that aluminum can be soldered have only to use stearine as a flux with an ordinary soldering copper and a solder which contains a small precentage of zinc, or that has been prepared on purpose for soldering this metal. It is quite possible that those who are expert in the use of soldering copper can tin the surface and solder the joint with half and half solder, with stearine as a flux. Those who have soldered tin plate, copper brass, zinc, and black iron, know that black iron is much more difficult to solder, because the surface must be thoroughly cleaned from all oxide and made bright. Those who have had the most experience do not attempt to solder the iron until it is in a perfectly clean condition. From the fact that aluminum presents a bright appearance. it is too often assumed by those who experiment in solder ing it that it may be readily soldered, while in fact as much care must be taken to have its surface perfectly clean as is taken in cleaning the surface of a piece of black shee iron for soldering Aluminum solder is made more durable and capable of stand
curious coincidence in connection with suicides in Switzerland is that they are about 5 per cent higher on Tuesdays than on any other day in the week, and for men hanging, and for women drowning, appears to be the method of dispatch preferred by each sex.-Journal of the Society of Arts.

## PRODUCTION OF RAIN BY GREAT FIRES

In the early part of the century Prof. Espy excited great interest by his lectures on the formation of clouds, rain, and storms, and several, but not many, instances were quoted in which fires in the forest or canebrake were known to have actually produced local rains. An experiment made by Espy, near Washington, was not successful, and, indeed, it is conceded that a very moist condition or a generally unstable condition of the air is needed in order to produce a favorable result. It will, perhaps, be of interest to find that attention had been called to this matter before Espy's time. Thus, in the London Philosophical Transactions for 1708 (see Hutton's Abridgment, vol. v, p. 403) the Archbishop of Dublin says :
"There are three ways of reducing heath and bog to arable land (in the counties of Londonderry and Donegal): the first is by cutting off the scurf of the ground, making up the earth so cut in heaps, and when the sun has dried them setting them on fire; when burnt as much as they can be the heaps are scattered on the ground, and, after plowing, it produces barley, rye, or oats for about three years. The inconveniences of this
ing the ravages of time by the addition of a per centage of silver, which immediately adds to the cost and also to the difficulty of soldering, as it must be and also to the difficulty of soldering, as it must be
done with a blowpipe or by some other means by which the high temperature necessary for melting and fusing the solder can be secured.

## THE GUTTA-PERCHA CROP OF 1896

The India Rubber World says: Advices from Singa pore, dated November 20, record the shipment of gutta percha, from the beginning of the year to that date, as follows:

To Great Britain... t........


These figures, for a trifle less than eleven months, ar larger than the total shipment of gutta-percha from Singapore for either of the years 1892 or 1893 . Unless the shipments were at a larger rate during December however, it is probable that the total for the year fell below that for most of the years during the past decade England's share of the total is even greater for the period covered by the table than usual.

## HISTORY OF THE AMERICAN LOCOMOTIVE.

The series of articles on the history of the American locomotive, which was announced to commence in the present number of the Scientific American, will be published in the Supplement, the first of the series appearing in next week's issue of that journal.

## A SPRING-SUPPORTED HANDLE BAR

The bicycle rider generally finds that in riding over rough roads the most tiring effects are those which come from the jarring and jolting communicated to the body through the handle bar. This very commonly causes numbness of the hands or forearm, and the striking of some special obstruction often sends a shock through the entire body. It is on this account principally that the wooden handle bars have met


THE ROBINSON SPRING-SUPPORTED HANDLE BAR.

with favor, as being more resilient and "springy" than those made of metal, but the amount of added elasticity thus obtained is an undefined quantity, and cannot be made greater or less as may be desired, according to the weight of the bicyclist or his manner of riding. To overcome these objections, the springsupported handle bar shown in perspective and in section in the accompanying figures has been invented and is being introduced by William Robinson, of the Devonshire Building, Boston, Mass. It was exhibited at the Boston bicycle show in February, and elicited general approval.
The handle bar proper has at its center an independent bracket, and the handle bar stem is similarly provided at its top with a bracket, the two brackets being hinged together to form a fulcrum, as shown in the sectional view, the hinge coming between the inwardly curved ends of the bar, or toward the rear of the machine On the handle bar bracket is a lug projecting down into the tubular stem, and to this lug is hinged a rod at the lower end of which is a spiral spring bearing against an annular shoulder within the stem, there being nuts on the rod below the spring by means of which its initial compression may be adjusted as desired. As the weight of the rider is thrown suddenly, or resting normally, upon the handle bar in riding, the bar moves slightly upon its fulcrum, the spring absorbing the vibrations and the handle portions yielding as indicated by the dotted lines, thus obviating all shock and jar on comparatively smooth as well as on the roughest roads. This bar yields only to downward pressure, and in lifting, as in hill climbing, it is rigid-unlike the wooden handle bar, which is equally elastic in all directions. The spring is adjustable to any weight of rider, and the bar itself is adjustable in its bracket, and may be easily reversed, giving either an up or down curve to the handle bar. The construction described does not interfere in the least with the neatness and


## A SEMI-TRACTION GASOLINE ENGINE

The illustration represents a novelty in traction engines, being a gasoline semi-traction engine which was last month shipped to Yucatan, for running a stone crusher and for use upon a tramway several miles long, upon which, however, it will be self-propelling in one direction only, having a tongue and attachments for hauling by team. It was built by the Charter Gas Engine Company, of Sterling, Ill. It has flanged wheels for use on the track, but the flanges are so low that they do not cut in very much when used on the road. The propulsion of the engine in one direction by its own power is effected through the sprocket chain connection of the main shaft with a sprocket wheel on one of the axles, as shown in the illustration. This engine has the general features of the Charter gasoline engine, which has been many years on the market, the use of gasoline direct from the tank being so controlled use of gasoline direct from the tank being so controlled
as to secure perfect immunity from danger of fire and as to secure perfect immunity from danger of fire and
explosion, while unaffected by changes of weather and temperature. The driving pulley is a friction clutch pulley, simple in construction, and with means for tak ing up the wear of the clutch shoes, which are lined with hard wood. The machine that is being operated can be stopped and started at will, while the engine continues to run. Muftiers for the exhaust reduce the noise, so there is not as nuch as is made by the stean engine exhaust. The gasoline tank has capacity for over a day's consumption, and is shown in the cut.

## CIgar Ribbons.

One New York firm alone turns out yearly an average of more than $\$ 200,000$ worth of cigar ribbons and on these employs nearly 500 hands, says the New York Sun. Until 1868, it is said, cigar ribbons were not manufactured here. The use of silk ribbons to tie up cigars originated in Cuba. The Spaniard's patriotism im pelled him to choose the national colors of red and vellow, and at the present time these two colors, and rate or in combination, are still the favorites. The rate or in combination, are still the favorites. The
fibbons were made in Barcelona and were the rich crimson-scarlet, known as the Figaro, the vivid yellow of the Cabanas and Partigas, and the red and yellow of the Española.
The first domestic ribbons made were of cotton, of a pale yellow, with a brown stripe running down the center, and this was speedily followed by a ribbon made wholly of silk. In 1868 a cigar manufacturer in this country conceived the idea of having his name printed on the silk ribbon, which had hitherto been plain, and also the shape of the cigar. This was at first done in black, then in colors, and eventually in silver and gold, with embossed work and coats of arms Then the name was woven into the ribborr instead of being printed. Woven ribbon is very valuable as a trade mark, since it is impossible to duplicate it in small quantities.
In 1868 the first ribbon factory was established in his country by a man named Wicke, who established a small factory near the East River. It was operated by two Swiss. The demand for the ribbon increased and in 1870 the profits were so good that a four-loom actory was started and operated by Swiss weaver especially imported. Only two widths of what is termed "Londres" ribbons were then made. In 1887 here were more ribbons used in proportion to the tota number of cigars manufactured in this country than in any other year, and since then the bundling of cigars has steadily decreased in favor of the system of packing twenty-five or fifty in a box without ribbons.
The raw silk for the ribbous is imported direct from Japan and China There are ninety four styles of ciga ribbons made, va rying in width from one - eighth of an inch to an inch and a half. United States ribbons are sold in Canada in preference to the English make, although the duty on our goods is heavier. Some of the machinery is very interesting, especially that used for weaving in the name of the firm in black.
Some years ago the general public was bitten by a cigar ribbon fad and many ribbons were sold by cigar dealers to make
lambrequins, sofa cushions, ttc. A woman in New Haven made a table mat of 450 separate ribbons and it fetched $\$ 160$, while a cushion made by a cigar manufacturing firm as a compliment to an actress, whose name was used as a trade mark, cost $\$ 250$ simply for the needlework and time expended on it.

