### A WEEKLY JOURNAL OF PRACTICAL INFORMATION ART, SCIENCE, MECHANICS CHEMISTRY, AND MANUFACTURES.

Vol. LXXVII.—No. 8. ESTABLISHED 1845.

NEW YORK, AUGUST 21, 1897.

\$3.00 A YEAR.
WEEKLY.

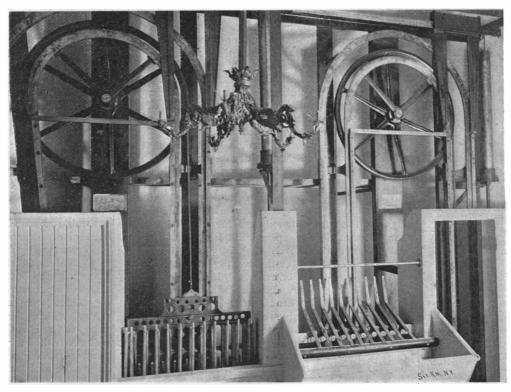
### THE BOOK CARRIERS OF THE NEW LIBRARY OF CONGRESS BUILDING.

BY E. J. PRINDLE.

The new building for the Libra. ry of Congress is, probably, in its architecture and decoration, the most perfect public building in this hemisphere. A great deal of machinery is necessary to conduct the affairs of so large a building, and the mechanical and sanitary features have been the objects of most careful and skillful attention. The lighting, heating, and ventilating systems represent the highest development in those directions; and, in designing them, as with all the other engineering work in the building, the object of the building has been kept constantly in view.

The Library of Congress contains seven hundred thousand volumes, exclusive of duplicates and pamphlets to the number of three hundred thousand. It is no small problem to provide machinery which will bring any one of this great number of books from the necessarily large

well lighted by electricity and is large enough for easy passage erect. This book carrier was installed by Mr. wheel truck that is secured to the cable, the wheels of



CAPITOL TERMINAL OF THE LIBRARY-CAPITOL CARRIER.

and distant book stacks quickly to the reading room George Miles, of Boston, Mass. A double track runs and the fingers are inclined upward and back. As the of this building or to the Capitol for the use of Congress. from one terminal to the other, and an endless half-For the latter purpose a book carrier runs from a inch cable draws two baskets or carriers constantly terminal beneath the rotunda or reading room of the around the track. The carrier consists of a solid back library building through a tunnel twelve hundred feet and sides and a bottom and front formed of a series of As the carrier ascends the next vertical section of the in length to the Capitol, where a second terminal is parallel, U-shape fingers secured to the back and havlocated between the Hall of Statuary and the library ing no obstruction between the fingers. Strips of felt fingers similar to those on the carrier; and any packof the United States Supreme Court. The tunnel is are secured in grooves in the fingers to protect the age that may have been deposited in these stationbooks. The carrier is pivoted to the face of a two ary fingers is caught up by the carrier and taken

the truck being in the same vertical plane.

The track consists essentially of two flat rails, one above the other, between which run the carrier wheels, and a rail beside the upper of these rails, against which anti-friction rollers bear that are journaled on the back plate of the carrier. The truck follows the inclination of the track, but the carrier remains vertical. As all machinery in the library is required to be as nearly noiseless as possible, the track is supported by rods from rubber washers in the ceiling. At the terminals, the track passes up and down twice in the general form of the letter M, except that curves replace the angles. A guide wheel in each curve of the terminal keeps the cable in proper relation to the track. The carrier traverses a terminal from right to left, and it deposits its load on the first descent and takes the books for the return trip on the following ascent. A series of stationary fingers is secured in front of a trough at the unloading point,

carrier descends, the stationary fingers of the receiving station project between those of the carrier, and the books are left by the carrier to slide into the trough. track, it passes through a series of U-shape, stationary (Continued on page 120.)



ROTUNDA OF LIBRARY OF CONGRESS BUILDING.

## Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS. PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

### TERMS FOR THE SCIENTIFIC AMERICAN. (Established 1845.)

Remit by postal or express money order, or by bank draft or check MUNN & CO., 361 Broadway, corner Franklin Street, New York.

### The Scientific American Supplement (Established 1876)

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, for the U.S., Canada or Mexico. \$6.00 a year, or £1 st. \$8.00, to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page. Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U.S., Canada or Mexico, on receipt of seven dollars. To foreign countries, eight dollars and fifty cents a year, or £1 14s. 11d., postage prepaid.

### Building Edition of Scientific American. (Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To architects, builders, and all wao contemplate building this work is invaluable.

Single copies 25 cents. By mail, to any part of the United States, Canador Mexico, \$2.30 a year. To foreign countries, \$3.00 a year, or \$20 22.4 d. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, and Supplement, \$3.00 a year. To foreign countries, \$6.50 a year, or \$2.6 s. 9d. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN, and Supplement, \$3.00 a year. To foreign countries, \$11.00 a year, or \$2.5 s. 2d., postage prepaid.

### Export Edition of the Scientific American (Established 1878)

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 100 pages, profusely illustrated. It is the finest scientific industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. \$3.00 a year, or \$0 12s. 4d., postpaid to any part of the world. \$1.00 a year, or \$0.00 and \$1.00 and \$1. MUNN & CO., Publishers, 361 Broadway, New York.

The safest way to remit is by postal order, express money order, extremediate to bank check. Make all remittances payable to order of MUNN CO. & CO.

SP Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, AUGUST 21, 1897.

### Contents.

(Illustrated articles are marked with an asterisk.)

Air brake instruction car* 117 Air, liquid, possibilities of 118	Patent attorneys, deceptive methods of114
Black art* 123	Patent Office employes cannot
Book carriers, National Library* 113	take out patents 119
Books, new	Patents granted, weekly record of 125
Cyclists, military, dogs to attack 122	Pension roll, big 124
Electrical work, liquid air in 118	Pere Marquette, the* 121
Electric celebration, Maine 118	Prosperity 114
Electricity, contact, Lord Kel-	Railway air brakes* 117
vin on	Railway mail catcher and de- liverer*116
Exposition, Pan-American, 1899, 119	Rockies, climbing the 116
Fear and thunder and lightning 122	Rotunda of National Library* 113
Ferry steamer, a seagoing* 121	Sand storms at Cape Ann 118
Hammer, Treat's nail-holding* 122	Science, modern, advances of 119
Inventions recently patented 124 Library, National. the* 113	Science notes
Locomotive counterbalance	Space, earth traveling through 124
problem, the	Stage illusions*
Looks of people 119	Steamer, stern wheel, ocean
Magic* 123	voyage of
Mail transfers, railway*	Thunder, lightning and fear 122 Town and cape, saving 118
Nail holding hammer, Treat's* 122	Trade. South American 114
New York City, rapid transit in 114	Tunnel, rapid transit, New York 114
Notes and queries 125	Universe, extent of the 124
Patent attorneys, registration of 115	University of California, the 119

### TABLE OF CONTENTS OF

### Scientific American Supplement

No. 1129.

### For the Week Ending August 21, 1897.

Price 10 cents. For sale by all newsdealers.	
I. AERONAUTICS.—The Captive Balloon in the Navy.—1 illustration	180 <b>3</b> 9
II. AGRICULTURE.—American Horses for Germany Electric Plowing.—2 illustrations	18044 18047
III. ARCHÆOLOGY.—Cannibalism in Ancient Egypt.—15 illustrations.	18050
IV. BOTANY AND HORTICULTURE.—The Coryanthes.—2illustrations.	18053
V. CIVIL ENGINEERING.—The Dortmund-Ems Canal.—A description of the canal and ship elevator.—I illustration	18046
VI. COMMERCE.—Possible Steamship Service between New York and Tangier.	18039
VII. ECONOMICS.—Nutritive Value of Food	
VIII. ELECTRICITY.—Electric Plowing.—2 illustrations	
formation.	
IX. ILLUMINATION.—The Automatic Ignition of Gas	18044
X. LOCOMOTIVE ENGINEERING.—Tests of the Strong Balanced Locomotive at Purdue University.—An article of great interest, giving a detailed description of the elaborate series of tests.—12 illustrations.	18042
XI. MEDICINE AND HYGIENE.—Snuff Inebriety  Do We Take Too Much Acid Food?	18049
XII. METALLURGY.—The Utilization of Aluminum in the Arts.— The first installment of a valuable paper	18046
XIII. MINERALOGY.—Utah Uintaite Deposits.—A description of the new mineral used in varnish making, etc	18052
XIV. MISCELLANEOUS. — The Strength of Ladders. — A unique paper giving the results of a series of ladder tests. — Are Men of Genius Degenerates? — Engineering Notes. — Electrical Notes. — Selected Formulæ	18054 18045 18045
XV. NATURAL, HISTORY.—The Reproduction of the Eel.—By HENRY DE VARIGNY, in La Nature.—I illustration. The Theater of Insects.—By John H. LOVELL The Iguanas in the Zoo at Leipzig.—I illustration.	18052 18051 18051
XVI. ORDNANCE AND ARMOR.—A New System of Throwing High Explosives.—By HUBSON MAXIM.—A most interesting paper, giving details of a new and elaborate system of throwing high explosives which bids fair to revolutionize modern navies.— 10 illustrations.	

### EXTENSION OF OUR SOUTH AMERICAN TRADE.

Judging from the geographical standpoint, it must be admitted that the trade of the South American states belongs to the United States and should be controlled by them. As a matter of fact, however, the export and import trade is chiefly in the hands of German, English, and French houses, which supply most of the manufactured products called for in these countries. It must not be supposed that the relative scarcity of American trade is due to any superiority in the goods manufactured in European countries. The paucity of our trade is explained by the fact that we have comparatively very little commercial re-It is the practice of presentation in these states. other countries to maintain exhibition centers, where their goods are always on view, and these are superintended by expert salesmen who are thoroughly in touch with the wants of the community and keep their wholesale houses continually informed of its needs.

We have already drawn attention to the efforts of the National Association of Manufacturers of the United States to establish at Caracas, Venezuela, a depot for the exhibition of sample American goods, and we are glad to learn that the enterprise is now being established on a firm basis.

The government of Venezuela has given material assistance by rescinding the duty on goods which are brought for purely exhibition purposes, though, should the goods be subsequently sold, the duty would, of course, be collected. One of the leading steamship lines has also agreed to reduce the rates one-half on all goods that may be shipped for exhibition. The charges for exhibition space will be such as are necessary to cover the current expenses, exhibitors being charged from two to five dollars per square foot per year. Great care will be exercised in the selection of salesmen, and the management will favor the employment of men who are thoroughly conversant with the country, its people and its needs. We very heartily commend this enterprise to the attention of American manufacturers. It is certainly the most practical way to attack the problem of opening the doorway for our surplus product into this hitherto much neglected field.

### THE PROPOSED RAPID TRANSIT TUNNEL, NEW YORK CITY.

The commission of three appointed by the Appellate Division of the Supreme Court to report upon the tunnel railroad proposed by the Rapid Transit Railroad Commission of New York City is now engaged in taking testimony from the commissioners, the chief engineer, and the property holders along the route of the road. The data furnished by the engineer places the prospects for building the road in a better light than they have presented at any time since the original scheme was first mooted. The present amended plans were illustrated and described in the issue of the SCIENTIFIC AMERICAN SUPPLEMENT for November 21, 1896, at the time when they were first drawn up. In the interval more extensive surveys have been made. and the latest estimates show that the probable cost of the road will be even less than that originally estimated for the amended scheme.

According to the present plan, a trifle over twenty miles of road will be built. This will reach from the Post Office to the Kingsbridge Station on the west side, and to Bronx Park and the Boston Road on the east side. Although this is about two miles longer than the route first proposed, known as the Broadway route, it involves two miles less of four-track tunnel. The estimated cost of the route which was vetoed by the Appellate justices was about \$50,000,000, whereas the estimated cost of the present proposed route beneath Elm Street will not be over \$32,600,000. This total, however, will be considerably reduced if the commissioners persist in their decision not to put up any pipe galleries at their own expense, and to replace the proposed enameled-brick tunnel lining with painted cement concrete—a change which will probably be made. This would effect a saving of about two and a half million dollars, and would reduce the cost of the completed tunnel to something under \$30,000,000. The preliminary borings which have been made through Center Street, Elm Street, Fourth Avenue and the district beyond, indicate that the work of excavation will be easier than was at first anticipated.

The fact that this great and much needed public work can be built for such a reasonable sum (nearly one-half less than the probable cost of the Broadway scheme) will remove a considerable part of the opposition which the scheme originally aroused. Next to this the greatest difficulty to be overcome is the prejudice which will naturally exist against any underground system of transit. Regarding this, it must be admitted that the question is one of a choice between two difficulties. The public must either be content to submit to the overcrowding and general inconvenience of the present overloaded facilities or it must take the tunnel with its comparative darkness and other imaginary discomforts. Judging from the success of underground transit as carried out on modern lines, it is almost certain that the enlarged accommodation and confidence of business men and capitalists that nothing

the high speed which would be realized in the new tunnel would very quickly reconcile the New York citizen to the fancied inconveniences of this mode of

### DECEPTIVE METHODS OF PATENT ATTORNEYS.

The general discredit which the practice of certain patent attorneys has cast upon the Patent Office and the profession, by reason of their peculiar crooked methods and deceptive advertisements, is greatly to be deplored, since it is likely to create in the minds of many well meaning inventors a lack of confidence in all attorneys, however honorable a reputation they have borne in the past. The activity, however, of the present Commissioner of Patents, the Hon. Benjamin Butterworth in taking measures to raise the standard and morale of the office, and by examining into the methods of John Wedderburn & Company, charged with pursuing fraudulent methods in patent practice, is greatly to be commended and will doubtless receive the approval of all inventors.