## THE DENSMORE TYPEWRITER BALL BEARING TYPE BAR JOINTS.

One of the latest to be introduced and one of the most valuable of the improvements which have marked the history of the Densmore typewriter is the ball bearing type bar joint shown in the accompanying illustration. Fig. 1 is a side view of the type bar and its hanger, with the depending key rod, and Fig. 2 is a larger view of a portion of the hanger, both views showing the five balls contained in the ball case on one side of the type bar pivot. A longitudinal sectional view of the type bar joint is shown in Fig. 3, there being five balls on each side of the pivot, and the joint thus has ten of these hardened balls. The arrangement prevents wear at the bearings, upon which perfect alignment and durability of a machine chiefly depends. The key rod, as will be seen, is pivotally connected with the short arm of a compound lever pivoted adjacent to the short arm of a compound lever pivoted adjacent to the
type bar joint, while the longer arm of this lever embraces and slides on the type bar during the stroke, as one's hand slides on an ax helve in chopping, thus gradually overcoming the inertia of the type bar. The gradually accelerated speed and force thus obtained with the least effort of the operator, account for the very light stroke of the Densmore typewriter, while the compound lever and its bearings receive all the latera strain, so that there is practically no wear or play. The ball case is adjustable, but is screwed very firmly into place, and will rarely need taking up even after long use. There is shown in the window at the main office


THE DENSMORE TYPEWRITER BALL BEARING TYPE BAR JOINTS
of the Densmore Typewriter Company, 316 Broadway, New York, a type bar and connections complete of heroic size, the type bar being eighteen inches long and the balls nearly half an inch in diampter. The hangers are numbered, each hanger having tenons which fit accurately in mortises in the top of the frame, where hey are firmly screwed in place, and this, with the delicately exact construction of the type bar joints, gives the machine an accuracy of alignment which does not depend upon the occasional adjustments of a repairer, but which must stay, because the type bar joints do not wear out and the hangers cannot become unadjusted.
The Densmore has comparatively few parts, is of light weight and easy to operate and very convenient to handle or carry. It has attained its great success from the thorough excellence of its manufacture and the many advantages and conveniences it possesses.

## Carborundum Production and Use.

The Carborundum Company reports to us that its works have produced during the year 1896, in round numbers, $1,191,000$ pounds, or $5951 / 4$ tons, of crystalline carborundum, says the Engineering and Mining Journal. Consideration at the present is given to the production in crystaliine form only, but another important industry in which carbide of silicon promises to be a valuable adjunct will naturally increase the usefulness of the material. Some mention has been nade of the experiments showing that carborundum can be used, and will, in all probability, take the place of ferro-silicon in the manufacture of steel. Prof. Luehrmann, of Germany, recently wrote an article on his subject indicating that in the use of carborundum here will be in Germany alone approximately 2,500 tons consumed annually, provided its cost would not exceed six cents per pound. It may be used for this purpose in an amorphous form, and the Carborundum Company is prepared to furnish it at a price slightly under this figure.

## A NEW AUTOMATIC MILLING MACHNE

The illustration represents a machine which is well worth the attention of manufacturers of all classes of goods on which hexagonal milling is an important item of expense. The machine was designed and built by James Gregory, of Bridgeport, Conn., to whom a patent was recently issued therefor. It mills the hexagonal surfaces on the different parts of steam valves and other similar work, and its operations are so completely automatic that the operator needs only to place and clamp the parts to be milled, when they are passed from one mill to another, presenting a new face or surface to each successive cutter until all the faces are milled. At the last stop, after being automaticaily loosened, they are taken by the jaws of an unloading mechanism, after unscrewing which the finished articles are dropped into a receptacle.
The machine has an intermittently rotary table, eight movements of which constitute a complete rotation. The table has holders to retain the hubs to be milled in their proper position during the several cutting operations on the hubs by the ninillers, which are stationed at equal distances apart on the frame of the machine, each serving to mill off a special surface. In the time of one movement of the table, the operator, standing in front of the machine, sets a hub upon a holder, and sets the hub at a proper angle with respect to the cutter, by means of a tool provided for that purpose, after which, on moving a handle, the table is rotated to carry the hub to the first one of six milling stations, where the cutter operates to mill off one of the outer surfaces of the hub. During the time of this milling the operator has placed a second hub on the holder, then at the front station, after which the table again rotates automatically an eighth of a turn, carrying the first hub to the second milling station and the second hub to the first station, the hubs being slightly turned between the stations to insure the proper engagement of the cutters with their successive surfaces. The operation is continued in this order, by the rotation of the table, until the six surfaces of the first hub have been milled, when the next movement brings the first hub beneath the gripping head by which its removal is effected, the operation being simultaneous with the work of the several cutters on the heads that have been successively placed in position. As the hubs are thus removed from the holders the latter are left free to be immediately supplied with additional hubs. The cutters are easily adjusted for different sizes of hubs, and the construction and operating mechanism of each of the eight holders and six cutters are substantially duplicates of each other. The operator easily feeds to the machine hubs of ordinary sizes at the rate of about three hundred an hour, and the milling is the final operation, the finish being of a superior character. The machine from which our illustration was made has been running nearly two years, a good portion of the time night and day, without other expense than the wages of unskilled laborers to operate it.

## A Curious Manufacturing Establishment.

In the Scientific American Supplement, No. 1079, for September 5, 1896, will be found an article entitled "An Industrial Democracy," which gives an interestincr picture of the establishment for training salesmen.
Probably no industrialinstitution in the world offers more unique features than does this plant and the method by which the business is conducted. Aside from the manufacturing part of the business, great at tention is paid to the systematic training of employes. Usually the salesman is a person who is given a sample of the article which he is intended to sell, and he is sent out among prospective buyers to woik out his own salvation; but the proprietors of this manufacturing company determined that salesmen should be as carefully trained as professional men, and to this end they have devoted agreat deal of time and expense. The school for salesmen is situated in the upper part of the factory, and is fitted up with a small theater, the seat arranged in a circle, and a stage is provided which represents the office of the business man or any kind of store, as a haıdware store, candy store, grocery store, etc.
The man who wants to become a salesman may take up a course in this school, at the compa-
ny's expense, and, while sitting in the auditorium,

## he is enabled to see how a thoroughly skilled sales-

 man approaches a probable purchaser and how he overcomes the objections which the merchant is almost sure to bring up. Then, in turn, the embryo salesman is required to take his place upon the stage and thus learn confidence and tact while he is watched by expert critics who are able to make friendly suggestions or criticisms when they are needed. The places at the side of the stage are filled with what appear to be store windows, which are utilized to display goods of various samples, so as to familiarize the salesmen with the art of window dressing, in order that they may make valuable suggestions to customers. It is little wonder that, under this system, salesmen which are turned out are able to act successfully as agents for the establishment which employs them.The Armies of Europe.
An editorial article in the London Spectator has the following characterizations of the armies of continental Europe:

The vast armies of the Continent, which seem on land so irresistible, have all, like our own small army


THE GREGORY AUTOMATIC MILLING MACHINE.
there is no proof that the cause of the evil, be it econ my of supplies or corruption in their distribution, or a certain want of cheeriness which is deep in the Slav character, has as yet been removed. The Russian army, irresistible in defense of Russia, is not, as the ast war with Turkey proved, equally formidable in offensive operations. The Austrian army, though splen idly organized, and with perhaps the finest cavally in the world, thinks in too many languages, has to nany kinus of patriotism, and is governed too exclu sively by a caste which has often failed in developing nthuiasm in the soldiers it educates and commands. The Itaiian army has not the confidence whici comes from a history of victory, and its history in Abyssinia seems to show that, while it will face anything, it leaders are unaccustomed to separate responsibility, and depend on the commander-in-chief, who may or may not be equal as a strategist to his position. Finally, the French army, with its new and complete organization, its hundreds of thousands of brave men and its ardent generals, is still embarrassed by certain sources of weakness. The supply departments are still it is believed, infested with jobbery in the management of the great contracts, the huge mass of officers still includes many who are inefficient, and the Minister of War General Billot, has recently made speech to a syndicate of military jour cals which reveals with amazing frank ness some other mischiefs. Very short service does not quite suit the genius of the French people, who, quick to learn and eager in combat, are not equally ready to perceive the necessity of machinelike discipline. It takes them time to learn perfectly to obey, or, as General Billot puts it, we mus remember 'the fact that the temperament of the German nation is more naturally inclined to those ideas of discipline and obedience which are not possessed by our young French men, so intelligent, so brilliant, but -let us confess it-so giddy and thoughtless. And while we must ever bless the French revolution, which has so thoroughly made us men and citizens, I cannot help remarking that, from a military standpoint, the revo lution has made the task of the in structors of the army a very heavy one -the task of subjecting to the yok of discipline men for whom the idea of liberty has become a dogma.'"

## Experiments in Military Ballooning.

A series of experiments are being made at Shoeburyness by the officers of the ordnance department and the superintendent of experiments at the school of gunnery on the one hand and the officers of the school of military ballooning at Aldershot on the other says Public Opinion. A captive bal loon was sent up over the Estuary o the Thames, attached by a cable of about 700 yards to a boat loaded with ballast, which was set adrift on the water. The weather was somewhat boisterous, and the morning dull and hazy. The field piece was placed on the marsh land beyond the school of gunnery, from where the firing took place. The distance or range was ascertained to be about 4,000 yards The gun was worked by the staff of the school of gunnery, under the direc tion of Major Hickman, R.A., assist
[the English], their points of weakness, differing in each state, but still well known to those who pass their lives studying their qualities. The German army is, as a fighting machine, probably the most perfect of all, but as Count von Moltke said, it has never been tested by retreat; it rests on universal conscription which sweeps the unwilling as well as the willing into the military net, and it is of necessity commanded by the Emperor, whc must take part in the campaign, and who may or may not be competent to choose rapidly among the best plans, or to select the generals most competent in actual warfare. It is difficult even to imagine the total defeat of the wonderful machine worked up as it has been for thirty years, but its real trial would come when it had to conquer in another and greater Zorndorf another Russian army equal in numbers to itself, and resolved to perish on the field. The Russian army, matchless in numbers and perfect in obedience and courage, is composed of underfed men, who, either from that cause or some special physical liability, perish when in movement in astound ing numbers, and, once outside Russia, have a positive habit of dying. Army after army of Russians has ant superintendent of experiments. Shrapnel shell was used, and good practice was made from the first. On the sixth round, however, excellent elevation and direction and distance were obtained, and the hell was observed to burst almost immediately ove he balon. After osillang for few secolls, the he balloon. After oscinating for a few seconds, the balloon was observed to be collapsing, and then it
gradually fell. Its descent was slow, and, as far as could be judged, had the car contained any occupants, it is possible they would have sustained but little, if any, injury had the balloon fallen on land. When it was seen that the balloon had been injured and was descending, the boat to which it was captive wa. picked up and towed to land, and the balloon wa packed up and later in the day sent back to Aldershot t was impossible to ascertain the extent of the injur which was done to the balloon itself, but the wicke car appeared to have sustained little or no damage The experiments were at once suspended, and a report was drawn up and forwarded to the war office.