We believe there has never been before the Patent Office a case of such magnitude as that now pending before the Commissioner, in which is disclosed by the evidence, a surprising system of misrepresentation and equivocation designed for the deception of inventors.

According to the evidence as brought out at the examination by Assistant Commissioner Greeley, who has been assigned by the Commissioner to conduct this investigation, it appears in a large percentage of cases it was the custom of the firm in question to render favorable reports and send misleading letters to inventors of clearly unpatentable inventions. When the inventor responded and the application was lodged in the Patent Office, he was usually rewarded with a silver medal. Upon the absolute refusal by the Patent Office of a patent the inventor was advised that serious objections were raised against the granting of a patent, which might be overcome if an appeal was taken to the Board of Examiners in Chief, and further fees were asked for. If the amount was forthcoming. in numerous cases very little or no effort was made by argument, and usually the decision of the examiner below was affirmed of which the inventor was seldom notified, but on the contrary was apprised of the probable remarkable value of the invention, estimated at various sums from \$5,000 to \$20,000, and was urged to secure foreign patents. He was further requested to remit another sum for the purpose of advertising the invention and having a sketch of himself written and published.

Thus by an extensive system of flattery and misleading correspondence, combined with medals or prizes, the inventor was led into the belief that his unpatentable invention was patentable and likely to bring to him a fortune.

Whatever may be the outcome of the proceedings instituted by the Commissioner of Patents, one excellent result is already manifest in the fact that fraudulent and crooked methods of securing patents have been in a measure checked, and the aspersions cast upon reputable attorneys nullified. There should be brought about soon a wholesome restoration of confidence between inventors, attorneys and the administration of the Patent Office, which should be of lasting benefit

### PROSPERITY.

The prolonged period of business depression, which may be said in a general way to have lasted since 1892, appears at last to have come to an end, and from almost every quarter and in nearly all lines of business we hear most encouraging reports. We think there will be general unanimity in finding the principal factors of the depression of the past four years in three main causes—the difficulty in repealing the silver purchase act, and the consequent doubts as to the stability of the currency, and the two successive tariff acts, with the disturbance they have caused to trade and manufacture. Whatever may be the merits or demerits of the tariff just enacted, it is a great thing for business that the subject is now out of the way, probably for three or four years, at the least, and it is extremely fortuitous that, just as this most vexatious matter ceases to cast its shadow over the business world, we are come upon a period of good crops and advancing prices for the farmer. The grain crops of the rest of the world are below their usual average, while our wheat crop is considerably above the average, and, with a surplus of corn from last year, we shall have large supplies to market at figures which have been steadily advancing for the past three months, and do not yet appear to have reached their limit. So, too, it is predicted that this year's cotton crop will be the largest one ever raised. The trunk line railways are all making preparations to handle a very heavy business, which will test the capabilities of their entire rolling

The improvement in trade and manufacture, stimulated and supported as it necessarily is by the excellent crops, which must always afford the backbone of a healthy prosperity, is also largely due to the increasing

will be practically effected by those who have been so long working to debase the currency of the country. The best evidence of the hopelessness of their task is to be found in the steadily declining price of silver, and, although the silver agitation may continue for some time yet, the possibility of its again becoming a vital issue grows more distant with each improving feature of the business situation. Confidence is of slow growth, but it is evident that it is now the dominant feature in business circles generally.

### A SUCCESSFUL SOLUTION OF THE LOCOMOTIVE COUNTERBALANCE PROBLEM.

The Purdue University locomotive testing plant has recently concluded a series of tests which will rank high in interest and value among the many which have been carried out since it was first put in operation. As most of our readers are aware, the apparatus has been designed for the purpose of subjecting full sized locomotives to test under conditions which shall be as far as possible identical to those which obtain in actual service on the road, and the data which is so secured has the double value of a trial which is at once practical and scientific-all the possibilities of error being eliminated with the care which distinguishes laboratory work.

The tests to which we refer were carried out upon a locomotive which was designed for the purpose of overcoming the old-time and apparently insuperable difficulties attendant upon counterbalancing. What these difficulties are is so well known as scarcely to call for repetition here; but the effects of faulty counterbalancing are not so generally appreciated. How destructive these effects may be, how costly to the railroad companies in repairs both to rolling stock and to track, may be judged from the fact that a poorly balanced freight engine running at high speed over a stretch of track has been known to bend the steel rails into a series of hollows, and in some cases break them altogether.

The counterbalance difficulty arises from the impossibility of balancing the moving parts (crank pins, connecting rods, pistons, etc.) which are attached to the driving wheels, so that the center of gravity of the wheels and the attached parts shall coincide with the axis of the wheels. The revolving parts (crank pins, part of connecting rods, etc.) may be balanced to a nicety by placing weight on the opposite side of the wheel; but the reciprocating parts (part of connecting rod, the crossheads, piston rods and pistons) cannot be so balanced for the entire revolution of the wheel. For if, after the revolving parts have been provided for, counterbalance weights be added whose momentum will be equal to the momentum of the reciprocating parts when the latter are at the half stroke and traveling at their greatest speed, it is evident that when the crank is on the dead center and the reciprocating parts are at rest the whole momentum of this counterbalance will be "in excess," as it is called. This excess will increase the pressure of the wheels on the rails on the downward half of the revolution and reduce it on the upper half. Theoretically we should expect that a speed would be reached where the upward momentum would exceed the tension of the springs, causing the wheels to jump clear of the track at each revolution. It was suspected that this variation of pressure of driving wheels on the rails occurred in practice, and the various tests at Purdue University have shown that such alternate "hammering" and lifting actually takes place.

If all the reciprocating parts are balanced, there will be destructive vertical hammering; if none is balanced, there will be longitudinal disturbance, producing an uncomfortable tremor throughout the train and badly racking the locomotive. To meet the difficulty, or rather to moderate it, locomotive builders have taken a middle course, and, while balancing all the revolving 1897, is amended to read as follows: parts, they have balanced only a portion—usually 70 excess balance of from 400 pounds in the average engine to as high as 800 pounds in some recent heavy compounds. This, in the latter case, is equivalent to the the skillful preparation of the specification and claims. vertical effect of fastening nearly half a ton of metal The office cannot aid in the selection of an attorney. eccentrically within a wheel which is revolving at the rate of 300 or 400 revolutions per minute. It is little wonder that rails are bent or broken and that the locomotive repair bill is often so heavy.

In the locomotive which has recently been tested on the Purdue plant the difficulty is overcome by the use of four cylinders. These are arranged so that each pair of engines on either side has its cranks set 180 degrees apart, and the reciprocating parts are made to exactly counterbalance each other. A full description, with illustrations, of this engine was published in the Scien-TIFIC AMERICAN and the SUPPLEMENT respectively for November 14 and November 21, 1896. Without going member of a firm so engaged and not disbarred, prointo details, it is sufficient to say that the reciprocating parts of the low pressure engines were designed so as to be of the same weight as those of the high pressure en- so prosecuted by him. gines, and by placing the cranks at 180 degrees, as stated, the counterbalancing dilemma was entirely re- any court of record in the United States or any of the moved. In the current issue of the SUPPLEMENT will States or Territories thereof, and shall furnish a certibe found a digest of the test as carried out by Prof. | ficate of the clerk of the United States, State, or Terri-

Goss, of Purdue University. It consisted in running a set of wires between the locomotive drivers and the supporting wheels on which they turned, the theory being that the wires would be flattened in proportion to the pressure to which they were subjected during a revolution of the drive wheels. If the pressure was even, the wire would be even in thickness; if it varied, the thickness of the wire would vary proportionately.

In the tests which had previously been made on the Schenectady experimental engine, which carries an excess balance of 400 pounds, the wire, after passing under the drivers, showed great variations in its thickness, which increased where the counterbalance in the wheel approached the upper quarter of its revolution until its full diameter was reached, "a condition," says Prof. Goss, "which continues through several feet of its length and makes plain the fact that the wheel must have risen clear of its support during a considerable portion of its revolution."

On the other hand, the wires from the balanced locomotive were "nearly of the same thickness through-

The report concludes by stating that the data of the test justify the conclusion that the drive wheels of this locomotive "are at all times in perfect balance, that they neither increase nor diminish the pressure with which they act upon the rails as they revolve."

This very creditable result goes to prove that many of the so-called inherent drawbacks of some of the most familiar mechanical appliances are not inherent at all, and may be made to yield to an intelligent treatment of the problem. If it is objected that the new system of balancing involves the use of four cylinders and a multiplication of parts, the question becomes one of expediency and relative cost. The present practice of turning out locomotives carrying an excess balance is admitted to result in a more or less destructive action upon the track and bridges. Not only so, but it shortens the life of the locomotive itself. The Purdue tests indicate that the wear and tear of the track from this cause must always be considerable, and that under locomotives having a considerably greater excess than the 400 pounds carried in the test, and running at high speed, it must be enormous.

To what extent does the cost of repairs to track and locomotives due to excess balance in the present type of locomotive exceed the extra cost of a four cylindered locomotive of the same weight and power? This is a question which may well be commended to the thoughtful consideration of the roadmaster and the master mechanic.

### OFFICIAL REGISTRATION OF PATENT ATTORNEYS.

We have commented before on the need of more stringent requirements by the Patent Office of persons who desire to practice there in the rôle of attorneys than has heretofore existed, in consequence of the fraudulent practices that have been permitted with regard to applications for patents and their subsequent prosecution. The need of reform in the patent bar, if

there is such a thing, has been evident for a long time. We therefore are glad to note that a step in securing such reform, and which should soon exert an elevating influence on those engaged in soliciting patents, as well as give renewed assurance to the public that it will be honorably and honestly treated, is the new order and amendment to the Rules of Practice, promulgated August 6, 1897, by Hon. Benjamin Butterworth, Commissioner of Patents, which requires a register of attorneys to be kept at the Patent Office. The amendment is so important that we herewith give it in full:

"DEPARTMENT OF THE INTERIOR,

'United States Patent Office,

"WASHINGTON, D. C., August 6, 1897. "Rule 17 of the Rules of Practice, approved June 18,

"17. An applicant or an assignee of the entire interest per cent—of the reciprocating parts. This results in an may prosecute his own case; but he is advised, unless familiar with such matters, to employ a competent attorney, as the value of patents depends largely upon

> "A register of attorneys will be kept in this office, on which will be entered the names of all persons entitled to represent applicants before the Patent Office in the presentation and prosecution of applications for patent. The names of the following persons will, upon their written request, be entered upon this register:

> "(a) Any person who at the date of the approval of the present Rules of Practice, June 18, 1897, was engaged in the active prosecution as attorney or agent of applications for patent before this office, or had been so engaged at any time within five years prior thereto and is not disbarred, or is or was during such period a vided that such person shall, if required, furnish information as to one or more applications for patent

> "(b) Any attorney at law who is in good standing in

torial court, duly authenticated under the seal of the court, that he is an attorney in good standing.

"(c) Any person who has been regularly recognized as an attorney or agent to represent claimants before the Department of the Interior or any bureau thereof and is in good standing, provided that such person shall furnish a statement of the date of his admission to practice as such attorney or agent, and shall further show, if required by the Commissioner, that he is possessed of the necessary qualifications to render applicants for patents valuable service and is otherwise competent to advise and assist them in the presentation and prosecution of their applications before the Patent Office.

·"(d) Any person not an attorney at law who shall file a certificate from a judge of a United States, State, or Territorial court, duly authenticated under the seal of the court, that such person is of good moral character and of good repute and possessed of the necessary qualifications to enable him to render applicants for patents valuable service and is otherwise competent to advise and assist them in the presentation and prosecution of their applications before the Patent Office.

"(e) Any firm which at the date of the approval of the present Rules of Practice was engaged in the active prosecution as attorneys or agents of applications for patents before the Patent Office or had been so engaged at any time within five years prior thereto, provided such firm or any member thereof is not disbarred, provided the names of the individuals composing the firm are stated, and provided, also, that such firm shall, if required, furnish information as to one or more applications prosecuted before the Patent Office by them.

"(f) Any firm not entitled to registration under the preceding sections who shall show that the individuals composing the firm are each and all recognized as patent attorneys or agents or are each and all entitled to be so recognized under the preceding sections of this

"The Commissioner may demand additional proof of qualifications and reserves the right to decline to recognize any attorney, agent, or other person applying for registration under this rule.

'Any person or firm not registered and not entitled to be recognized under this rule as an attorney or agent to represent claimants generally may, upon a showing of circumstances which render it necessary or justifiable, be recognized by the Commissioner to prosecute as attorney or agent a certain specified application or applications; but this limited recognition shall not extend further than the application or applications named.

"After January 1, 1898, no person not registered in accordance with this rule will be permitted to prosecute applications before the Patent Office.

"BENJAMIN BUTTERWORTH, Commissioner.

"THOMAS RYAN, Acting Secretary of the Interior."

The advantage of this rule to the general public is that before intrusting business to an attorney a person may ascertain from the Commissioner of Patents whether such attorney is on the Patent Office public register. An affirmative answer would convey the inference that the attorney could be depended upon to deal with his client honestly—an assurance which is now lacking, yet which should in the future bring the patent practice up to a higher and better level. All reputable attorneys should at once endeavor to have their names registered and assist in establishing this needed reform. Commissioner Butterworth certainly deserves the thanks of the public and of the patent attorneys in particular for the promulgation so promptly of this excellent amendment.

### Ocean Voyage by a Stern Wheel River Steamer.

We are informed by Frank S. French, of San Francisco, Cal., that during the past month insurance and seafaring men have been speculating as to the outcome of the proposition to bring a stern wheel river boat, the H. C. Grady, down the coast from Astoria, Ore., to San Francisco, Cal.

At a glance it will be seen that a flat-bottomed, topheavy and unwieldy craft, built to run on smooth water, with guard scarcely two feet above the water, and further encumbered by a heavy stern wheel, is not a very inviting risk either to underwriters or crew when a voyage of the better part of a thousand miles down a treacherous coast is to be undertaken.

After many delays a start was made, and for five days this unseaworthy hulk battled against head winds and high seas, but to the surprise of many actually succeeded in making port under her own steam. The success of the venture is largely due to the skill of the master, Capt. Denny, an old-time sea captain, well known on the Pacific coast.

It is doubtful if a stern wheel steamer of this class ever made an ocean voyage before, unassisted by other

ACCORDING to experiments recently conducted by Messrs. Holborn and Wien, the electric resistance of platinum theoretically sinks to 0 at -258° Centigrade. -L'Industrie Electrique.

### RAILWAY MAIL CATCHER AND DELIVERY DEVICES.

In continuance of our notice of railway mail catcher and delivery devices we present the accompanying illustrations of the Ayars mail catcher and receiver. Of these Fig. 1 shows the apparatus as attached to the side of the mail car, and Fig. 2 is a side and rear view of the iron mail receiver as set up alongside the track. The catcher is attached to the outside of the car on one side of the door by means of a plate which is se-

curely bolted thereto. Another plate on the opposite side of the door carries the shafting and gear of the deliverer, which is capable of swinging outwardly through a quarter circle, and is held in the outward position by means of lugs or stops. Upon the outer end of the delivery arm is pivoted a tripping device, as will be later described. At the upper end of the vertical shaft upon which the deliverer is keyed is mounted a gear segment which meshes with a similar gear segment on a horizontal shaft which extends along the side of the car toward the doorway. The shaft is rotated in its bearings by the hand bar attached thereto at right angles as shown in Fig. 1, thereby causing at the same time the delivery arm to swing out from the car or return to its original position. This shaft is carried in bearings cast on the plate on which the deliverer is carried, and the end opposite the door opening is carried within the hollow end of the large arm of the mail bag catcher. The catcher is supported by its connection with this shaft at one end, and at the other end it rests in a bearing secured to the side of the car in front of the door, where an adjustable collar is provided to limit its forward movement. The usual buffer is provided at the rear of the catcher to receive the impact of the bag. The end of the horizontal shaft which operates the delivery arm is flattened where it enters the hollow shaft of the

catcher, and a transverse opening in the latter receives turn the delivery arm in against the car, where it upon the great white cross that indents the Mount of a flat pin which serves to lock the shaft and the catcher arm so they shall rotate together. The handle above mentioned on the catcher opposite the catching hook is in such a position as to lie flush with the side of the car when the catcher is not in use. When the train is approaching the receiver, this handle is that the management of both these railroads have pulled down into a horizontal position within the car, the hook arm being carried then into a horizontal position and placed in line with the bag which is to be caught. The same movement of this handle turns the horizontal shaft and the vertical shaft by means of the gear before mentioned and swings the horizontal arm, with the mail bag attached, out to a horizontal position, bringing the bag into the proper position for delivery. The releasing of the bag is accomplished by means of an automatic cast-off device which is operated by means of a striker on the mail receiver, as will be later

The receiver, which is built usually on an extension of the ties of the railroad track and is securely bolted to them, is a metal structure of the kind shown in illustration, Fig. 2. A little in advance of the mouth of it a small crane is erected which carries a series of pendent strikers. These are suspended at such a height that they will just strike the tripping lever on the castoff or release device before mentioned, and they are made in separate pieces in order to lessen the weight of the blow when the train is traveling at a high rate of speed. The strikers may be made of very light weight, as it requires but little force to release the catch. The fingers of the release device are ingeniously designed to cause the bag to drop the moment the lever of this device is pushed slightly backward. The side of the receiver consists of wire netting. It is built of sheet iron and is curved somewhat to a cycloidal form, as this form is best adapted to bringing the mail bag to a state of rest gradually, and with least injury to its contents. Just to the rear of the receiver is a stout wooden crane with a swinging cross bar, and when mail is to be delivered to the train the cross bar is drawn down into a horizontal position and the mail bag suspended from it.

described.

At stations where there is no receptacle for mail it will not be necessary to use the delivery arm on the car, and to enable the mail clerk to use the catcher alone, it is only necessary to withdraw the small pin before mentioned, which locks the catcher to the deliverer. This will allow the delivery arm to remain locked against the side of the car while the catcher is swung delivering mail is as follows:

On approaching a mail station the clerk hangs the mail bag upon the holder while the delivery arm is projecting into the door opening. As the station is The mail train passes these three stations at the rate approached he pulls down the handle of the catcher, thereby swinging the delivery arm out into position. grade at this point the trains frequently go by at a When the station is passed the catcher will, of its speed of seventy miles an hour. In spite of the brief own accord, swing down into normal position and interval of time between stations, the mail clerk has

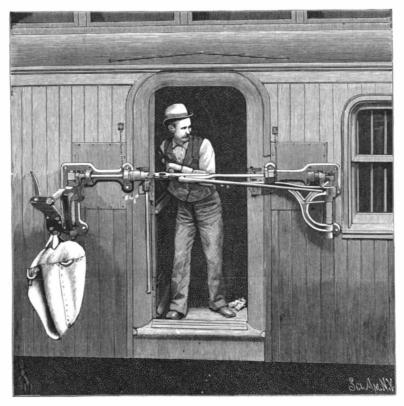


Fig. 1.-THE AYARS DELIVERER ARM AND CATCHER IN POSITION.

may be securely locked. This very interesting the Holy Cross at an elevation of 14,176 feet? and effective device has been thoroughly tested by the Erie Railroad Company at Lake View, N. J., and also by the New York and New Haven Railroad, at New Haven, Conn., and we are informed expressed their unqualified approval of the device. Special advantages claimed by this form of catcher and deliverer are that the receiver is always set and requires no attention before the arrival of the train: that there is no violent contact of metal against metal to cause ultimate breakage and necessitate repairs, and this device involves no risk to the mail clerk as compared with others, for the reason that it is not necessary for him to hold down the catcher handle after the delivery arm has been thrown out.

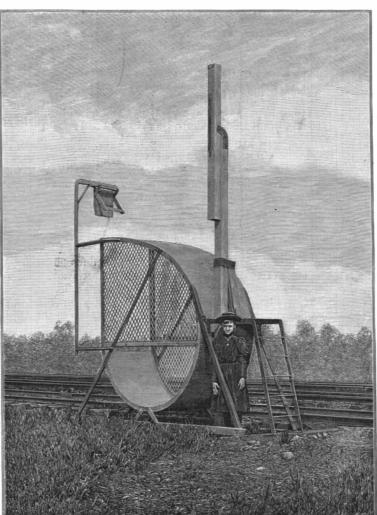


Fig. 2.-THE AYARS MAIL RECEIVER.

out into position. The operation of catching and be received and delivered along the route, attention is drawn to its trial on a division of the Pennsylvania Railroad at three stations, between which the distances were respectively 0.8 of a mile and 11/8 miles. of sixty miles per hour, and as the road is on a down

> no difficulty in locking the pouches and attaching them to the deliverer.

### Climbing the Rockies.

The terrible Jungfrau of Switzerland is but 14,000 feet high, yet travelers from all over the world journey to Interlaken to climb it, or to say that they have sat in the hotel and wished that they might climb it. Mont Blanc, in the same delightful little European republic, is forever quilted with snow, and for this reason it is one of the most seductive features of travel in the neighborhood of Geneva. The Chor health resort, on the east side of the Swiss republic, is visited by thousands of invalids, because it is one of the loftiest and noblest of European sanitariums.

Then why should not, says the Denver Times, every American who has money to spare and the desire to make a journey get out into Colorado, strap a pair of mountain boots on to his legs, put a spigot on an ash staff and attempt to climb Mount Blanca in the southern part of this State? Mount Blanca is over 14,400 feet high. Or, if he does not care to take the risk of this perilous ascent, why should he not come up into the northern part of the State, place his field glasses in his hands and gaze on the glacier and the perpetual banks of snow that cover Mount Hallett? Or, if tourists be possessed of reverence or of piety, why may they not locate in Central Colorado, and fix their eyes

If it is the duplicate of Chor that tourists seek. Manitou, in this State, rests at the foot of 14,000 foot Pike's Peak for them, and is itself 6,300 feet above the sea, while being endowed with health-giving waters the equal of Carlsbad.

There are 110 mountains in Colorado whose peaks are over 12,000 feet above the ocean level. Forty of these are higher than 14,000 feet, and more than half of that number are so remote and so rugged that no one has yet dared to attempt to climb them. They are as unique as those of Switzerland, and as fearful as the Alps in the warning they offer to men and women who are so hardy as to defy them by starting upon their ascent. Some of them are massed with snow, others have glaciers over their approaches, and As an instance of the facility with which mail may others are merely masses of jagged rocks.

> Not even Coloradoans have sought as yet to surmount them, and the profession of "guide" is still open for whoever may care to enter it. Railroads reach within close enough range to provide hotel facilities, but otherwise the mountain climbing of Colorado is awaiting its pioneers. Did the Coloradoans or the people of the State fully realize the intoxication as well as the health-giving powers of mountain climbing, Rocky Mountain climbing would be one of the popular recreations of America.

Only one mountain climbing club is known to exist in Colorado. There is room for a dozen more. There should be one in every city. By the evidences such clubs might offer of their thrilling experience and unexampled pastimes, the fame of the Rockies as a place of pleasure and adventure might be widely advertised, and Colorado thus be pushed forward to the place it must eventually occupy as the American substitute for Switzerland.

THAT the water of the sea contains gold, among other metals, is perhaps well known. According to Tont Savoir, quoted by the Revue Scientifique, which gives a summary of the data that have been obtained in regard to this subject, Sondstadt, in 1872, reached the conclusion (confirmed more recently by Munster) that the "briny deep" contains about one grain of this metal to the ton of water. One grain is not much, but this figure has its value when we take into consideration the immense extent of the oceans, which, as a whole, would, at this estimate, contain a total of 10,250,000,000 tons of gold. This latter is found in the state of iodide, and the iodide that enters into the combination would amount to something like 4,428,800,000,000 tons.

### ALE BRAKE INSTRUCTION CAR ON THE "BIG FOUR neighbor by a window which affords plenty of light with the necessary drainage. Mounted on pedestals ROUTE."

ganization which distinguishes the operations of the which the appliance is intended.

possible exception of the army and navy, there is no sphere of human activity where the necessity and advantage of order and method have been recognized and realized more fully than in the control of the finances, the equipment and the large army of employes of our first-class modern railroad system.

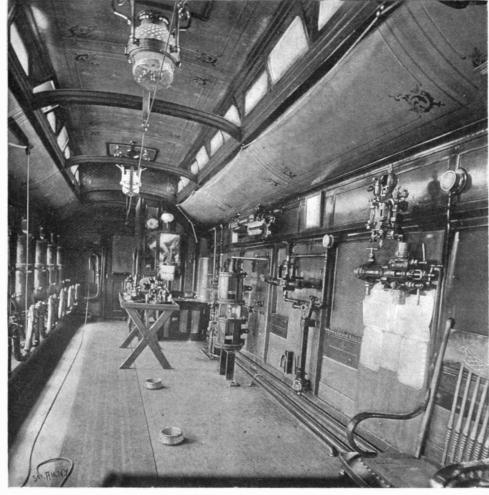
If one were asked to name the department where these features are most necessary and conspicuous, he would probably select that which is in charge of the superintendent of motive power; for it is upon the efficiency of this department that the safety of the public and the profit of the shareholders depend to a degree that characterizes no other branch of railroad service.

During the past dozen or fifteen years there has been a steady advance in the men and methods of this department. The employes are more thoroughly trained, and greater care and better judgment is used in selecting candidates for promotion. Greater effort is made to give the employes instruction in the theory and use of the plant and equipment which is intrusted to their care. A premium is put upon education and intelligence, at least so far as it relates to the work of this department, and a green hand is encouraged to do something more than merely "catch on" to the mechanical handling of the equipment -he is expected to acquire a knowledge of its parts, so that in cases of break-down he may be able to lo-

the round house or the repair shop. By the kindness of Mr. William Garstang, superintendent of motive power on the Cleveland, Cincinnati, entering the main room, and, at the same time, gives cates of proficiency are issued by the instructor to each Chicago and St. Louis Railway, familiarly known as the "Big Four Route," we are enabled to illustrate the partition is the 8 inch pump which supplies the air, The men all take a lively interest in the matter, some

system. The car was specially built, as its name implies, for the instruction of the train crews on the road. To this end it is fitted up with a complete, full-size train equipment, such as the air brake, the steam heating apparatus and the lighting equipment, as further explained below. Externally the car is of the standard style and color of the first-class coaches on this system. It is 54 feet long on the inside and is finished in ashand walnut. It is divided into two compartments, one of which is carpeted and is used as an office and reception room. This is furnished with a desk, chairs, one lower and one upper berth, the former being of the portable lounge pattern, and there is also a wardrobe and toilet.