On the western bank of the Nile Medinet Habu has been disincumbered of the rubbish under which it was buried and now stands out in all its magnificence.

## NEW YORK ACADEMY OF SCIENCES.

## annual exhibition and reception.

The fourth annual reception and exhibition of the New York Academy of Sciences was held in the American Museum of Natural History, on the 5th and 6th of the current month, and the presence of several thousand people testified to the value of the event and the interpeople testifed to the value of the event and the inter-
est taken it. This year the exhibits were limited to the est taken it. This year the exhibits were limited to the
exhibition of the progress made in science in the past exhibition of the progress made in science in the past
year, and it enhanced greatly the scientific interest of year, and it enhanced greatly the scientific interest of
the exhibition, while enough popular matter was shown the exhibition, while enough popular matter was shown
to occupy far more time in its inspection than many of the guests were able to devote to it. Even such cultured assemblages as were present at the three sessions of this exhibition showed the interest aroused in the average human mind by something in motion, and the rock cutting machine, the exhibit in experinental psychology, the two booths in which new Roentgen X ray apparatus was at work, and the electrical furnaces had apparatus was at work, and the electrical furnaces had
crowds of people around them all the time. Three sescrowds of people around them all the tiine. Three ses-
sions were held, that on the evening of the 5th being sions were held, that on the evening of the 5th being
assigned for members of the academy and guests, while assigned for members of the academy and guests, whine
the sessions of the next day were open to the general public and members of the Scientific Alliance and of the museum.
Fourteen departments of science were represented in the exhibition, and a catalogue comprising sixty-two printed pages was needed to enumerate the articles exhibited. The electrical section was especially strong, and its exhibit formed one of the striking features of the reception. A collection of incandescent lamps showed the advances made from the first crude forms to the present 220 volt high efficiency lamps. The oldest one shown was Edison's paper horseshoe lamp, which was described in the Scientific American, April 17, 1880, and is still in good working condition. The question of producing electrical energy from carbon without the application of heat is one that is always in the minds of electricians, and that always receives much thought. One method of solving the difficulty is by using the Jacques carbon battery, in which carbon and iron are placed in caustic potash $(\mathrm{KOH})$ and air is admitted for a supply of oxygen. The apparatus was shown. The new and improved forms of Roentgen ray tubes and coils in operation in one of the booths were powerful enough to show the shadows of the bones of
the human body, though most of the visitors contented the human body, though most of the visitors contented
themselves with taking a good look at their hands themselves with taking a good look at their hands
by means of the fluoroscope. One of the curiosities of the electrical department was one of the great porcelain insulators, ten inches in longest diameter, used on the Niagara-Buffalo transmission line to support wires between which exists a pressure of 10,000 volts.
In the chemistry section there was a supplement to the clectrical exhibit in the shape of several electrical furnaces, two of which were constantly in operation. In one of them quartz (a mineral until recently regarded as wholly infusible) was shown in a molten state, while the other was used for showing the spectra produced by dropping an appropriate metal into the are, according to the method of Roberts-Austen. An interesting series of chemical compounds produced by the aid of the electric furnace was on exhibition. The heat developed in thesefurnaces is estimated to be as high as that developed in the sun $\left(3,500^{\circ}\right.$ to $4,000^{\circ}$ C.) The furnace used by M. Henri Moissan when he made diamonds before the academy last October was on exhibition, and the great carbons, $31 / 2$ inches in diameter, like those used in the aluminum' works at Niagara Falls, attracted some attention. A display of the Tiffany favrile glass was made in this section.
The most popular feature of the section devoted to botany was a collection of one hundred water color paintings of Australian wild flowers. These were done from life in their native haunts by Mrs. F. C. Rowan, by whom they were loaned to the reception. Their marvelous fidelity to nature, combined with their artis tic merit, have won twelve gold medals at various places from Melbourne to Paris and Amsterdam. A grewsome exhibit in the botanical section was a series of bacteria from our city water. Fortunately, most of them are entirely harmless.
Improved methods of installing exhibits of an archæological character were shown in a model of an altar mound excavated near Chillicothe, O., last year, showing the manner of doing the work, and in a skeleton mounted in exactly the position in which it was found and surrounded by the personal ornaments which were originally buried with it. The exhibit in the archæological department which seemed to attract the most attention was a selection of specimens illustrating re cent discoveries at the ruins of Omitlan, state of Guer rero, Mexico. The ruins cover a large area and were
discovered by Mr. William Niven, in a region that has discovered by Mr. William Niven, in a region that has
never been visited by any of the famous explorers and of which no mention is made by any of the Mexican historians. Many of the antiquities found are of unusual form, but most of them have apparently been used as dress ornaments, amulets, ceremonial stones and the like. Seventy mother-of-pearl buttons and pendants were found in a small olla or pot of terra cotta nine feet below the surface of the ground in a temple. These were exhibited, a portion of them still remaining
in the clay which filled the olla. Dozens of highly polished idols of jade, diorite and serpentine and ear ornaments of the same materials, together with masks of One shell object chert and jade, were on exhibition, but it bore a closer resemblance to an ordinary napkin ring. A series of fine photographs showed portions of the ruins and the laborers at work. Some 1,400 objects the ruins and the laborers at work. Some 1,400 objects
comprise this unique collection, which is now on permanent exhibition in the American Museum of Natural manent exhibition in the American Museum of Natural
History, having been acquired by that institution. Inasmuch as the Mexican government has just granted to Mr. Niven the right of exclusive exploration in these and other ruins in Guerrero for ten years, under certain conditions, we may reasonably hope for the display of additional material from this won
Experimental psychology is a department of science which is receiving much attention now from students and has its strongly popular side. The delicate and ingenious devices for determining the strength, duration and effect of various sensations, the quickness of perception, and other mental processes were in opera tion at one table and aroused much interest in the visitors. The great advances made of late years in the application of electricity to mechanical devices have rendered great assistance to this as well as to every other department of applied science.
Geology, with its closely allied sciences of physiography, mineralogy, and paleontology, occupied a large portion of the space devoted to the exhibition and showed much that was new in material or method.
The section cutting machine devised and exhibited by Prof. W. B. Dwight, of Vassar College, Poughkeepsie, marks a great advance in this important aid to the study of rocks, minerals and fossils. The special features of the machine lie in the devices for holding the object so as to produce a cut in exactly the desired direction and for the adjustment and control of the cutting disk by adjustable friction rollers, so that the sectioning can be done by either small or large disks (six to twelve inches in diameter) with great accuracy, facility and economy of material. With this instrument can be cut sections of from eight to twelve square inches and from $\frac{1}{50}$ to $\frac{1}{100}$ inch thick with very true, smooth sur from ${ }^{\text {b }}$ frog
Pros.
Progress made in physiography was shown by the display of recently completed maps, charts and topographic models, one of New York City being of specia interest.
Paleontology, both vertebrate and invertebrate showed that its devotees had not been idle the past year. Mounted and unmounted skeletons of marvelous perfection of mammals from the Tertiary lake beds of South Dakota and Wyoming were exhibited as some of the results of last year's expeditions. One of the most important features in this section, from a scien tific point of view, was a series of specimens from New Mexico which revealed to Dr. J. L. Wortman the fact
that the order of edentates or sloths originated on this that the order of edentates or sloths originated on this America, as has long been supposed to be the case
Prof. S. H. Scudder, of Harvard University, contributed to the reception a selection from his celebrated collection of Tertiary insects from Florisant, Colorado, some of which are still undescribed and without names All the principal orders were represented and in con siderable variety. Prof. C. E. Beecher, of Yale Univer sity, exhibited a set of models of trilobites which gave the results of infinite study and pains. Trilobites are crustacea and may be regarded as the ancestors of the modern lobsters, shrimps and crabs.
In the mineralogical section the most striking spe cimens were a group, $20 \times 12 \times 12$ inches in size, con sisting of three golden calcite crystals and another somewhat larger group consisting of very large crystal of calcite, galena, copper pyrites and zine blende on chert. These were from a new lead and zinc mine nea Joplin, Missouri.
In the physical department Prof. O. N. Rood exhibit ed a series of photographs demonstrating the regula reflection of the Roentgen. Among manyother objects of interest in this department, mention may be made of the ingenious device gotten up by Mr. P. H. Dudley for the purpose of learning the amount of depression of railroad rails under moving trains. It is an electrica contrivance which is firmly attached to the base of the rail in such a way as to register automatically the elongation and compression of the rail as the train passes over it. Experiments with this little instrumen prove that the deflecting pressure on a rail from moving train is from ten to twenty times as great a was calculated from theoretical considerations. The plans of the zoological and botanical building to be erected in Bronx Park were on exhibition
A portion of Tuesday evening was devoted to ad dresses by Prof. R. E. Dodge, chairman of the reception committee, Prof. J. J. Stevenson, president of the acadeny, and Morris K. Jesup, Esq., president of the American Museum of Natural History, and a lecture by Dr. Nicola Tesla. Prof. Stevenson dwelt upon the fact that the past year had been a memorable one in
the history of science in New York City. The Botan
ical Garden is well under way, the Zoological Garden is an assured fact, and the Natural History Museum has made great enlargements in its building and more are provided for to complete the south front. Private munificence toward all these enterprises has been very great. The scope of the Academy of Sciences has been broadened by the establishment of a section of anthro pology, psychology and philology, bringing the associ ation a long step nearer to the older academies of science in Europe. The publications of the academy have been larger and mare numerous than ever before and show the active scientific work that is being car ried on under its auspices. Mr. Jesup outlined the status and plans of the great museum in which the re ception was held, and spoke of the close relations exist ing between it and Columbia University, the city Board of Education and the State Department of Public In struction in the work of popularizing and disseminating scientific knowledge. The growth of the museum and related institutions in the last ten years has done much to remove from New York the stigma of being a purely commercial city, caring nothing for science, literature and art. Every exhibit in the museum was plainly labeled, giving information about the object, rendering a catalogue unnecessary.
The subject of Dr. Tesla's lecture was "The Streams of Lenard and Roentgen, with Novel Apparatus for their Production," and was illustrated by many diagrams and some apparatus. After a brief but concise statement of what is known about the so-called $\mathbf{X}$ rays, Dr. Tesla detailed some of his own experiments with them and their production. Toward the close of 1894 he began an investigation into the effects upon covered photographic plates produced by Crookes tubes, and found that some affected the plates and some did not. The destruction of his laboratory interrupted his ex periments, and Roentgen's announcement came before they could be taken up again and completed. One great difficulty in the way of success with some lines of electrical study has been to get a machine which will give a sufficient frequency of vibration. Now this problem seems to be solved. Dr. Tesla's latest dis covery is that a particular form of the electric arc light gives off $\mathbf{X}$ rays which produce results far supe rior to those emanating from Crookes tubes. He also described a method he had lately discovered of de flecting the $X$ rays by means of magnets and magnet ism so simple that any boy could do it.
The reception and exhibition committee this year was R. E. Dodge, H. F. Osborn and C. F. Cox; specia committee of arrangements, J. L. Wortman and G. D Orner ; and the chairmen having in charge the special departments of the exhibition were : Anatomy, George S. Huntington ; astronomy, J. K. Rees ; botany, L. M. Underwood: chemistry, Charles A. Doremus; elec tricity, George F. Sever; ethnology and archæology Franz Boas and M. H. Saville ; experimental psychol ogy, J. McK. Cattell ; geology, J. F. Kemp ; mineral ogy, George F. Kunz; paleontology, Gilbert Van Ingen; photography, William Stratford; physics, William Hallock and J. F. Woodhull ; physiography, R. E. Dodge ; zoology, C. L. Bristol and Bashford Dean. The officers of the academy for 1897-98 are: Presi dent, J. J. Stevenson; first vice-president, H. F. Osborn; second vice-president, N. L. Britton; corre sponding secretary, William Hallock ; recording secretary, J. F. Kemp; treasurer, C. F. Cox; librarian Arthur Hollick.