The other and larger compartment forms the lecture room, which contains the Westinghouse and American air brake appliances, full size. It is furnished on one side with a long row of cane-seated chairs for the use of the instruction class. On the opposite side, next the office, is the complete air brake equipment of two locomotives (one 8-wheeler and one 10-wheeler), and also complete driver-brake models, driven by a small motor and made to operate in conjunction with the other appliances. Then, in their order, down the side of the car, are one passenger car and six freight car equipments, complete with all pipe fittings and hose cocks in their regular position, the same as upon a train of the same length. To compensate for the shorter pipes, the full brake-pipe volume on each car is represented by small reservoirs which are placed out of sight. This apparatus is placed on the wall in such a way that each car equipment is separated from its



AIR BRAKE INSTRUCTION CAR LOOKING TOWARD BOILER ROOM.

cate the difficulty and not be entirely dependent upon upright boiler and a coal bunker, which are parti- with such appliances are requested to attend the lectioned off from the lecture room by folding doors, an tures as often as possible during its stay. Classes of arrangement which prevents heat, noise and dirt from easy access for repairs and cleaning. Adjoining this individual and a duplicate sent to his superior officer.

and ventilation. Directly above each appliance is a and placed on a strongly built table are a set of cut Railroad men are justly proud of the splendid or- large photograph indicating the design of vehicle for sections of air valves, painted red. There are also cut in sections a 91/2 inch air pump mounted on a revolving great railroad systems of the United States. With the At the opposite end of the car from the office is an pedestal, an entire freight car brake and a Nathan

> No. 9 injector, triple sight feed, nickel plated lubricator and a Gold Car Heating Company's steam heat apparatus for locomotives and cars. There is also a working model of the latest improved Leach sanding device.

In a large case are six blackboards, each containing working templates of all the air valves, pump valve motion, Hodge & Stevens brake foundation gears, diagrams, etc., which are used in the elementary lessons and referred to in explaining mechanical effects.

The car is equipped with Pintsch gas fixtures, having four 4-flame lamps in the body of car and two side bracket lamps, one over the instructor's desk in office room and the other in front of the steam gage at boiler. The lamps are supplied by two gas receivers, which, together with the water tanks, are placed beneath floor and in such position as to cause proper distribution of weight to all springs. The car is heated with the Gold system of steam heat, supplied with the standard valves, gages and traps, but so arranged as to return the condensed steam to its own water tank. The car's steam heat, signal and air brake foundation appliances are connected with those in the instruction room and used in this connection.

The plan of operating the car is to have it go from one division point to another, where previous notice has been given, and those whose duties bring them in contact

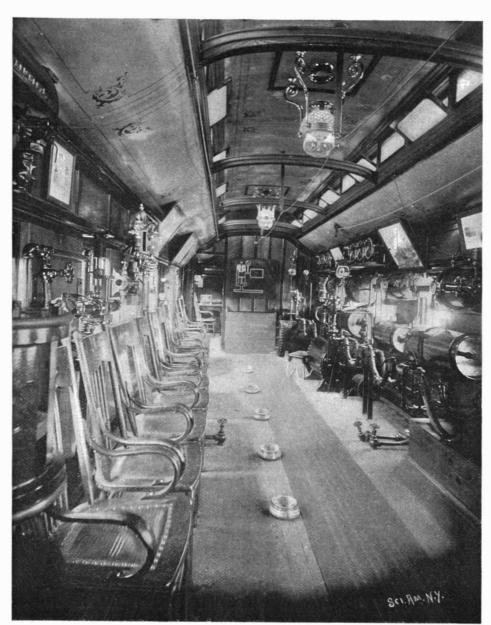
twelve each are instructed and examined, and certifiinterior of the air brake instruction car used on that and this, with the duplex boiler feed pump, is supplied to the extent of laying off their runs and taking a

regular course. The latter, in addition to greatly increasing their knowledge and their record of attendance, obtain a higher grade of certificates, etc., due recognition of which is made by the company when choosing from the ranks for promotion.

In designing the car, care has been taken, not only to have the apparatus of instruction completely and conveniently shown, but also to make the car comfortable for those giving and receiving instruction. Attention, therefore, has been paid to light, ventilation and seating capacity, and those in attendance are not obliged, as is frequently the case in cars of this sort, to stand crowded together during the lecture and to endure the heat of the boiler as well as the inconvenience of standing.

The car is in charge of Mr. W. J. Hartman, who for six years traveled for the Westinghouse Company as instructor and expert, and previously was instructor of engine and boiler management at the Rose Polytechnic Institute, Terre Haute, Indiana. We are informed that the car has already made one tour over the system, in the course of which some 3.000 men received instruction with results which have been very satisfactory to the company.

It has been known for some time that red hot iron is pervious to carbon dioxide. M. Gréhant has found by experiment that the carbon dioxide does not only freely pass through the iron, but is decomposed, carbon monoxide being set free. This may account for some of the accidents which the monoxide has caused. Rooms must not be heated by a red hot iron stove.-Revue Industrielle.



AIR BRAKE INSTRUCTION CAR LOOKING TOWARD OFFICE.

### Saving a Town and Cape. BY GEORGE ETHELBERT WALSH,

The Harbor and Land Commissioners of Massachusetts are making systematic efforts to reduce the danger and prevalence of sand storms which sweep across Cape Cod whenever a high wind blows up from the sea, and incidentally to protect Provincetown from threatening destruction. There is probably no immediate possibility of Provincetown being overcome by the sand; but if the encroachment of the belt of sand upon the wooded section next the harbor and town should be allowed to continue undisturbed for the next half century, the place would be depopulated. It is not the first time that the inhabitants of Provincetown have been compelled to exert themselves to stop the encroachment of sea and sand. Many years ago it was made compulsory by law for the citizens of Cape Cod to turn out every spring and plant marram grass to shut out the sea, and Provincetown owes its existence to-day to wise laws which empowered a "beach grass committee" to enter any man's inclosed garden or field and plant marram grass, if the sand was uncovered or movable.

The purpose of the Harbor and Land Commissioners now is to make the work of laying the sands permanent and endurable. Most of the land troubled by the drifting sand storms is owned by the State, and it is only just that the State should perform the work for which Provincetown has so long been held responsible. The tract of land comprises between 3,000 and 4,000 acres on the extreme northerly point of the cape, and it was purchased by the Colony of New Plymouth from the holding their own. It was not expected that the trees Indians in 1692. The land faces the Atlantic Ocean on one side, and stretches back to a belt of woods, which the early inhabitants of Provincetown planted to protect their town and harbor from the sand storms. Recently, however, the sand belt has been steadily encroaching upon the wooded tract, and it is to prevent the destruction of work already accomplished that the commissioners have set out to reclaim the sandy beach from the sea and wind.

A sand storm on Cape Cod, back of Provincetown, is something more to be dreaded than a Western blizzard. When the wind blows in a gale from the northeast the soft, light sand drifts in immense clouds, completely obscuring all objects around further than ten feet away. It is worse than snow in many respects. It not only covers up the road or trail in a short time, but it changes the general features of the landscape permanently. People get lost in the sand storms, and often, when the storm subsides, the landscape is so altered that they are bewildered and puzzled in trying to locate their homes. The sand may not be as freezing cold as the snow, but it is far more injurious. It cuts and grinds the face as it strikes it, and performs about the same operation as a sandblast. Men who have been lost out in the furious sand storms, and members of the lifesaving patrol, have returned home at night with their faces lacerated and discolored so that they resembled raw beef. Even the glass windows of the houses are so ground by the flying sand that they have to be replaced often by new ones. After one heavy storm it is almost impossible to see through the glass. People now shut the blinds of the houses facing the wind during sand storms in order to save the glass. No man can face the sand clouds and endure the pain for long.

As the prevailing sea winds are from the northeast on the cape, the sand dunes are drifting steadily and persistently toward Provincetown. The reclaimed belt of woods is thus in imminent danger of destruction and burial. This growth of woods is unmistakably very remarkable for a sandy beach, and the variety of plants and trees is a genuine surprise to every botanist who visits the region. The commissioners cite this condition of affairs as good evidence that the sand is very fertile if once held in place, and that their scheme of reclaiming the rest of the beach is not only feasible but eminently practical. The black oak, pitch pine, and beech are the leading trees that have obtained a sturdy growth on the beach; but underneath them there is a most interesting flora of smaller plants. The privet, bayberry, and wild rose especially predominate. In the summer time the woods are gay with rich colored wild flowers that carpet the ground and hang in festoons from the trees and bushes.

An appropriation of \$3,000 was obtained by the commissioners in 1894 to experiment with their work on the cape, and in the two following years appropriations of \$3,500 each were obtained. When the first appropriation was made the commissioners started a small nursery of plants and trees on the cape, and these have grown large enough now to supply most of their needs. The beach grass, plants, and trees were planted almost immediately after the first sum was obtained from the State, and every fall and spring since then plantings have been made.

The commissioners started on the windward side of the beach at the northeast end of the cape. The beach is divided at this point into three huge dunes or waves, across which the sand drifts like the foam and spray of the sea. The windward side of the first dune has been almost entirely covered with beach grass and vegetation. The grass thus extends along the face of

the water for nearly a mile, comprising about fifty acres of land. A good roadway has also been made on the sand, which makes driving along the beach more than passable. Across the movable and unprotected sands driving is reduced to a complex labor problem. The horses sink in the soft sand up to the fetlocks, and the broad-tired wagons with a slight load on go down several inches until they strike the strata of wet sand, which seems to underlie the whole beach at Cape Cod. This wet, moist condition of the under layers of sand is responsible for the profuse vegetation in the belt of woods, and the commissioners build much of their hope upon this peculiarity of nature in the vicinity.

Several plantings of grass have been made up to date, and while spring planting will be practiced in the future, the commissioners are convinced that fall planting gives the best results. The grass that was planted a year ago last fall is found to be in a more flourishing condition than the grass put in the preceding or succeeding spring. Very little of it has died in either case; but in spots the wind has succeeded in burying bunches of the grass with the sand so that they have been smothered.

Along the edges of the water a wind break of young trees was planted to test their ability to withstand the cold, stormy winds and weather of the ocean. These trees were mostly pines and silver poplars. They were taken from the belt of woods back of the beach, or from Provincetown, so that they were thoroughly acclimated before transplanting. The pines have become well established in the soil, and the poplars are would grow vigorously in the sandy soil until the whole surface was matted over with the fibrous roots of the grasses, and consequently the present condition of the trees is an agreeable surprise to all.

Behind the wind break of trees broom and tamarix plants were put in to test their hardiness, and though they have a little, stunted growth, they are growing and spreading. A few white birches planted in the sand seemed to be unable to stand the heavy gales, and they show signs of injury and decay. None of these will probably be planted again. Willows were also tried back of the wind break, and another planting of them will probably be made the coming fall. They were whipped about by the wind, so that many of the old shoots were killed; but new branches have started up and are growing vigorously. The commissioners are pushing their work actively, but, in view of the necessity of experimenting as they proceed, the project cannot be accomplished in a day.

If the enterprise proves successful—and nobody doubts in the least that it will-some 3,000 acres of worthless sand will be converted into excellent building sites. The popularity of Cape Cod for a summer resort is growing and extending every year, and it has been nothing but the sand storms and instability of the land that has kept this region from being built up with summer cottages and settlements. If the commissioners succeed in establishing fine woods all along the coast, the value of the land for building purposes will be doubly enhanced.

### Possibilities of Liquid Air in Electrical Work, BY ELIHU THOMSON.

The well-known effect of cooling by liquid air or like gases a conducting metal like copper is to almost abolish its resistance. Consequently a conductor so cooled is able to carry very much larger currents with less loss than at ordinary temperatures. This fact has attracted the notice of electricians and physicists for a long time past.

It has recently been found that liquid air is one of the most perfect insulators, and that most insulating materials cooled to the temperature of liquid air are greatly improved in insulating qualities. It is known also that cooling renders it more difficult to cause a spark to occur between oppositely electrified conductors, the striking distance for a given pressure being di-

The stability or permanence of liquid air in bulk, even when it is fully open to the ordinary atmosphere or kept at atmospheric pressure, is, of course, simply dependent upon the heat insulation provided, and if this could be made perfect, the air would never evaporate.

Recent methods, such as those of Hampson and Linde, make it possible to obtain large quantities of liquid air by simple means and with moderate expenditure of power.

Niagara power is twenty-four hour power, and as there are but few industries demanding power for the whole day, it must follow that surplus power is either not used or wasted, and that to keep the plant working night and day at full capacity is desirable, even if some of the power only yields a moderate return. Can it not be used in making liquid air? Cannot the excess at certain times of day be put to use in compressing air to be afterward liquefied on the large scale?

It would seem that large tanks of liquid air can be

\* Modern Machinery, July, 1897.

heat-insulated very perfectly by layers of air and fibrous material properly placed outside. The evaporated air from the tank could traverse the jacketings in successive order from within outward, so as to help keep down the temperature of the jacketings. A furnace with an internal temperature of 2,000° to 3,000° above the normal temperature of the air is easily insulated by moderate thicknesses of asbestos or other fibrous coating, so that the outside temperature is but slightly above the normal. The temperature difference between liquid air and normal air is, say, oneeighth of that between the interior of the furnace assumed and the normal, so that it ought to be possible to insulate so that but little heat would enter. In most electric long distance transmission lines a loss on the line of about 10 to 15 per cent is suffered. With 18,000 horse power this would mean from 1,000 to 1,500 horse power lost in resistance of line. If the conductors were immersed in a pipe with liquid air, the loss might fall to not over 1 to 2 per cent, perhaps, leaving available a large power for condensing air to supply evaporation. Just how far 1,000 horse power would go in keeping the conductors supplied with liquid air coatings is a matter requiring data to determine. But if it were not sufficient for the purpose, there is a surplus of power during certain hours to supplement it.

But it may be possible that a much higher voltage than is now used (10,000 to 20,000 volts) may be successfully used with conductors cooled and insulated by liquid air. If the potential could be raised to 50,000 volts, either the loss on the conductors for a given power transmitted would fall off as the inverse square of the voltage, or the conductors could be made smaller in the same proportion, or the distance of transmission increased with the same section of conductors as the square of the potential. These are matters worthy of experimental determination.