The American Coal and Iron Production in 1896. According to statistics prepared by the Engineering and Mining Journal, of New York, the output of bituminous coal in the United States during 1850 reached a total of $141,770,099$ short tons ( 2,000 pounds), howing a gain over 1895 of $4,371,752$ tons. On the other hand, there was a decrease of $6,782,057$ short ton in the anthracite production. The total coal production was, therefore, $193,351,027$ short tons, and the total decrease, as compared with 1895, was $2,410,305$ tons. The production of coke showed a gain of 445,276 tons, chiefly due to the activity of the iron and stee trades in the earlier part of the year. The price o oal continues very low, the average for bituminous oal at mines being below $\$ 1$ per ton. The production pig iron last year was $8,768,869$ long tons $(2,240$ pounds). The depression in business which made itself manifest in the latter part of the year had less effect than might have been anticipated, the decrease from 1895 being only 677,439 tons, or about 7 per cent.

New Deputy Commissioner for Canada.
In a recent issue we announced the death of Colone Richard Pope, late Deputy Confmissioner of Patent or the Dominion of Canada. A successor has just been appointed in the person of Mr. William Bain Scarth, ex-Member of Parliament, who will fill the dual positions of Deputy Minister of Agriculture and Deputy Commissioner of Patents, reverting to the old system previous to 1888, when the late Chevalier Tache, M.D. held the above important offices. Mr. William J. Lynch, Financial Clerk, has been appointed Chief Clerk of th Financial Clerk, has been appointed Chief Cle
Patent Offlce, vice Mr. J. F. Dionne, resigned.

Recent Patent and Trade Mark Decisions.
Klein v. City of Seattle (U. S. C. C. A., 9th Cir.), 77 Fed., 200.
Insulating Pins.-The Klein patent, No. 297,699, for an improvement in pins for holding insulators for electric wires, consisting of making the pin of wrought metal, with a soft metal head adapted to be screwed into the insulating material, has been held void for want of patentable novelty.
Extensive Sales as Evidence of Invention. -The fact that a device has gone into general use, displaced other devices, while in some cases evidence of invention, is not conclusive of patentability, where the changes made over the prior art are mere changes of mechanical construction or of form, size or materials.
McDowell v. Kurtz (U. S. C. C. A., 3d Cir.), 77 Fed., 206.

Protection for Pipe Threads.-The Kurtz patent, No. 440,168 , for a band or ring to protect the screw threads of pipes, has been held valid and infringed on motion for preliminary injunction.
Public Acquiescence.-Where plaintiffs have manufactured and sold their device without opposition for more than five years, there is sufficient proof of public acquiescence, and it is immaterial that a large number of other devices were not marked "Patented" when it appears that enough were so marked to give general notice of the patent.
Cleveland Faucet Company v. Syracuse Faucet Company (U. S. C. C. N. Y.), 77 Fed., 210.
Hydraulic Air Pump. - The Weatherhead patent, No. 504,097, has been held valid as showing patentable invention and infringed by a pump containing a mechanism which accomplishes a similar result in the same way, although it differs in the construction somewhat.

Matheson v. Campbell (U. S. C. C. N. Y.), 77 Fed., 280,
Color Compounds.-The Hoffman and Wynburg process and product patent, No. 345,901 , for the naphthol black color compounds, have been held valid and infringed on rehearing.

Anticipation.-Where it is shown that a coal tar dye, similar to a dye covered by a process and product patent and answering to the chemical tests of the patent, was cn sale in this country prior to the application, it does not amount to anticipation of the patent, where it appears that it was made from a dif ferent starting material, was inferior in quality, and was sold at a higher price.
Validity of Product Patent.-Where a patent first describes a new patentable process, producing an article chemically and technically identical with an article formerly known, but superior thereto, the invention is a meritorious one, and the claim on the product will be held valid as well as the claim on the process
Burden of Proof of Infringement of a Process Pat ent.-The complainant has shifted the burden of proof resting upon him as to infringement of the process patent when he has shown that the defendant's pro-
duct corresponds with that claimed in the patent when duct corresponds with that claimed in the patent when subjected to chemical tests, and then the burden i upon the defendant to show that it was made by different process.
Heaton Peninsular Button Fastener Company v. Eu-
reka Specialty Company (U. S. C. C. A., 6th Cir.) 77 Fed., 288.
Sales of Patented Machines with Conditions Limit ing Their Use.-It is lawful for the owner of a patent for a machine to sell such machines subject to a condition that they shall be used only with a certain article manufactured by the seller, and that, in case of a
breach of the condition, the title shall revert to the original owner. This is true, although such articles which must be used with the machine are not patented, if such restriction gives the owner of the machine patented a monopoly of their manufacture and sale. This is not void as in restraint of trade or against public policy, for the purchaser of the machine is a mere licensee, and the breach of the condition would not only be a breach of the contract, but a violation of the monopoly, for which an injunction would lie. In such case, too, it immaterial that the patent owner
sells the machine through jobbers and not directly to the users where the nachines bear a conspicuous metal label with the conditions of the sale thereon and all parties have notice of it. Where, for example, ma chines for fastening buttons on shoes are sold by the patentee on condition that only staples made by said patentee, although not patented, shall be used therein, any other party will be enjoined from selling staples which are intended to and can only be used in such machines, for he is guilty of contributory infringement. And in such case it is immaterial that the defendant did not use the patented machines or that they are making and selling an unpatented article.

## International Tooth Crown Company v. Bennett (U

S. C. C. A., 2d Cir.), 77 Fed., 313.

Artificial Teeth.-The Low patent, No. 238.940, for a device for permanently inserting artificial teeth without a plate and without using the gum as a support, was held void as to the first two claims.

A life sized bronze statue of Poseidon was recently discovered in the sea near Mount Cithaeron by a fisher man. Though it is badly rusted, the head is untouched and only the hands are missing. Near it was a splendid marble pedestal with an inscription. The statue is as signed to the sixth century before Christ by archæolo gists, who say it is as fine as the Jupiter Olympus found at Delphi.
Cologne has been celebrating the carnival by a his orical and artistic procession around the cathedral, including young women who represented St. Ursula and her eleven thousand virgins, the town tower, and the mercenaries employed by the archbishops when they were secular princes. It is asserted that the car nival has been held at Cologne since pre-Christian times and that it is the direct representative of the Roman Saturnalia.
Edmond de Goncourt's Oriental china, for which he and his brother spent 400,000 franes, brought 237,046 francs at the recent sale in Paris. His eigh teenth century drawings, however, were sold for much more than he paid for them. So far the collections have brought in $1,162,352$ francs, and there are four more sales to come but the sum is much smaller than was expected, and the Goncourt Academy will be poorly provided for, even if the will is held valid by the courts.
The Romanesque tower with its Roman foundations at the entrance to the mausoleum of Diocletian, at Spalato, in Dalmatia, has been destroyed. A new structure is taking its place. Fragments of capitals, sculptures, and stones that date from the third to the twelfth century are lying about the ground; some of them are being built into the new structure which is taking the place of the old. This is not very likely to make Dalmatia as popular a place of resort for the tourists as Italy or Sicily, and if the antiquities of this interesting region are to be rebuilt in this wholesale manner, it will not tend to encourage visitors.
M. Berthelot has recently published in the Comptes Rendus analyses of weapons, tools, etc., from Tello, in Chaldea. Their date is put from 4000 to 3000 B. C. A large lance and a hatchet were found to be approximately pure copper, and another hatchet was of copper with traces of arsenic and phosphorus, by which it seems to have been hardened. No trace of tin was present in any case. Thus in Chaldea an "age of cop per"seems to have preceded the "age of bronze." An
egg-shaped object from the same locality, weighing 121 grains, was of iron ; an ingot of white metal was 95 per ent silver ; a leaf of yellow gold was found to contain considerable quantities of silver
Prof. Thomas D. Seymour, chairman of the manag ing committee of the American School at Athens, says that on account of the threatened war the excavations projected by the school this season at Corinth, and perhaps elsewhere, will not be undertaken. The Cor inthian excavations, on account of the great depth and the purchase of valuable land, would this year have meant a considerable undertaking, and the government has had no time to give to the matter of expro priating land and superintending the work. At this obtain lo the year it is always somewhat dificult to men for service in the Greek army, the effort to hire them would be useless.
The lake village of Glastonbury, England, is very nteresting. During the last year fifteen additiona dwelling houses and 500 feet of palisading have been disclosed, and nearly two-thirds of the boundary have
now been unearthed. According to the Academy many now been unearthed. According to the Academy many
valuable relics have been obtained, among them being a aw, a wooden ladder seven feet long, a smalldoor, and a mirror-a feature of late Celtic art. The pottery was abundant and was ornamented in late Celtic style, uninfluenced by Roman art. Hence, the discovery of this lake village cannot fail to shed much light upon one of he obscurest periods of British art. The discovery is f great importance, for it reveals the manner and avo cations of the prehistoric people who occupied Glaston bury in the iron age.
The Athenæum of February 20 reported the discov ery at Athens of an ostrakon, or potsherd, bearing the name of Themistokles. Of this curious find we are able, says The Builder-thanks to the Berliner Philoogische Wochenschrift, February 27-to give our readers some further particulars. The ostrakon in ques tion is a fragment of the brim of a large vessel, of black erra cotta ware. On its surface has been scratched with a sharp tool the words "Themistokles Phrearri os," in archaic letters. There can be no question tha Themistokles is the famous statesman, and that one of the actual ostraka that condemned him to banishment in B. C. 470 has come to light. Up to the present time only three similar voting ostraka had been discovered of Hippokrates, the uncle of Perikles; another, also on the Acropolis, with the name of Xanthippos, the father of Perikles ; and a third, bearing the same name but found in the Kerameikos. All three are published, and we hope the Themistokles ostrakon will shortly appear It was found in the excavations being carried on by the German institute near the Areopagos.

The Italian physicist Signor Pettinelli has been making a number of observations in the minimum tempera ure of visibility. He finds that the larger the hot surface, the lower the temperature required. With a surface equal to 23 square inches in area placed 2 feet from eye the minimum temperature necessary to render the surface visible in the dark is $400^{\circ} \mathrm{C}$.
The death is announced of James Joseph Sylvester the Savilian professor of geometry at Oxford; Professor Georges Ville, of the Paris Natural History Museum who was professor of botanical physics and author o mportant works on fertilizers; also Professor Henry Drummond, the author of "Natural Law in the Spiritual World." "The Ascent of Man," and other works aiming at the reconciliation of theology with science and evolution.
The photography of ripples is a subject which seems to be of great interest, as is demonstrated by experinents by Mr. J. H. Vincent before the Royal Insti tution. Ripples produced on a mercury surface are in visible to the naked eye, but by means of an electric park, photographs of ripples set up in mercury by a sylus attached to the tuning fork can be obtained These photographs show in a novel way the phenomena of interference, diffraction, and spherical aberration.
There has been placed in the Treasury Whips' room at the House of Commons, London, for the inspection f members, a section of the barrel of a new Lee-Enfield rifle which has never been used, and a section of a imilar weapon through which 4,050 rounds of cordite mmunition have been discharged. The latter is in a erfectly serviceable condition, and experts declar hat it is good for another 8,000 rounds. As 300 rounds year is the average number fired by a soldier, it folows that the life of a Lee-Enfield barrel is considerably ver ten years, the official estimate of their period of atility.
The Sinking Fund Commissioners of the city of New York adopted a resolution, on March 25, setting aside 261 acres, the entire southern portion of Bronx Park, or the establishment of a zoological park, under the condition that the zoological society shall raise $\$ 100,000$ before beginning to use the park and $\$ 150,000$ within hree years from the date that the work of improve ment is begun by the park department. The society ontributes the buildings and the collection of animals The city of New York will spend $\$ 125,000$ immediately in the preparation of the land and will during the first year of occupation provide a maintenance fund not exceeding $\$ 60,000$ for the care of the animals and the further improvement of the park.
The international aerostatic ascents, which for some time past have been contemplated, took place on the 18th ult., at Paris, Berlin, and Strasburg. Three unmanned balloons were liberated at about 10 A. M.ocal time-at each station. The Berlin balloon burst he Strasburg balloon disappeared in the northeast and has not yet been recovered; the Paris balloon descended, after having traveled during a little more than two hours in the N. N. $1 / 4$ E., and ran 102 kilo meters, the temperature recorded being $60^{\circ}$, at an altitude of more than 10,000 meters. An apparatus, constructed by Cailletet, for bringing back to land a sample of the air of the upper atmosphere, was success ul, but the gas captured has not, says Nature, yet been analyzed.
An ingenious application of Michelson's interference efractometer to the study of alternate currents and magnetic induction is described by Carl Barus in a re cent number of the American Journal of Science. The slender iron cores of two identical coils are placed horizontally at right angles to each other and at the same distance from their point of convergence. The semitransparent mirror is placed at that point, and a smal mirror is mounted on the fore end of each core, the other ends being rigidly fixed. The distances are so adjusted that interference fringes are seen in the telescope. These disappear when one of the cores expands r contracts, but not when both do so to the same ex tent. Hence a delicate means is afforded of determining whether the oscillatory changes of length produced by an alternating current traversing both coils in suc cession have the same phase.
It is intended to establish at the Yerkes Observatory a museum for the preservation and exhibition of photographs, charts and drawings of the sun, moon, planets, comets, meteors, stars and nebule and their spectra, and of optical phenomena observed in the laboratory; photographs and drawings of astronomical and physical instruments; and portraits of astronomers, astrophysicists and physicists. Scientific men, learned societies and directors of laboratories and ob-
servatories are earnestly requested to assist in the servatories are earnestly requested to assist in the
formation of a library for the observatory by contriformation of a library for the observatory by contr
buting to it copies of their publications. Photographs of scientific subjects, on glass or paper. will be very welcome for exhibition in the museum. Drawings and catalogues of scientific instruments are also desired. It is expected that the observatory will ultimately be able to make some return for such contributions in the form of its own publications and photographic resulta.

## THE ART OF MOVING PHOTOGRAPHY

The art of moving photography had its origin, or, to speak more strictly, its first suggestion, in that ingenious little toy known as the zoetrope, which enjoyed such great popularity some thirty or forty years ago. This, it will be remembered, consisted of a cardboard cylinder about a foot in diameter, which was rotated on a vertical axis and contained a series of vertical slots cut in its periphery. A strip of paper, on which

Brothers, a firm of French photographers, brought out the cinematograph in 1894, and this was succeeded shortly afterward by the biograph, which last device, and the "mutograph" and "mutoscope," are the in ventions of Mr. Herman Casler and form the subject the present article
The machine, with which the original pictures are taken, is shown in Fig. 4. It is known as the "muto
natter of simple accomplishment; but when we re nember that impressions are taken at the rate of forty a second, and that the film, which is running at the rate of from 7 to 8 feet a second, has to be stopped and tarted with equal frequency, it can be understood that the problem was no easy one to solve. The film comes to a rest as the shutter opens, a phase or image is de posited, and the film starts again as the shutter closes