The limit to the capacity of an electric transformer to transfer energy from its primary to its secondary circuit is found in the heating and loss involved in the copper conductors comprising these circuits, and upon the nearness with which the two circuits may be placed one to the other, which is in turn governed by the insulating material used to separate them.

Could the conductors be kept cool by liquid air, and thereby their conductivity and insulation greatly increased, the work of transfer in a transformer could be much greater for a given size than it now is, or the loss could be even less than it now is, although but 3 per cent is sacrificed in ordinary practice.

Transformers in liquid air might be made entirely of copper without iron, and their light load efficiency become nearly equal to full load efficiency.

A transformer without iron would avoid the loss in the iron and would permit such a saving in material that changes in design or disposition of the copper could be made to suit the conditions.

We need not touch upon the possibilities of liquid air as a means of energy storage, for they are self-evident enough, since liquid air is virtually compressed air which remains compressed, as it were, even when exposed to atmospheric pressure; that is, addition of heat gives to it pressure and the ability to do work in suitable engines in the usual compressed air motors. Our object has been to briefly point out what may be termed possibilities in electric engineering, assuming that data favorable to the ideas presented be the outcome of experiment.

It is too early to make any predictions or calculations concerning this object. It must be confessed that it has a certain fascination. Perfection of heat insulation seems to be the key to the situation. All else seems to depend on that, the main questions being what will it cost in power and machinery to supply the necessary evaporation waste in a system of the kind outlined, and whether the voltage of transmission can be raised in consequence of the new conditions.

### Electric Power at Richmond, Va.

A project for utilizing the immense water power at me pr assuming definite shape. It is believed that when the enterprise is established it will do more for the material development of Richmond than all the other enterprises attempted. There is more than 10,000 undeveloped horse power in the James River at this point, which if converted into electric power would be of great benefit, not only to present manufacturers, but would also tend to bring other manufacturers to the

### Electric Celebration in Maine.

The celebration of the invention of the electric motor car was held on July 26, at Eliott, Me., in connection with the summer meeting of the American Institute of Electrical Engineers. The celebration was in honor of Prof. Moses G. Farmer, who on July 26, 1847, exhibited in Dover, N. H., what was considered the first electric car. The exercises included an interesting exhibit of early apparatus, and addresses by Professors Dolbear, Barker, Duncan, Pupin, etc.

### Patent Office Employes Cannot Take Patents.

A very important decision was given on the 9th inst. by the Commissioner of Patents, Hon. Benjamin Butterworth, in regard to the impropriety of a Patent Office examiner or other official applying for patents in their own behalf, the application perhaps being assigned to them for consideration, and it is worthy of the attention of the inventive public. The Commissioner says, as reported in the Washington Star:

"The applicant, John H. McElroy, while an assist ant examiner in this office, examining in the class of voting machines, filed this application complete in all its parts on February 15, 1895; on June 2, 1896, he resigned his position, and on the day following paid the government fee of \$15 to secure the examination of his application, which application presents an invention claimed to be an improvement on a voting machine for which other joint applicants had filed an application, which was before Mr. McElroy for examination and action while he had charge of that class in this office. This earlier application is still pending.

"Acting under instructions, the examiner states that on August 5, 1896, and on December 23, 1896, he rejected the claims on reference to the pending applications, and also in view of the provisions of section 480 of the Revised Statutes, which is as follows:

"'All officers and employes of the Patent Office shall be incapable, during the period for which they hold their appointments, to acquire or take, directly or indirectly, except by inheritance or bequest, any right or interest in any patent issued by the office.'

"A case on all fours with this was before me on February 5, 1884 (26 O. G., 337), in which I held that in view of the statute above quoted it was not competent for an employe of the office to file an application for a patent while he was employed in the Patent Office. The reason for not permitting this to be done has special force in case of an examiner who seeks to file an application covering an improvement on an invention disclosed in some pending application of which he, as such examiner, has charge or may have charge, and the objection derives additional force from the fact that his application, if filed, would or might be referred to the division in which he is employed as an examiner. In the case mentioned I directed that the application then under consideration be stricken from the files and island has about 175 acres, which is ample room for all returned to the applicant, and that the fee be returned

"Notwithstanding this decision, it seems that it is not wholly exceptional in the office for examiners to file applications which are properly referable for examination to the division in which they are employed. But whether an application so filed is properly referable to the division where the applicant is employed as an examiner makes no difference in the conclusion I reach. Whether the former decision was right depends upon the proper construction of section 480 of Shore and Wabash roads. Between the steam railroad the Revised Statutes, hereinbefore quoted. The question is, whether the spirit and intent of the statute is ara Falls electric road are laid, which assures trolley intended to reach and embrace only an interest in a patent that has actually been issued.

"I do not so construe the statute. To so construe it would be to defeat in a large measure, if not wholly, the obvious purpose and intention of Congress, which was, and is, to prevent persons employed in the Patent Office from improperly utilizing their knowledge of the inventions of others, acquired as a result of their official connection with the Patent Office, and from utilizing the opportunities they have, as a result of their employment, to become rivals or competitors of inventors whose applications they have before them for examination, or in any wise to take undue advantage of the knowledge they have acquired of pending applications in their capacity of examiners or officials.

"The reason of the statute which prohibits an officer or employe of the Patent Office from acquiring, either directly or indirectly, any interest in a patent issued would seem, by fair intendment, to prohibit him from filing an application for the interest he is not permitted of the Great Lakes. Thus the locality is rich in histo acquire. The application is the evidence of an inchoate right to a patent—and the ownership becomes complete when the patent is issued. Any other conction would obviously permit, if, in fact, it did not encourage the very mischief the statute was clearly in- the falls. It is reasonable to suppose that many of this tended to prevent, as examiners might make some slight improvement or modification in inventions covered by applications pending before them for examination and file an application, change or modify it from time to time, negotiate the sale of the whole or a part interest in the invention or application, or the patent to be predicated thereon, and resign and prosecute the case and take out a patent whenever such course seemed to offer greater pecuniary advantages than to remain in the office; and thus the office might become freighted with applications filed by examiners of the strict letter of the statute, and thus become a prolific source of scandal.

"In my judgment, the construction I give to the statute is necessary in order to give force and effect to the obvious intent and purpose of the law, and to to the integrity of the office. Nor does this construct restaurants will be fitted with electrical apparatus projectile.

of the statute. I adhere to the former ruling and direct ject of the exposition is to make fitting display of the that the application under consideration be stricken progress made in the Pan-American countries during from the files and the fee returned to the applicant. He may, of course, file his application now that he has severed his connection with the office, but it was originally filed in violation of the statute, and cannot be recognized in pursuance of such filing as a pending application."

### Pan-American Exposition, 1899.

There is every promise that the Pan-American Exposition which it is proposed to hold in 1899 will prove worthy of record as being one of the greatest of such events the country has ever seen, says the Iron Age. The company under whose direction the exposition will be conducted has but recently been incorporated, and among the members are Chauncev M. Depew, ex-Governor of New York Roswell P. Flower, ex-Lieutenant-Governor of New York William F. Sheehan, E. B. Thomas, President of the Erie Railroad; Edgar Van Etten, general superintendent of the New York Central; H. Walter Webb, vice-president of the New York Central; Daniel O'Day, vice-president and general manager of the United Pipe Lines Company; John M. Brinker, president of the Niagara Falls and Lewiston Railway; F. C. M. Lautz, vice-president of the same road and president of the Ellicott Square Bank, of Buffalo; J. T. Jones, president of the Niagara Falls and Suspension Bridge Railway; W. Caryl Ely, president of the Buffalo and Niagara Falls Railroad; Charles R. Huntley, general manager of the Buffalo General Electric Company; Charles R. Haskins, of Milwaukee, Wis.; Henry J. Pierce, of the Manhattan Spirit Company; Howard H. Baker, postmaster of Buffalo; Hobart Weed, F. S. McGraw, R. C. Hill, Herbert P. Bissell, of Buffalo. The company are officered as follows: President, John M. Brinker: first vice-president. Roswell P. Flower: second vicepresident, Chauncey M. Depew; third vice-president, E. B. Thomas; treasurer, F. C. M. Lautz; secretary, R.

Cavuga Island has been selected as the site for the exposition. This island is situated in the upper Niagara River, a few miles above Niagara Falls. In size the purposes: but, should more land be desired, it can easily be obtained on the mainland. The railroads recognize in Cayuga Island an ideal spot for a great gathering of exhibits and people, and the transportation facilities promise to excel anything ever before enjoyed by Americans on such occasions. Within 200 feet of the island run the tracks of the New York Central and Erie roads, which are used by the New York Central, the West Shore, Michigan Central, Grand Trunk, Erie, Lehigh Valley, R., W. & O., Canadian Pacific, Lake tracks and the island the tracks of the Buffalo & Niag car connections without any trouble. On the outside shore of the island there is ample water to allow of boats coming down the lake and river to land, thus assuring the possibility of running excursions by water as well as by rail, and establishing all kinds of transportation facilities. A good portion of the land is covered by woods, which if cleared up, as it is proposed, will make delightful spots for excursionists to rest while at the exposition. The Little Niagara River and Cayuga Creek will afford fine runs for electric launches. On the mainland, immediately opposite Cayuga Island, is the village of La Salle, which is a suburb of the city of Niagara Falls. This village takes its name from the famous French explorer who, on December 6, 1678, landed at the mouth of the Niagara River and proceeded through the forest to the mouth of the small stream now known as Cayuga Creek, where he is said by some historians to have built the Griffon, the first vessel, other than Indian canoes, to sail the waters torical interest.

The reports of the Commissioners of the State Reservation at Niagara are authority for the statement that 500,000 people annually visit the State reserve to number would go to the exposition, while it is still more reasonable that the number of visitors would be largely increased by the holding of the exposition, and therefore it is estimated that during 1899 Niagara Falls will see the greatest influx of visitors it has ever known in a single year.

While the exposition will not be entirely devoted to electricity and electrical subjects, it is already announced by the management that the electrical features will predominate. The electrical power supply will be transmitted from the great power house of the Niagara or other employes, in contravention of the spirit if not Falls Power Company, a few miles below and almost in sight of the island, and its influence and presence will be demonstrated in almost every part of the exposition grounds. There will be no boilers and ugly smoke stacks to mar the beauty of the spot, but all machinery will be operated by the subtile current from avoid scandals which would be injurious, not ruinous, the falls. Electric cooking will be the order and all completed, will weigh 16 tons and will carry a 400 pound

tion do violence to the letter while enforcing the spirit necessary to the conduct of their business. The obthe century that will close with 1899.

### Do People Have a True Conception of Their Looks?

It has been said by one who ought to know that no man has any clear conception of how he himself looks. The expression of the face is continually changing. No artist, no camera, can catch this changing, fleeting, evanescent expression. When you look in the glass, the very intent to find out how you look is depicted on your face. The more you strive, the more the intent is intensified, and such an expression is not natural to your face. How often do we look at a photograph and find only disappointment in it? Why is this? The camera depicts the sitter just as he is at the moment the picture is taken, but very seldom can the instrument catch and record that subtile thing called "natural expression," because few persons are natural when seated before the camera. Well, what of all this? Simply this. If you are noble, loving and true, such virtues will light up your face; if you are sordid, mean and selfish, your face proclaims it to the world. Anything in your life that is active for either good or evil will impress itself upon your personal appearance. Pride, scorn, hate and lust write themselves indelibly in the physiognomy. When such ignoble qualities rule the life and have become habitual, they are impressed on the face and finally become habitual to the countenance, and the features themselves become permanently changed to accord with such expressions. It has often been remarked that persons who have been married for a long term of years come to look something alike, nor is this surprising when we call to mind that their life and environment is one, made up of the same joys and sorrows, the same hardships and trials, and the same successes and pleasures—in short, the intellectual and spiritual atmosphere of both is to a considerable extent identical, and we know that these things affect the physiognomy often to such a degree as to mould the physical features of the face into the same shape. - Extract from an editorial in the Journal of Medicine and Science.

### Advances of Modern Science.

There are some that imagine that the Victorian age has been destructive of the belief in miracles. In reality it, more than any other since the world began, has brought home to the average man the stupendous miracle of the world. They call it a materialist age, which has chained the soul of man to inert matter. But almost before the reproach is heard, science proclaims that there is no such thing as inert matter, that every atom is alive, and that our mortal bodies are vast composite conglomerations of living organisms. upon whose pitched battles in our veins depend our health or our disease. To take but one instance. Imagine all that we understand by the word microbe, and then recall the fact that the microbe was practically unknown when the Queen came to the throne. In a very special fashion, science has revealed to us a new heaven and a new earth, infinitely marvelous, testifying to an understanding so vast that the mind of man cannot by searching find it out. Behind each discovery that advances our knowledge, the infinite unknown indefinitely recedes. We weigh the stars, analyze their composition in the spectroscope; we photograph the moon and make maps of the canals in Mars. But far more stupendous are the discoveries that have been made, not in the infinitely distant abysses of space, but in the infinitesimally small molecules which are all around. Science has sent its Roentgen ray through the darkened veil, and revealed the invisible and summoned all men to enjoy it as their inheritance.—"A Retrospect of Sixty Years," by W. T. Stead, in June Review of Reviews.

### The University of California.

The University of California has \$4,000,000 already pledged for its support, and asks architects to compete for the plans for the new buildings, and a jury of famous architects has been secured to pass upon the plans. The jury is to meet at Antwerp as soon as the plans are completed. The competition is to be international. An advisory board has been selected to fix upon such location as will best suit the landscape. On this board are Alma Tadema, Puvis de Chavannes, Andre, Luciain, and Knaus.

### A Big Cannon Casting.

At the Otis Steel Works, Cleveland, Ohio, August 4, the casting of a smooth bore gun on the methods suggested by Dr. R. J. Gatling, of Hartford, Conn., inventor of the Gatling gun, was successfully performed. The government thought so well of Dr. Gatling's method that Congress appropriated \$40,000 for the test. The casting weighed 30 tons and the gun, when

## THE BOOK CARRIERS OF THE NEW LIBRARY OF CONGRESS BUILDING.

(Continued from first page.)

along. The carrier, after passing the next curve, descends to the main track and travels to the opposite terminal, where it passes through the same series of operations.

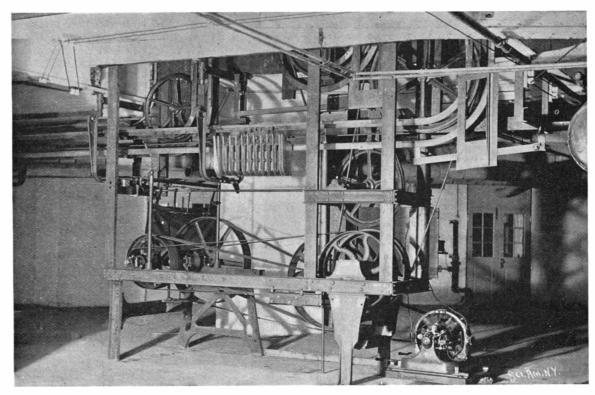
In order to keep the carrier vertical while the truck is passing the curves of the terminals, a number of sliding frames are provided at the curves; and these frames have vertical surfaces which engage the carrier and prevent its tipping. At the first curve a simple rectangular frame is mounted on slightly inclined rails, so that gravity places it in the path of the carrier; and, when the lat. ter strikes against the frame, the frame, while bearing against the end of the carrier, travels up the inclined rails until the car-

rier has passed above it. At this point, two supplemental rails enter grooves in the sides of a boss on the back plate and maintain the vertical position of the carrier until the upper curve is reached. The sliding frames at this and the next two curves are the same, except that the frame for the lower curve is inverted. These frames consist of a base and two depending legs, and they slide on horizontal rails. The legs form continuations of the supplemental rails; and, as the carrier passes around the curve, the frame slides on its rail to correspond to the horizontal component of the motion of the carrier. The frame is returned to its first position by a chain which is attached to a weight in a vertical tube whose lower end is closed, and is provided with a cock to regulate the escape of the air under the weight and thus to prevent shock. At the last curve no frame is needed to steady the carrier.

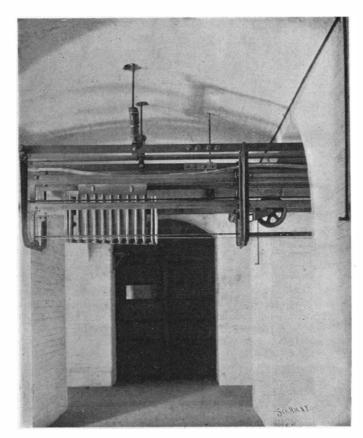
The carriers necessarily move at a slow rate of speed while passing through the terminals; but, as there are twenty-seven hundred feet of cable, the speed is increased while the carriers are passing from one terminal to the other. There are two carriers on the cable and they are half the length of the cable apart, so that the carriers are in the terminals at the same time, one at the library and one at the Capitol.

While the carriers are in the terminals, the cable is run at a speed of fifty feet per minute; but while they are in the tunnel the speed of the cable is six hundred feet per minute. Two minutes are required for the passage through the terminals and two minutes in the tunnel. By the use of ball bearings, the power required

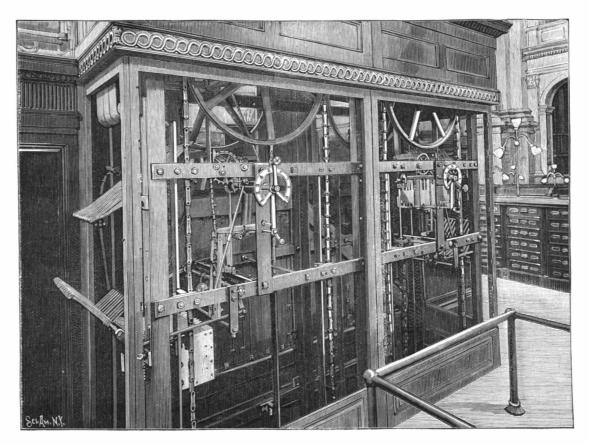
is reduced to five horse power. An electric motor is used and is belted to one of two parallel shafts in a framework below the terminal in the library. Two belts connect pulleys on these shafts, and the shaft that is belted to the motor is connected by a belt to a third shaft from which the power is taken. One pulley on each of the first two shafts is connected to its shaft by a friction clutch. and the operating levers of these clutches are connected indirectly to a long sliding rod whose farther end is pivoted to a lever in the path of the incoming carrier. The rod is also connected to a lever that is in the path of the carrier as it leaves the terminal. When the friction clutch on first shaft is in, the speed of the motor is reduced but twice; and this condition obtains when the carrier has passed through the terminal; but, when the clutch on the second shaft is in, the speed is reduced four times



DRIVING MECHANISM OF LIBRARY-CAPITOL CARRIER AT BASE OF LIBRARY TERMINAL.



MAIN TRACK OF THE LIBRARY-CAPITOL CARRIER.



THE TERMINAL IN THE READING ROOM OF THE BOOK STACK CARRIER.

to allow the carrier to traverse the terminal safely.

This book carrier, like that for the book stacks, is the result of much experiment during its construction, and they are the first carriers of their kinds.

The book stacks in the Library of Congress are placed in two wings, situated north and south respectively of the rotunda. There are nine floors in each stack. Two independent book carriers are provided to bring the rotunda into communication with the two stacks, and they are duplicates. They were constructed by the Miles Pneumatic Tube Company, of Boston, Mass. These carriers run from within the circular desk in the center of the rotunda. down to the second floor below, where they pass to the centers of the book stacks and up vertical shafts to the top of the book stacks.

These carrier systems employ pairs of sprocket chains four hundred and fifty feet long, each system having eighteen carriers pivoted at equal distances apart on the pairs of sprocket chains.

Each carrier has a system of keys pivoted in its back, by which it may be made to take a book to any particular floor of the book stack and there deposit it automatically. Any carrier leaving the reading room empty will pick up the first book that is placed in the delivery tray of one of the stations in its course; but it will not take up books similarly placed at any subsequent station on the line. A carrier may be made to take a book to the central station and carry one back on the same round trip; but it cannot take a book to the stack and carry one back on its return trip. The carriers travel at a uniform speed of one hundred feet per minute by sprocket wheels that engage the chains at the foot of the vertical shaft in the stacks, and the power is derived from a 21/2 horse power electric motor. The sprocket chains pass over large pulleys at the top of the shaft through the book stacks, and the bearing blacks of these pulleys are adjustable vertically on screws to tighten the chains.

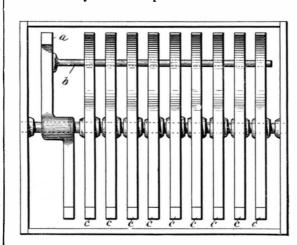
The carriers are in principle like those of the Library-Capitol carrier system, and they consist of a solid back and sides and a bottom and front formed by parallel, separated fingers attached to the back. In the vertical portions of the carrier's travel it is kept upright by rails which occupy grooves in the sides of the carrier, and the carrier is steadied by vertical strips as it approaches the rails, to insure the rails' entering the grooves.

In a compartment in the back of the carrier are mounted, on a horizontal shaft, nine key levers, c, which operate the receivers of the stations, and one "pick up" lever, a, which operates the delivery trays of the stations. The key levers are duplicates and are formed with a projecting lug below and a slightly dished upper end. The lugs, when projected out, operate the mechanism that throws a receiver, consisting of a series of parallel, separated fingers, on a pivoted frame into position under the carrier to take the book from the latter as its fingers pass down between those of the receiver. A rock shaft above the receiving station is connected by links and levers to the pivoted frame of the receiver, and this shaft is turned by a sprocket chain passing over a sprocket wheel on the shaft and connected at one end to a block that slides in a fixed, vertical guide. This block has a

lug that is engaged by the lug on the proper key lever the lugs being out of vertical alignment with each and Pere Marquette Railroad for transporting freight for that station when the latter lug is projected from the carrier. This engagement pulls on the chain and swings the receiver into operative position. A counterweight on the other end of the chain gradually falls in a closed tube and throws the receiver and it's book out of the path of the carriers. As the sliding block descends, a weighted lever carried thereby passes a shaft and is thus forced against the key lever lug and disengages it from the iug on the block. The key levers are set for the proper station at the central station in the rotunda. The carrier comes to the central station on the part of the sprocket chains that is at the rear, and, after passing over the large wheels at the top, descends through a fixed inclined series of fingers down which the book slides to a desk. As all incoming books are left here, it is not necessary to make the receiving fingers movable. Below these fingers are a series of similar fingers that are inclined in the opposite direction, on which fingers the book to be sent to the stack is placed. The book is held from sliding down by a series of short fingers that are placed between the fixed fingers and that are mounted on a rock shaft. This rock shaft is linked to another rock shaft on which is splined a sleeve having an arm that carries a roller which sets the proper key lever by bearing against its upper end, this end being projected out in the act of releasing the receiver. These rock shafts are operated from another rock shaft above them that is turned by a lug on the pick up lever in the same manner as the key lever operates the receivers in the stacks. Thus, the roller is thrown out and sets the key lever at the same time as the book is delivered to the carrier. The position of the roller is determined by a finger which engages a groove in the sleeve and that is carried by a horizontal rack. The rack is shifted by a gear on a vertical shaft that is geared with a horizontal shaft carrying a handle over a dial with nine digits upon its face. In order not to set a key lever except when a book is to be sent to the stack, the vertical guide for the sliding block is hinged below and is allowed to tip back above, to be out of the way of the pick up. A movement of a handle throws the guide to the vertical position, where it is held by a gravity catch which is released on the upward movement of the sliding block.

other. A long horizontal arm on the pick up passes behind the upper end of the key levers, so that, when any of the latter are set, the upper lug of the pick up is withdrawn, and the lower lug is projected.

The depositing in the stack is performed by a horizontally sliding tray composed of parallel, separated fingers and operated by a block sliding in a pivoted pair of guides like those used at central station for the same purpose. The carrier rises through these fingers and takes up the book, after which the counterweight carries the trayout of the path of the carriers. This



KEY MECHANISM OF BOOK STACK CARRIER.

throws in the upper pick up lug; and a fixed cam at central station, operating on the lower pick up lug, throws the upper lug again into operative position.

Pneumatic tubes similar to those used by cash carriers convey orders for this system and also for the system running to the Capitol.

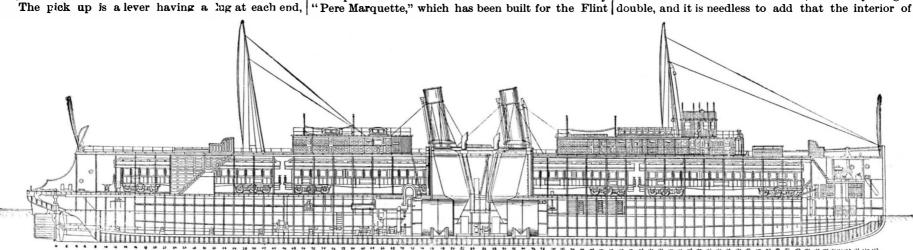
The beautiful mahogany casing of the carrier at the reading room terminal is lined with asbestos so that no sound of the machinery may disturb the readers.

### THE SEAGOING FERRY "PERE MARQUETTE,"

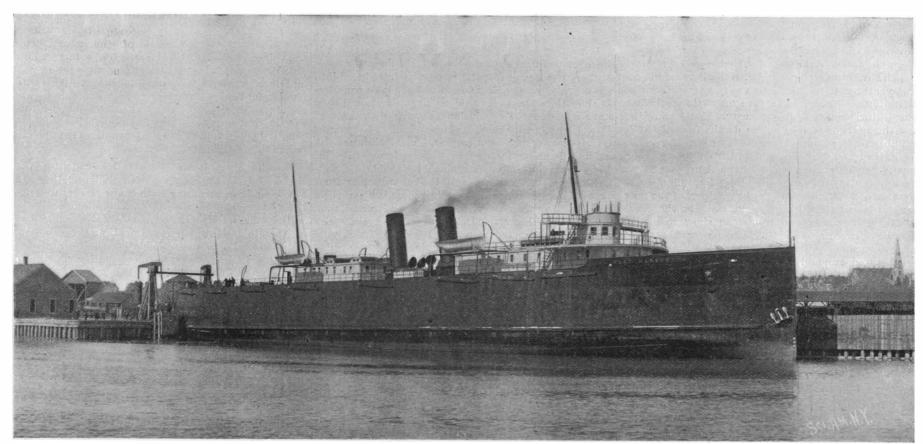
We present illustrations of the twin screw car ferry

or passenger cars across Lake Michigan. She is considerably the largest ship of her kind afloat, and in respect of her seagoing qualities she is quite unique among the large ferries of the United States. Her dimensions are 350 feet long on deck, 56 feet in beam, with a depth from keel to upper deck of 361/4 feet. She has four tracks, with accommodation for thirty freight cars or sixteen full sized passenger cars.