"MUTOGRAPH" PICTURES OF CLAY PIGEON SHOOTING AND OF THE FIRING OF A TEN INCH DISAPPEARING GUN AT SANDY HOOR.
were printed a series of moving figures, each one in signifying "changing delineation." The camera|hundiedth and one four-hundredth of a second. While a different position from its predecessor, was coiled frame is mounted by means of three adjustable the ordinary speed is forty a second, the mutoscope around the inside of the cylinder just below the line of slots or peep holes, the distance between the figures being equal to the distance between the slots. As the cylinder was rotated, the figures appeared to be in motion. The illusion is explained by the fact that the eye is capable of receiving and recording only a given number of impressions in a given time, and if the successive pictures are presented to the eye too fast for their indi vidual apprehension, they will blend, as it were, and produce on the mind the impression of a single picture.
The zoetrope had its day, and ultimately passed out of favor; but its very crude and imperfect moving pic tures were full of suggestiveness. The optical laws by which the results were obtained in course of time at tracted the attention of experimentalists in the then youthful art of photography. About ten years ago the French scientist Marey, while at work on a flying ma
rame is mounted by means of three adjustable the ordinary speed is forty a second, the mutoscope egs upon a triangular turntable which may be placed can take equally good pictures at the rate of one upon any suitable support. Upon the top of the rame is bolted a two horse power electric motor which is driven by a set of storage batteries, that will be noticed standing at the side of the machine. The combination of the turntable with the vertical adjustment before mentioned enables the camera to be shifted so as to take in the required field. In the front end of the camera is fixed a particularly perfect lens capable of gathering a great flood of light and proucing an image of exceedingly clear detail. Above this lens on the front face of the camera is fixed a phoographic "finder," which gives the same sized image as the main lens, and enables the operator to determine when the subject is properly focused. Inside the camera is a strip of gelatine film $23 / 4$ inches wide and usually about 160 feet in length, which is wound upon
hundred per second if it is necessary. The higher speed would be used in photographing the flight of a projec ould be used in or a The mechanism within the cabinet is driven by belting from the motor above mentioned, and the speed of the motor is controlled with great nicety by means of a resistance box which is shown in our engraving Fig. 4, mounted upon the storage batteries. The ap paratus is here represented in the act of photographing he celebrated "Pennsylvania Limited" while it was unning at the rate of about sixty miles an hour. The mutograph is set up at the side of the tracks upon a solid platform. the stretch of track is properly focused by the operator, and at the moment that the tram by the operator, and at the moment that the tram being regulated through the resistance box, as ex


Fig. 5.-drying and retovching room "mutoscope" shown in the foreground.
chine, obtained photographs of birds in motion by a small pulley or drum. The length of the film varies plained. By the time the last car of the train has chine, obtained photographs of birds in motion by $\begin{aligned} & \text { a small pulley or drum. The length of the film varies } \\ & \text { means a number of cameras, whose shutters were }\end{aligned}$ perated by the wings of the birds as they flew acros the room. - The idea was then taken up and further de veloped by Dr. Muybridge, of Philadelphia. At an earlier day than this Mr. W. K. L. Dickson had been experimenting in the same field, and as the result of the subsequent joint labors of himself and Mr. Edison the famọus Ediṣon vitascope was produced. The Lumiere
scene, it may extend to several thousands of feet.
The film is led through a series of rollers and caused to pass directly behind the main lens of the camera, and finally is wound upon a second drum. The object of the rollers is to cause the film to pass behind the lens with an intermittent instead of a continuous motion. At ordinary speeds this would seem to be a
flashed by, 160 feet of film has streamed past the lens, received its one thousand impressions and been wound with its precious record upon the receiving spool.
After the inutograph has done its work upon the films, they are carefully packed and sent to the New York establishment of the American Mutoscope Com pany. Here they are taken to the dark room, the in terior of which is shown in the accompanying engrav
ing. Ranged along each side of this room is a series of pictures are thrown upon a large screen upon the stage, thing that has ever been taken in this class of photoing. Ranged along each side of this room is a series of pictures are thrown upon a large screen upon the stage troughs above which are suspended large skeleton
reels, 3 feet in diameter by 7 feet in length, the axis of the subject which is represented in the engraving,
an express train running at sixty miles an hour, is one the reels being journaled in brackets attached to the of the most vivid representations of the kind ever at ends of the troughs. The films are wound upon the tempted. The audience sees the clouds of steam, the
graphy.
Perhaps the most novel of the three machines is the mutoscope, Fig. 3, which, on account of its compact ness, simplicity of operation, and the large size of it


Fig. 6.-MOVABLE STAGE FOR PHOTOGRAPHING SCENES WITH THE "MUTOGRAPH."
reels and subjected to the action of the various solu troughs are filled, the reels being transfred from bath to bath until the films are ready to go to the drying to bath until the films are ready to go to the drying
room. In this same department are prepared the positive transparent strips for use in the biograph, and the bromide prints for the mutoscope, as will be explained later in the present article.

The reels are then carried to the drying room, Fig. 5, where the films are unwound on to large wooden drums, of about the same size as the reels, where they are carefully dritd. At the far end of the room are seen the machines for cutting up the bromide prints, and here also is carried on the work of retouching the films and prints and preparing them for use in the biograph and mutoscope machines.
graph and mutoscope machines.
The biograph (or life delineator), Fig. $\because$, is similar in its general appearance and construction to the mutograph. There is a similar arrangement of rollers and mechanism for controlling the movernent of the film, and the machine is driven, as before, by an electric motor and controlled by a resistance box, which in the engraving is shown to the left of the operator. The chief difference observable in the interior of the biograph, as compared with the mutograph, is that the former contains a hand regulating aic lamp of 5,000 candle power, which is placed behind the lens. When a sublens. When a sub-
ject is to be thrown ject is to be thrown
upon the screen, a spool containing the positivefilm is placed in the cabinet and run with an intermittent motion through the controlling rollers, down ling rollers, down between the lamp and the lens, and
tinally wound upon a receiving spool. In order to insure that the best effect shall be secured it is necessary to run the film at the same speed at which it was taken -a result which is obtained by the use of a tachometer. The engraving shows the biograph at work in a New York theater. The whole apparatus and the operator are inclosed in a cabinet which is located at the back of the balcony. A hole is cut in the hole is cut in the cabinet for the lens and there is a window
for the operator. The


"MUTOGRAPH" PICTURES OF A BLANKET COURT MARTIAL AT GOVERNOR'S. ISLAND.
pictures, is certain to win great popularity. In this machine the bulk, the complicated mechanism, and the motor of the biograph are replaced by a simple, boxlike apparatus, no larger than the cover of a sewing machine. The enlarged pictures, 6 by 4 inches machine. The enlarged pictures, 6 by 4 inches
in height, are mounted in close consecutive order in height, are mounted in close consecutive order
around a cylinder, and stand out like the leaves of a book, as shown in the illustration. In the operation of the mutoscope the spectator has the performance entirely under his own control by turning a crank which is placed conveniently to hand. He may make the operation as quick or as slow as fancy dictates, or he may maintain the normal speed at which the original performance took place, and if desired he can stop the machine at any particular picture and inspect it at leisure. Each picture is momentarily held in front of the lens by the action of a stop attached to the roof of the box, which allows the pictures to slip by in much the same way as the thumb is used upon the leaves of a book.
The capacity of the mutoscope is coequal with the camera. It reproduces in motion anything which can be photographed, whether motion of human bodies or movements in mechanism or nature. Thus the Falls of Niagara, conflagrations, moving trains, animals in of Niagara, conflagrations, moving trains, animals in - action, athletic games and sports, scenes from play:

introducing promiite roles; in fact, any ite roles; in fact, any
scene can be reproscene can be repro-
duced with perfect fidelity to nature and with the actual movements presented by the scene depicted in a most realistic way. Important events in public or private life can be perpetuated, such as parades, military, civic, etc., preserving for the years to come the movements and gestures precisely as the scene occurred at the time of its recording by the camera, although some or all the participants in the scene may have long since departed.
Upon the roof of the New York estal)lishment of the company there has been erected a large movable stage for taking photographs of celebrated scenes from plays or of individual performances in which it is desired
to reproduce the motions as well as the features of the shaft of bone or iron-or any other substance-is subject. The details of the structure can be clearly about twice as strong as a solid shaft containing the made out in engraving No. 6. It consists of a floor of same quantity of material.
steel I beams which carries a series of three concentric steel tracks. Upon this rotates a massive frame, at one end of which is a stage supplied with the necessary scenery, and at the other end a corrugated iron house in which is located the mutograph. The stage is bolted to the frame, but the house travels upon a track and may be moved to or from the stage as required. The frame carrying the stage and house rotates about the smaller circular track located beneath the house and may be swung around so as to throw the light full pon the stage at any hour of the day
Our thanks are due to Mr. Herman Casler, the inventor of the above described apparatus, and to Mr. W. K. L. Dickson, the pioneer investigator in the a of moving photography, for courtesies extended.

## THE ESSICK HOT FLUID BATTERY.

There has recently been exhibited in this city a new primary battery from which quite remarkable results are obtained. It represents a modification of the well known Daniell battery. It includes a zinc copper element of large superficial area excited by a solution of copper sulphate, its action being greatly accelerated by the application of heat
The cell consists of a rectangular vessel, which, in the model battery illustrated, is $1 \frac{5}{8}$ inches by 8 inches in horizontal section and 11 inches high. Within the vesel are contained three plates, two of zinc and one of copper between them. Strips of wood are used to prevent contact of the plates. These are bolted together by bolts passing through the wood, as shown in one of the illustrations. For each cell a feeding tube, a rectangular tube of copper about an inch square, is provided, whose end is closed with a per forated diaphragm. This tube sets into ond of the cell. Through this tube one end of the cell. Through this tube, whose lower end is shown in the cut, copper sulphate solution is. fed, or the tube may be packed with crystals of copper sulphate. It rests upon a projection of the copper plate, so that it reaches about half way down to the bottom of the cell.
Any number of these cells may be packed in the external vessel, which is bottomless, and merely holds them together and keeps the heat from disseminating. The supply of copper sulphate is introduced into the feeding tube, and heat is applied.
As a source of heat, a couple of ordinary kerosene oil stoves are used in the battery illustrated, which contains five cells connected in series. It will be evident from the description and drawings that the very large surface of copper and zinc are very close together. This, of course, tends to reduce resistance, besides which, both sides of the zinc are made fully operative, because the copper vessel is connected by the ribbon to the central copper plate, so that this interior surface acts as a negative element.
Quite extraordinary results are ob-
tained. It is said that a single cell will give from fifteen to thirty-eight amperes at a pressure of about one volt. This, of course, makes the battery of very high power. How long it will run, in view of the fact that it has so small a cubic capacity for liquid and that no arrangements are made for keeping the liquid at a constant strength, is not certain.

## Queer Things About Mankind.

Few people are aware of the wonderful engineering skill and ingenuity with which their bodies are constructed. If patents were taken out- for all the clever contrivances to be found there, they would probably keep the staff of the Patent Office going for three months.

Who would think that in his eye there is a block and pulley, or "tackle," as the sailors call it, as complete and efficient as that with which a ship hoists her mainsail? There it is, however; and wheneve you look at the tip of your nose the muscle that moves your eyeball works in it. There are several of these pulleys in the body.

Another clever dodge of Nature is shown in the bones of the face. Accomplished engineer that she is, she always uses the smallest quantity of material sufficient for strength. In making the bones of the face, she wanted a large surface to which to attach the muscles; but, as she didn't wish to encumber us with heads as heavy as an elephant's, she burrowed hundreds of little holes in the bones, called air cells, and thus secured strength, large surface and lightness. In the same way she made the long bones of the legs and arms hollow in the middle. What a saving this is may be understood from the fact that a hollow


THE ESSICK HOT FLUID BATTERY.

One of the most valuable of all the inventions made or our comfort and safety is the perspirative gland. It acts like the safety valve of a boiler, letting off heat when we are becoming dangerously warm. If our temperature rose seven or eight degrees, we would not have twenty-four hours to live. The value of the sweat gland is therefore obvious. In fact, without it a football, or cricket, or rowing match would be out of the question, and we could not safely walk at a speed of more than a quarter of a mile an hour. Nature has taken good care, however, that we should not run short of these useful organs, and has given us no less than $2,500,000$ of them.
So inventive was Nature when constructing our body that the difficulty is to stop enumerating her clever ideas. She saw that we would very soon grow tired if we had to hold up two heavy legs by means of muscular effort, so she made the hip joint airtight and the pressure of the air alone keeps the leg in its place.
At the same time, although she had not discovered ball bearings, she made the ball of the leg bone and the socket of the hip so smooth, and oiled the join so well, that the friction is practically nothing.

When the spinal canal in the backbone was made great pains had to be taken, for, while it consists o many pieces and is freely movable, it contains the precious spinal cord, one nip of which would be fatal. The measurements are so accurate that there is no danger of such an event. Wherever there is much and free motion, as in the neck, the cana is large and open, and a nip is impossible. Again, the heart and lungs are, of course the very basis of our life. They are in constant motion, and if allowed to rub against the chest walls around them they would either get inflamed or wear awa by friction. Nature has therefore sur rounded them with a double sac, and between the outer and inner layers of it she has placed a quantity of lubricating fluid.

But the most remarkable of all device is that for splicing broken bones. The moment a bone is broken, a surgical geniu is at once dispatched from the brain to the spot. He proceeds to surround the broken ends with a ferrule of cartilage. This is large and strong, and takes quite month to complete. When the two end are held firmly and immovably in place by the ferrule, this mysterious surgeon begins to place a layer of bone between them and solder them together
And when the layer is complete and the bone securely welded he removes the fer rule, or callus, just as the scaffolding i removed from a finished building. Often a bone does not get broken for two or three generations, and yet this power to form the callus, and knowledge of how to do it, is never lost.-From Answers.

Horseless Cabs to Hire in New York
In the Scientific American for March 13,1897 , will be found an article on the lectric hansom cabs which were brough New York to cabs when with ordinar abs drawn by horses. It was quite a tim
only capable of dealing with the small quantities in ordinary food, and when you are so foolish as to eat powered.
Another protection from danger is afforded you by the supply of a small quantity of hydrochloric acid to the stomach. There are little machines in the stomach specially designed for the manufacture of this acid from the salt you eat, and they are so regulated that they produce a quantity equal to one-fifth of one per cent of the contents of the stomach. Experiment shows that this is exactly the percentage required to destroy the microbes that we swallow in thousands in our food. But for this thoughtful provision of Nature we would probably get a new disease with every neal.
Most people know the use of the epiglottis, which aves us from imminent death every time we swallow a bit of food. At the back of the mouth the air pas sage and the food passage cross each other, and whenever we swallow food, it would inevitably go into the windpipe and choke us, only that this little body pops down and covers the entrance. It is like the policeman who regulates the traffic where street cross.
The semicircular canals, for centuries a physio ogical puzzle, are an extraordinary device for enablin us to keep our balance. They are little channels, hollowed out, in connection with the ear, in the bone of the head, and partly filled with fluid lymph. As our head or body sways the fluid moves, acting like a spirit level, and informing the brain whether w re standing in the perpendicular or at a dangerou angle.
before the company could obtain the necessary permis ion to run their cabs for hire upon the streets, but the licenses having been obtained, the cabs are now a well known sight in the upper part of New York, and occa sionally they may be seen going as far down town as Wall Street, winding in among the trucks and cable cars This open competition with horse-drawn vehicles may e regarded as one of the most satisfactory events in the motor carriage world for a long time.

## A New Photographic Paper

One of the latest novelties in the photographic line is self-toning collodion sensitized paper prepared by coating the paper with a collodion emulsion mixed with the silver and the toning chemicals, such as chloride of gold. When a sheet of the paper is placed in the printing frame behind a negative, the printing akesplace in the usual way but instead of being a red color, it prints the same color as the ordinarily finished print does, the operation being continued until the print looks a trifle darker than is desired
It is then placed directly in a fixing bath composed of hyposulphite of soda and water for a few minutes, washed in changing water for half an hour, then dried and mounted. The prints are very satisfactory, equaling in brilliancy those made in the ordinary way, and are said to be fully as permanent.

By the consolidation of the two great iron manufac uring firms of Schneider and Canet, of Paris, the heads of the two foundries visited President Faure recently and assured him that France now has an iron manufacturing plant rivaling the Krupp establishment in Germany.

## RECENTLY PATENTED INVENTIONS. <br> <br> Engineering.

 <br> <br> Engineering.}Rotary Engine.-Nicholas J. Verret and Thomas H. Mooney, Pine Bluff, Ark. The engine devised by these inventors is designed to be very effective in operation, utilizing the steam to the fullest advantage, while being of very simple and durable construc-
tion. It has an annular cylinder provided with slidable steam-cushioned abutments, an inlet and an exhaust porpiston having cam heads extending into the cylinder and piston having cam heads extending into the cylinder and three heads on the piston, and while one valve delivers steam to act on one head, the steam is acting under ex-
pansion on the following head, insuring a continuous pansion on the following head, in
rotary movement with full pressure.

## Mechanical.

Vise.-William J. Wanless, Bay City Mich. This vise has, in conjunction with a swivel bot om, a swiveled front jaw, constructed especially to hold either straight or tapered work, and after the jaws have
gripped the work both jaws can be revolved, if desired, in a complete circle, or held at any point in a circle that er passed loosely through the inner jaw of the vise cas ries the adjustable jaw, which may be moved to any desired angle to the clamping face of the inner jaw, and when the front jaw is loosened for swiveling it is selfdjusting to any conical form of work
Compound Cutter and Pliers.Lucien H. Tissot, Montecheroux, France. A tool more especially designed for the use of electricians is provided for by this invention, as it is adapted to cut heavy
wires without injuring the cutting edges of the cutters wires without injuring the cutting edges of the cutters. One jaw has a rigid handle and the other jaw is formed
with an extension carrying a pivot on which is fulcrumed the other handle, the latter having a forward extension adapted to bear against the under side of a projection on the rear end of the first jaw. An auxiliary fuicrum is thus formed enabling the operator to cut very heavy
wire without exerting hlgh pressure on the handles, and wire without exerting high pressure on the handles, and without wabbling the pliers. Mesers. Alfred Field \&
Company, of No. 93 Chambers Street, New York City, Company, of No.
automatic Feeder for Cigarett MAcHinks.-John O. Eaton, Fall River, Mass. For this inventor has devised an automatic feeder, to cause an even and steady shower or stream of tobacco to be deposited in the feeding mechanism, in sufficient quantity for the filler, thus obviating the feeding by hand as heretofore. The carrier or feeder belt which carries the tobacco from the hopper to the chute leading to the feeding mechanism is provided with curved carding teeth,
and means are arranged to prevent the carrier from taking amount of tobacco.
Baling Press.-William A. Ross, Hico, Texas. This is a machine for baling cotton and simi. ar fibrous materials cylindrically bs winding, a core
being dispensed with. An endless apron is arranged to un on three flanged drums or pulleys, one fixed in the frame of the machine and the other two journaled in heads that receive a rotary reciprocating motion, changing their position and slackening the apron to enlarge its loop as required by the growth of the bale. This move-
ment is resisted by other mechanism whose action is aument is resisted by other mechanism whose action is aupression to the bale as it increases in diameter.

## Electrical.

Time Check and Recorder.-Alexander Davidson, New York City, and Charles G. Armstrong, Chicago, III. This is a device designed mainly for use in same inventors, whereby reserved seats may be sold at different points without interference, but the invention is also applicable for noting the lack of synchronism in clocks, and other purposes. It comprises a set of annunciators, synchronized clocks, and commutators, with batteries and circuit wires to indicate automatically to a tion, also making a record showing the time of sale tion, also making a record showing the time of sale o
every ticket.
Amalgamator.-William Wright, New York City. The body of this amalgamator consists of upper portion a bed of steel with concaved pocket and at its lower end a bed of copper with similar pocket, a cop per surfaced cylinder revolving in the first pocket and a steel cylinder in the second pocket. The arrangement
constitutes electrodes arranged in pairs, the current being passed through from one bed to the other through the cylinders, and the reversal of the current reversing the from its receiving surfaces. The copper surface is coated with mercury, to retain any gold coming in contact therewith, and the only chemical necessary is a solu-
tion of common salt, which is fed in with the crushed material.