The Flint and Pere Marquette Railroad runs from Toledo, Detroit, Flint, Saginaw, Bay City, through Michigan and up through the lower peninsula to Ludington. From the latter place a line of steamers runs across Lake Michigan to Milwaukee, Chicago, and Manitowoc. The new ferry has been built for service between Ludington and Manitowoc, a distance of about sixty miles. As she is intended to run continuously throughout the whole year, she has been given great strength and a special shape of hull to enable her to withstand the heavy weather and the crushing strains of the ice during the winter months. Accordingly the framing from below the turn of the bilge to the upper deck is built of 12 inch channels weighing 25 pounds to the foot; the frames are spaced 24 inches center to center; the keel is 48 inches in width and weighs 32½ pounds per square foot; the center plate keelson is 42 inches wide and weighs 25 pounds per square foot, and the floor plates are 30 inches deep at the center, weighing 20 pounds to the foot, and they are connected to the center girder by double angles. On each side of the center girder, and spaced 63/4 feet from center to center, are two continuous keelsons flanged to the shell plating and extending above the top of the floor. The whole of the material worked into the bottom construction of the vessel beneath the engine and boiler spaces is made specially heavy. The shell plating from the keel to the bilge weighs 25½ pounds to the square foot. There are two water line strakes above the bilge and the main sheer strake, the last being double; all of these weigh 30 pounds to the square foot. The plating between main and upper decks weighs 10 and 121/2 pounds, and upper deck sheer strake weighs 15 pounds to the square foot. From the stem to about 35 feet aft, and from the keel to about 3 feet above the water line, the shell plating is



LONGITUDINAL SECTION OF THE "PERE MARQUETTE."



THE "PERE MARQUETTE" THE LARGEST SEAGOING FERRY STEAMER AFLOAT.

Deck length, 350 feet; beam, 56 feet; depth, 36¼ feet; capacity, 30 loaded freight cars or 16 passenger cars; speed, 16 knots.

the vessel at the bow is strongly reinforced with heavy bracing. The propeller shafts are protected by the plating of the hull, which is brought out and around the shafting so as to form a tube or sleeve.

The motive power of the "Pere Marquette" consists of two sets of compound engines, the cylinders being 27 and 56 inches diameter by 26 inches stroke. The high pressure cylinders are fitted with piston valves and the low pressure cylinders with double ported slide valves, and the Stephenson link motion is employed. Steam is furnished by four single ended return tube boilers, 15 feet 3 inches diameter by 12 feet long. The steam pressure is 135 pounds per square inch. The cabins are all placed on the upper deck, part of them being forward of the smokestacks and the rest being located aft, as will be seen from the accompanying drawing. In the forward cabin is a passenger saloon, 36 feet long by 10 feet wide, and ten staterooms. There is a smoking room measuring 10 feet 6 inches by 8 feet wide, with lavatory adjoining. The after cabin contains a dining saloon 16 feet long by 11 feet wide, and dining room for the officers and crew.

Except in regard to her stern, which is open after the fashion of all ferry boats, the "Pere Marquette" would readily be mistaken for an oceangoing steamship. The two pole spars and the raking smokestacks give the vessel a very handsome and seaworthy appearance, and her performance since she has been upon the lakes has been fully up to expectation. With a full load in open water she has more than once been driven at a speed of sixteen miles an hour. This is over three and a half miles faster than the contract speed. During the winter she has been put to some very severe tests. On one occasion she made the trip of sixty miles with thirty loaded freight cars aboard, in the face of a heavy gale which necessitated the other boat of the company putting back to shelter; and on more than one occasion she has pushed her way continuously through solid ice fourteen inches thick and maintained the speed of ten miles an hour. This, however, is not by any means the heaviest work that she will have to do, as it is not uncommon during a hard winter for the ice to be two or even three feet thick, and the heavy gales will frequently pile it up to a thickness of eight or ten feet. In making a landing, the "Pere Marquette" is taken in stern first, and the twin screws are used in the winter time to wash away the accumulation of ice in the slip.

This interesting vessel was designed by Mr. Robert Logan, of Cleveland, Ohio, and we are informed that the company is so well pleased with her performance that they intend to build a fleet of the same kind. We are indebted for illustrations and particulars to the builders, F. W. Wheeler & Company, of West Bay City, Michigan.

### Thunder, Lightning, and Fear.

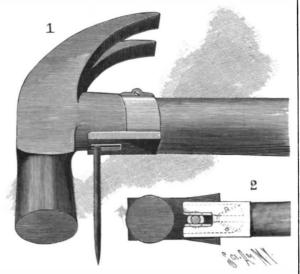
A current news item, says the Electrical Engineer. gives the results of an investigation carried out by Dr. G. Stanley Hall, president of Clark University, on the things that most excite fear in people. Of the 298 classes of objects of fear to which 1,707 persons confessed, thunder and lightning led all the rest, although in certain localities, as, for instance, those subject to the hammer head. With the nail held in such posicyclones, etc., the fear of the latter predominates. It may be accepted as probably true that thunder storms constitute the most pronounced source of fear with the majority of people, due, no doubt, to the always impressive and not infrequently overpowering nature of the phenomenon. But is there any justification in fact for this fear so far as fatal results are concerned? We believe there is not, but on the contrary, that many other causes which barely have a place in Dr. Hall's list are infinitely more entitled to the distinction as fear producers than lightning. As proof of this we may cite statistics of the United States weather bureau. These show that for the four years 1890-93 the deaths from lightning numbered 784, or an average of 196 a year. Again, Mr. H. F. Kretzer, of St. Louis, found from the record of nearly 200 newspapers that for the five years 1883-88 there were 1,030 deaths caused by lightning, or an average of 206 a year. We doubt whether, of the number of deaths classed as "accidental" in the whole United States, any one group can show number. In New York City alone over 200 people are drowned every year, while nearly 150 are burnt or scalded to death, and close on to 500 persons meet their end by falls of one kind or another. Comparing the record of 200 lightning fatalities for the whole country with the above records for New York City with its total of nearly 1,500 accidental deaths every year, it will be seen how groundless is the popular fear of lightning. It is a survival, an inherited superstition.

But there is another point in connection with this matter which ought to be particularly comforting to city dwellers, albeit country dwellers may not be affected in like manner, and that is, that statistics show that the risk of lightning is five times greater in the country than in the city. The cause of this immunity for city dwellers is not far to seek. It is doubtless due to the predominance of metal roofs, the well grounded water pipes in houses, and probably as much as anything to the protective network of overhead electric wires of all kinds. The popular belief that a stroke

of lightning is invariably fatal is also not borne out by facts. Indeed, one record specially devoted to this feature shows that of 212 persons struck, only 74 were killed. Taking it all in all, there seems to be no more groundless popular fear than that of lightning. Indeed, if one can go by statistics, the risk of meeting death by a horse kick in New York is over 50 per cent greater than that of death by lightning. Yet with all the weight of statistics against its deadliness, lightning will probably continue to scare people as heretofore. Perhaps, after all, there may be a more direct cause than the mere psychological one usually ascribed to it, and that is the fact that many people of nervous temperament are affected hours before the approach of a thunder storm and thus rendered particularly powerless to stand the strain which more or less affects even the most phlegmatic natures during a disturbance in the heavens.

### A NAIL HOLDING DEVICE FOR HAMMERS.

An attachment to carpenters' hammers, for placing a nail in the position where it is to be driven, is shown in the accompanying illustration, the hammer and its attachment being then disconnected from the nail and the latter driven in the usual way by the use of the hammer. The improvement has been patented by Albert R. Treat, of No. 1333 De Long Street, Los Angeles, Cal. Fig. 1 represents the application of the device and Fig. 2 is a bottom plan view. It comprises a clamp and a jaw-holding casing, preferably formed from one piece of metal, the clamp opening sufficiently to be passed over the handle, close up to the shank of the head of the hammer, where it is secured in position by a screw. Within the casing, and extending at



TREAT'S NAIL HOLDER FOR HAMMERS.

the side of and over a slot in its bottom face, are two pivoted jaws, normally held closed by a spring, these jaws engaging and holding the nail head as it is slipped into the slot, as indicated in Fig. 2, and the nail head being thus held between the jaws and the shank of tion it may be readily started in the surface where it is to be driven. The spring and jaws being entirely within the casing, there are no parts of the device liable to catch in the workman's clothes.

### Dogs for Attacking Military Cyclists.

It is stated in the German papers that an attempt is being made in some garrisons to train dogs to attack military cyclists. Since the cycle was introduced into the army. German officers seem to have been considering how the advantage could be neutralized, and they have come to the conclusion that the dog, a Great Dane by preference because of his weight and strength, is the best instrument to employ. The training of the animals is going forward in the garrisons of Berlin. They are taught in the first place, it is said, to distinguish German, Austrian, and Italian uniforms from those of French and Russian soldiers, and when their education in this respect is sufficiently advanced, they are taught to throw themselves upon the cyclists who wear the uniform of the supposed enemy. The Avenir Militaire says that cruelty is employed in their training, in which the whip plays a large part. Cyclists clad in various uniforms, and so guarded by padding that they are protected against bites, ride past or among the dogs, and these instantly rush at men costumed as Frenchmen or Russians, and throw them over. If by any chance a dog should attack a representative of the triple alliance he is severely whipped, while a reward is given him when he assails the man who personates an enemy. Here, we are told, is the whole secret of the training. German officers believe that a small number of dogs would rapidly dismount a scouting party of cyclists, and they dread the employment by the enemy of dogs for this work, fearing that in this case the animals might fight among themselves, and losing their sense of distinction between friends and foes, might attack the former. The Avenir Militaire urges French officers to take up the work of training dogs for this guerre aux cyclistes.

Science Notes.

Mr. Douglas, of Harvard College Observatory, has determined the period of rotation of Ganymede, the third satellite of Jupiter. He proves it to be 7 days, 5 hours, that is, nearly equal to its period of sidereal revolution. This confirms the statement of Herschel, that the satellites of Jupiter always turn the same face to their planet as the moon does to the earth.— Revue Scientifique.

Rinderpest being a cattle disease, Dr. Koch has found out that it does not attack birds. He tried to inoculate hens, pigeons, guinea fowls, a crane, an eagle and a secretary bird with the bacillus of the disease, but it did not affect them. He was equally unsuccessful with dogs, mice, rabbits and guinea pigs, but is not sure that the disease may not be conveyed to cattle by any of these animals.

The town council of Berlin have, by the advice of Prof. Virchow, decided to appoint a municipal hydrologist, whose duty it will be to supervise the Berlin waterworks in the interest of public health. In Paris the water supply is becoming a serious question, especially in view of the coming exhibition. The consumption has been steadily increasing for some years, and the authorities are busily engaged in the consideration of schemes for securing an adequate supply in the

According to the Revue de l'Electricité, birds are provided for in a wonderful way by nature. It may be noticed that their plumage is always tidy, no matter how rapid their flight may have been a moment before the time of our observing them. This, says the French paper, is due to the feathers being electrified positively, the down negatively by the air, so that the attraction between them makes them cling together in their place. This is very interesting, if the statement can be substantiated.

An inhabitant of the Scilly Islands was struck by the fact that the rats there seemed to prosper greatly, although the place is very barren. He resolved to investigate the cause of this, and digging up some of the nests by the seashore, found that the rats had dragged crabs into their holes, and, in order to prevent their escape, had bitten off their legs. No doubt the prey had been seized at low tide and brought home, to be stored up there by the original device just described.— Der Stein der Weisen.

Nitrate of lead is the cheapest disinfectant known that fulfills its intent. It does not, however, prevent putrefaction. The chloride of lead is much more effective in all directions. It is made by dissolving a small teaspoonful of the nitrate of lead in a pint of boiling water; then dissolving two teaspoonfuls of common salt in eight quarts of water. When both are thoroughly dissolved, mix the solution. When the sediments have settled, you have two gallons of clear fluid, which is a saturated solution of chloride of lead in water. A pound of nitrate of lead will make several barrels of the liquid and cost fifty cents retail.

Dispatches from Tacoma, Wash., dated August 3, say mail advices give further particulars of the great eruption of Mount Mayon in the Philippines, which began on June 26. This volcano is in the southern portion of the island of Luzon. It was said at first that fifty-six persons lost their lives and many more were iniured, but the latest advices at Hong-Kong from Manila place the loss of life to July 1 at fully 500. It was believed in Manila that the loss would be much greater before the volcano subsided. The flourishing towns of Malipot, Bacay and Libog were partly or wholly destroyed, and lava was still pouring into them. Many small hamlets and valleys at the foot of the mountain were certain of destruction, and it was considered no less certain that many of the rural population would be caught by the falling ashes and running red hot lava before they could get out of danger.

A series of geological lectures lately delivered in Boston by Mr. Grabau possessed the special value of throwing light, according to the most recent investigations, upon the feature of consolidation which peculiarly characterizes the conglomerates in some parts of New England, which have long been the subject of scientific study. This consolidation the lecturer finds to be due, in many cases, to the cementing together of sand and pebble by the carbonate of lime, silica or oxide of iron present in the water-a process even now going on, in many places, in the sediment deposited at the mouth of rivers or on the sea coasts, where the water contains an abundance of these materials. Of this formation are the sandstones, pudding stones and freestones, which occupy so important a place in modern construction, their value for this purpose varying with their resistance to the action of the atmosphere, which depends upon the nature of the cementing principle holding the mass together; some of the pudding stones are so resistant to the atmosphere that ages have not disintegrated them, due to the presence of felsite pebbles and a clay cementing substance. The great necessity, in laying these stones, of observing their lines of stratification has only within a few years been appreciated by builders.

BLACK ART.\*

and illusionists of Europe and America are indebted the vase on the other table. A life-size skeleton now his hands and hood over his head, made of black velvet, for the ideas of many of their best tricks and illusions. appears and dances around the stage, becomes dismem- he is not seen by the spectators, whose sight is some-

While the published reports of many of the alleged marvelous effects produced by the "wonder workers" of India must be taken with a very large amount of salt, yet we must give these people due credit for being the originators of many tricks from which the modern magician has taken principles on which he has founded and created several of the grandest and most successful illusions of modern times.