## Agricultural.

Seed Planting Machine.-James C. McCormick, Findlay, Ga. This machine has a motor wheel which operates by chain and sprocket connec uon a toothed discharge wheel in the hopper, in connec-
tion with a grain discharge disk and brush, there being a slidable device connected with a hand lever for elevating machine has a plow or furrow opener, which may also be pushed down into the ground or raised by the adjustment of the lever, the raising of the plow enabling the
planter to be readily moved from place to place. Cider Press. - Gerhard Baumann, Monmouth Junction, N. J. This is a press in which the whole apples may be supplied through a hopper and formed into pomace, which is carried forward between horizontally arranged extractors, consisting of endless
traveling bands, between which the pomace is pressed to traveling bands, between which the pomace is pressed to
extract the juice. The apples are ground as they pass through the hopper, and the pomace is distributed by a
spreader apon the carrier, the sheet of pomace beiog
carried beneath a presser where the pressure may be
regulated by weights on the levers of the presser regulers. The meshes of the carrier and a band around the prese
brushes.
Cow Milking Machine. - Modestus J. Cushman Wren lim provement in pulsating milking machines, where the provement in, pulsating milking machines, where the
air vacuum in the teat cups is made to alternately increase and decrease from a maximum of twelve degrees oo a minimum of four degrees of air pressure, it being desirable that the alternating pulsations shall be regular
and decided. The invention comprises a combination and decided. The invention comprises a combination
with differentiated vacuum chambers, a milk receptacle and air and milk pipes, and \& valve mechanism applied to the pipes with means for operating the mechanisu whereby the chambers may be alternately put in conwhection with and cat off from the milk pipe and renection
ceptacle.

## Miscellaneous.

Bicycle Saddle.-William Boulton, ipena, Mich. The frame of this saddle is formed of a
ingle rod, preferably round in cross section, bent or dinarily to an oval or pear shape, and with downwardly curved coiled front portions, the seat proper being formed of a net-like covering woven around the front and sides
of the frame and being such a distance above the coils as to of the frame and being such a distance above the coils as to hold the sides out of contact therewith. The straight ende
of the rod below the coils form arms by which the sad de may be readily attached to the saddle post.
Flooring. - William McPherson, Quincy, Cal. For the making of tesselated floors of ornamental blocks practically watertight and arranging
and connecting the blocks to prevent warping, this inventor provides the blocks with grooves on all of their edges, the grooves being engaged by long and short tongue strips, while around the outside edge of the de sign are arranged $L$-shaped base strips, which also have
grooves for the reception of tongue strips engaged by grooves for the reception of tongue strips engaged by grooves in the blocks, the vertical portion of the base
strips engaging with the wall of the room and being strips engaging with the wall of the room ans beting
adapted to serve as a base board. With this construction the water rised for clenning cannot penetrate between the iloor and wall.
Illuminated Sign.-Charles P. Gates, Brooklyn, N. Y. This is a sign which may be altera short time stationary both at the closed and open position, to heighten the attractiveness of the sign. A series of shutters is pivotally carried on the inside of the cas. ing, a bar being pivotally connected to the shuters and oo a pitman connected to a crank shaft, and the casing has orifices which the shutters close and open. A clock
work motor or an electric motor may be used to the device, which may be cheaply manufactured and readily set up in front of a store or in a store window.
Inkstand. - Alexander J. Bluntach,
INKSTAND. - Alexander J. Bluntach,
Olivia, Miun. An attachment is provided by this invention whereby the cover of the ink well may be removed during the act of carrying the pen to the well, the cover thus keeping the ink free from dust, etc. A bail pivoted in the stand and rocking over the ink well is connected with the cover by lever arms on which bear springs, to the ink well. As the hand holding the pen is brought down on a cross bar of the lever arms the springs are placed under tension and the cover is removed, to be replaced as the hand is withdrawn.
Siphon.-James B. Smith and Adolphe L. Julienne, Jackson, Miss. This invention relates to siphons having valves in both legs to retain the liquid consists of a frame with a tube guide or support, two tube clamps and compressors and a lever mechanism mounted on the frame and adapted to simultaneously operate the clamps or compressors,
ously close the flow through both legs.
Bridle.-Richard W. Evans, Baird, Miss. This is a simple bridle, especially adapted for work harness, and which may be quickly adjusted to the
desired size, and mademainly of cotton rope or material always at hand on a plantation. It is made with fittinge formed of light castings, all of which may be readily slipped by the fingers to adjust the bridle as desired, no buckles, seams or rivets being required.
Barrel Tap. - Ignatz Wasserstrom, New York City. To facilitate the tapping of barrels devised a tap in which the pressure will have a tendency to force the valve tightly to its seat, thus preventing any possible leakage when the valve is closed. It comprises
a bushing to be enzaged in the bung hole a tapered a bushing to be enzaged in the bung hole, a tapered
valve seat having opposite ports at the inner end of the bushing, a tapered valve having ports in its opposite sides, a perforated cap on the inner end of the bushing and a key for turning the valve.
Notr.-Copies of any of the above patents will be send name of the patentee, title of invention, and date of this paper.

## NEW BOOKS ETC.

The Century Dictionary and Cyclopedia, published by the Centory Company, of New York, was accepted as a very high authority, and became an ac
knowledged standard, on its first appearance. It wa unique in that it combined an unabridged dictionary with extend the sale of this great work, the con orany is putting in operation a plan which comprises the offerlng of prizes for the best answers to three examination paper containing fifty questions each. Sixty-six prizes in al are thus offered, two of them being for $\$ 500$ each, and exercise ans are such as combine pleasure with mental bexoat to all who angage in the competition.

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marked or labelec.
(7146) C. H. B. writes: I have lately made a dynamo from directions in the Scientific American Supplement, No. 600, following the directions given there, except that I wound six windings on
the fields instead of four.(i. e., 12 layers of wire instead of 8), and instead of winding the armature with No wound the ifirst time around with No. 19 and the second time with No. 18 wire. The machine seems to light up 14 incandescent lamps of 52 volts and 16 candle power each in quite a satisfactory manner. Am I correct in supposing that so long as the same speed
is kept up the machine will keep up its voltage, however is kept up the machine will keep up its voltage, however
many lamps may be connected on, and that it will there many lamps may be connected on, and that in will unere
fore keep on lighting up more and more lamps until so much current will be flowing that the armature will be lights such as I beve described ought the machine to carry without danger to the armature ? During one of my early trials with the machine, it suddenly commenced sparking, and on examination I found that the wooden iron rings to slip on the sleeve and neiguboring coils of wire to get short circuited at the commutator. A few of the windings, as I found on unwinding it, had burned out. I have thoroughly repaired the armature, made it eo that the rings cannot slip, and rewound it with well insulated wire. Is there any way in which I can make cut-out or circuit breaker of some kind which will ab solutely protect the armature against burning out again Scientific American Supplem ent which describes such a device? Wlll you please tell me the internal re sistance and also the amount of current required by a 52 volt 16 candle power Edison lamp ? A. If series wound, the E.M.F. at constant speed will tend to increase a more lamps are put on; if shunt wound, the reverse will be the case. There is danger of burning out the arma will carry easily 314 to 4 amperes from it. Your armature You can make or buy a four ampere fusible cut out which will protect your armature. You have tried to make your machinte give probably 14 amperes, or over
three times its proper current, so it is no wonder that it burned oat. The 52 volt 16 candle power lamp need 138 amperes and has 37 ohms resistance.
(7147) J. N. W. asks: 1 . What is the amount of current in volts and amperes that run the 641
motor with efficiency? A. It can take four or five amperes at seven or eight volts. 2. How many storage cells with five 6 inch by 5 inch plates would it take to run the are of rather small plate area. You might place them motor. 3. I wish to make a few storage cells, with five 6 inch by 5 inch plates in each; how many positive and how many negative should I have, and what kind of paste should I fill the holes in the plates with? A. It is some In our dificult to get good results with storage batteries, ture; price 10 cents by mail.
(7148) S. W. B. writes : I have a lot o exposure to the sun and cracking on the outside from apply to stop it? Also tell me how to make a water proof paint or coating for the inside of an iron tank to
keep from rasting. A Rubber Hose, etc., to Soften.-1 Dip in petroleum, expnse to the air, and repeat the opera tion if necessary. 2. Ammonia, 2 parts; water, 4 parts vapor of carbon bisulphide, with the further applicatio of vapor of kerosene. Coat your iron tank with aspha

INDEX OF INVENTIONS
For which Letters Patent of the United States were Granted MARCH 30, 1897,
AND EACH BEARING THAT DATE

burner
Burning fluid fuel, apparatus for, L. S. Buffing.
ton..................................


Card cilothing, manufacture of wire, F. Wijkin.







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tions with practical kuowledge. equally useful in physical develop ment, yet a thousand persons ride their wheels for one that uses dumb-bells. The reason is berpectly evident Bicycle riding combines pleasure with exercise; the use of dumb-bells is irudgery. so with these questions; they combine pleasure with mental exercise. You cannot start work on the frist one without continuing on to he last, and when you finish them you are repaid a hundredfold
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Moor. See impact motor.


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Stamping mill and pulverizer, ore, Wolfe
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Dunbar....
Steam boiler, . Pier.ioint
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Steam See.....

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Steel, manufacture of, A. E. Huni.....
Steel, etc., manufacturing, C. H. Foote











Valve, check, , St. Stone.........
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