Take, for instance, the illusion known as "black art," or the "midnight mysteries of the Yogi," made famous in this country by those master minds of magic. Harry Kellar and the late Alexander Herrmann. The weird illusion is founded on an idea advanced by

of this article have seen "black art" presented by one of the above named magicians, yet the number who could advance a plausible explanation of how it was done are very few, because as soon as one thinks that he has discovered the secret, the performer produces an effect in direct variance with the principle on which the illusion appears to be founded.

In this illusion the entire stage from the first groove to the rear is hung with black velvet, the floor covered with black felt, and the top is covered with black velvet, thus forming a large room lined entirely in black. The regular footlights are turned out, and a special set are used, that consist of a row of open gas jets placed on a line with the boxes, and carried up the outside of the black room, as shown in the large engraving.

The lights throughout the entire house are either turned very low or put out, with the exception of the special lights mentioned above.

The curtain rises, disclosing the black chamber. In a moment the magician appears, dressed in a white suit; a wave of his hand, and a white wand appears floating in the air, which the magician secures. A wave of the wand, and a table appears on the right, then a second table appears on the left. A large vase appears on one of the tables, and a second vase appears on the magician's outstretched hand. Both of the vases are shown and proved empty, and in one is placed a few orange seeds, and the wand is passed over the vase, which instantly becomes filled with oranges. The oranges are poured into the second, then returned to the first vase, when they disappear as quickly and as mysteriously as they appeared, and the

\* Copyrighted 1897 by Munn & Company.—From "Magic: Stage Illusions and Scientific Diversions, including Trick Photography."-Ready Septem ber 1, 1897.—Illustrated Prospectus sent free.

vases are again shown empty, and again placed one on appears is painted white, and the magician is dressed each of the tables. A borrowed watch is placed in one in white. There is an assistant on the stage all through To the Yogi and Mahatmas of India, the magicians of the vases, from which it disappears and is found in the act, but as he is dressed in black, with gloves on

what dazzled by the open gas jets. The tables are on the stage, but covered with pieces of black velvet, rendering them invisible. The second engraving shows how the assistant removes the piece of velvet and causes a table to appear at the magician's command.

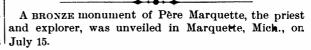
The vases are also sitting on the stage, but covered with pieces of black velvet. By picking up the covered vases the assistant can cause them to appear, by removing the velvet, one on the table and the other on the performer's hand. The oranges are in a black velvet bag, from which the assistant pours them into the vase. To cause the oranges to vanish, the magician, in-

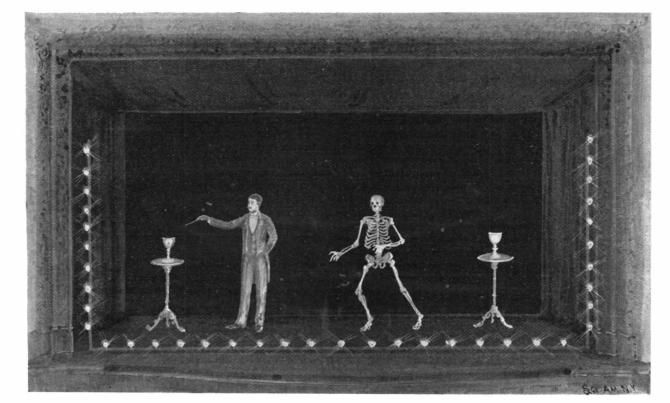
stead of pouring them into the vase, pours them into the open mouth of a large black bag held by the assistant just over the lower vase. The transposition of the watch from one vase to the other is just as easy. The assistant merely removes it from the vase in which the performer placed it, and places it in the second vase. The manipulation of the rabbit is equally simple. The assistant places the first one in the vase by means of a black bag in which it was concealed, then places the second one in the performer's hands from a second small bag. In vanishing the rabbits the performer merely tosses them up into a large open-mouthed black bag held by the assistant.

The skeleton is made of papier maché, painted white, and fastened on a thin board that is sawed to shape and covered with black velvet. One arm and one leg are jointed so as to be readily removed and replaced by the assistant when he is operating the skeleton. The two last illustrations fully explain the method of construction and manipulation of the skeleton.

The tables are made either of wood or papier maché and painted white. The vases are made of papier maché, painted white on the outside and black on the inside. The reason the inside of the vases are painted black is to prevent the hand of the assistant being seen when he places it in the vase.

This is one of the most expensive of stage illusions, costing several hundred dollars to properly stage it with the best drapery and accessories, and unless such are used the proper illusory effect is lost. In magic as well as in other business, cheap apparatus is dear at





THE STAGE SETTING FOR BLACK ART.

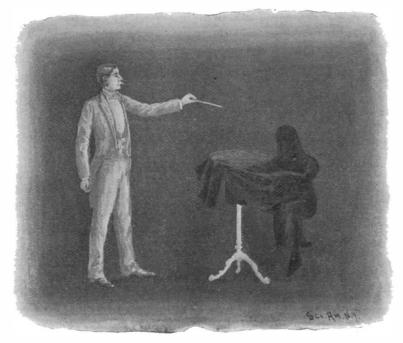
the Yogi of India. No doubt nearly all of the readers bered, the separated parts floating about, but they finally rearticulate themselves, and the skeleton vanishes. Now a rabbit is seen in one of the vases, from which it is taken by the performer, and in his hands it becomes two, which are tossed in the air and disappear.



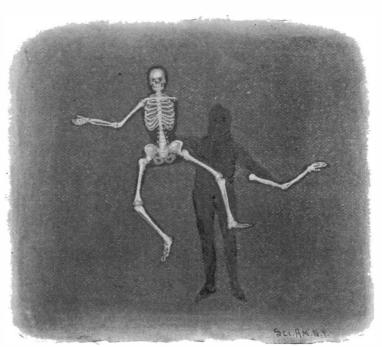
THE JOINTED PAPER SKELETON.

The number and style of tricks performed in the mysterious black chamber are almost unlimited, but an explanation of the ones mentioned above will suffice to show how "black art" is performed.

While the stage is draped in black, everything that July 15.



AN ASSISTANT REMOVING THE TABLE COVER.



THE DISARTICULATED SKELETON.

### The Extent of the Universe.

Prof. Simon Newcomb has delivered an interesting address on the "Problems of Astronomy" at the dedication of the Flower Observatory, University of Pennsylvania. It is printed in full in Science. We take from it the following passage:

I have seldom felt a more delicious sense of repose than when crossing the ocean during the summer months I sought a place where I could lie alone on the deck, look up at the constellations, with Lyra near the zenith, and, while listening to the clank of the engine, try to calculate the hundreds of millions of years which would be required by our ship to reach the star α Lyræ, if she could continue her course in that direction without ever stopping. It is a striking example of how easily we may fail to realize our knowledge when I say that I have thought many a time how deliciously one might pass those hundred millions of years in a journey to the star  $\alpha$  Lyræ, without its occurring to me that we are actually making that very journey at a speed compared with which the motion of comes such a mere point that, when magnified by the the steamship is slow indeed. Through every year, every hour, every minute, of human history from the first appearance of man on the earth, from the era of the builders of the Pyramids, through the times of Cæsar and Hannibal, through the period of every event that history records, not merely our earth, but the sun and the whole solar system with it, have been speeding their way toward the star of which I speak on a journey of which we know neither the beginning nor the end. During every clock beat through which humanity has existed it has moved on this journey by an amount which we cannot specify more exactly than to say that it is probably between five and nine miles per second. We are at this moment thousands of miles nearer to  $\alpha$  Lyræ than we were a few minutes ago when I began this discourse, and through every future moment for untold thousands of years to come the earth and all there is on it will be nearer to  $\alpha$  Lyræ, or nearer to the place where that star now is, by hundreds of miles for every minute of time come and gone. When shall we get there? Probably in less than a million years, perhaps in half a million. We cannot tell exactly, but get there we must, if the laws of nature and the laws of motion continue as they are. To attain to the stars was the seemingly vain wish of the philosopher, but the whole human race is, in a certain sense, realizing this wish as rapidly as a speed of six or eight miles a second can bring it about.

I have called attention to this motion because it may ceived by unaided vision. It is due to the magnifying

in the not distant future afford the means of approximating to a solution of the problem already mentioned-that of the extent of the universe. Notwithstanding the success of astronomers during the present century in measuring the parallax of a number of stars, the most recent investigations show that there are very few, perhaps hardly more than a score of stars of which the parallax and therefore the distance has been determined with any approach to certainty. Many parallaxes, determined by observers about the middle of the century, have had to disappear before the powerful tests applied by measures with the heliometer: others have been greatly reduced and the distances of the stars increased in proportion. So far as measurement goes, we can only say of the distances of all the stars, except the few whose parallaxes have been determined that they are immeasurable. The radius of the earth's orbit, a line more than 90,000,000 miles in length, not only vanishes from sight before we reach the distance of the great mass of stars, but bepowerful instruments of modern times, the most delicate appliances fail to make it measurable. Here the solar motion comes to our help. This motion, by which, as I have said, we are carried unceasingly through space, is made evident by a motion of most of the stars in the opposite direction, just as, passing through a country on a railway, we see the houses on the right and on the left being left behind us. It is clear enough that the apparent motion will be more rapid the nearer the object. We may, therefore, form some idea of the distance of the stars when we know the amount of the motion. It is found that in the great mass of stars of the sixth magnitude, the smallest visible to the naked eye, the motion is about three seconds per century. As a measure thus stated does not convey an accurate conception of magnitude to one not practiced in the subject, I would say that, in the heavens, to the ordinary eye, a pair of stars will appear single unless they are separated by a distance of 150 or 200 seconds. Let us then imagine ourselves looking at a star of the sixth magnitude, which is at rest while we are carried past it with the motion of six or eight miles per second which I have described. Mark its position in the heavens as we see it to-day; then let its position again be marked 5,000 years hence. A good eye will just be able to perceive that there are two stars marked instead of one. The two would be so close together that no distinct space between them could be per-

power of the telescope, enlarging such small apparent distances, that the motion has been determined in so small a period as the 150 years during which accurate observations of the stars have been made.

### Lord Kelvin on Contact Electricity.

At the Royal Institution Lord Kelvin recently gave a most important lecture. He began by showing an experiment which conclusively proved Volta's theory that, when a zinc plate and a copper plate were put in contact, one became charged with positive electricity and the other with negative. Although he had shown this experiment fifty years ago at Glasgow University, says the Builder, yet an immense amount of ingenuity had been wasted recently in trying to explain away this phenomenon. He considered that Volta was absolutely right and made an appeal to physicists to study Volta's work seriously. A very interesting and novel experiment was shown. A plate of uranium was connected to one terminal of an electrometer, and was then touched by a plate of aluminum. It was seen by the deflection of the spot of light that the uranium plate became at first positively electrified; it then gradually lost its charge and became negatively electrified. Lord Kelvin could suggest no explanation of this very mysterious experiment. Another interesting topic touched upon was Becquerel's discovery of the radiation given off by uranium. This radiation is very feeble, but photographs of coins, etc. taken by its means were thrown on a screen. He stated that it had been conclusively proved that this radiation was not due to phosphorescence, or the slow radiation of light previously absorbed, and he could give no explanation of it. Lord Kelvin was slightly discursive, but he was listened to most eagerly, and his points were rapidly taken up by an appreciative audience.

### Big Pension Roll.

The pension roll of the United States has almost reached the million mark. Commissioner Evans has just issued a statement showing that at the beginning of the fiscal year the pensioners numbered just 983,528, an increase of 12,850 for last year. During that year 50,101 new pensions were granted and 3,971 persons were restored to the rolls. Old age and disease, however, are working great inroads into the lists, for there were 31,960 deaths during the year. Other sources of loss were 1,074 from remarriage of widows, 1,845 orphans attained majority, 2,683 failures to claim pensions, and 3,560 losses from unrecorded causes.

### RECENTLY PATENTED INVENTIONS. Mechanical.

ROLLER MILL BELT FEED.—Evelyn E. Protheroe, Brodhead, Ky. According to this improvement the adjusting devices are at the outside of the machine, away from the rusting induence of the hot, moist air of the internal parts. The invention also provides a regulating gate to so control the stock that it will accumulate in proper quantities the full width of the belt at its delivery end, finally overcoming the resistance of the gate and dropping in an even sheet to the grinding rolls there being no liability of the feed choking, and stock that may escape from the belt feed being automatically returned.

WELL PUMPING POWER.-George W. Grimes, Bluffton, Ind. This invention relates to devices to be placed at a central station to operate a series of surrounding pumps for oil or water wells, providing a power of large capacity for operating a great number of wells. A master shaft is supported vertically in a metal frame on a base sill, auxiliary shafts supported by the frame having gear connection with the master shaft, there being pump rod actuating devices on the master shaft and on the auxiliary shafts, and driving mechanism having connection with the master shaft. The actuating mechanism is firmly attached to the shaft to rotate with it and also to prevent a vertical movement of the actuating devices relatively to the shaft

TOOL FOR SCREWING TREENAILS.-Albert Collet, Paris, France. A brake strap, according to this improvement, has vertical teeth adapted to engage and bite into the head of the treenail, on the inner face of its first convolution, and the strap also has horizontal openings adapted to be engaged by the ends of a lever or cross piece having at its middle an upwardly projecting square boss on which fits an operating key, a central vertical rod descending into the treenail, and centering the screwing tool on its head. The strap is locked on the nail by its teeth, when turned in one direction, thus carrying the treenail forward and screwing it in, and when turned in the opposite direction the strap opens out and turns freely without engaging the nail.

### Railway Appliances.

SWITCH.-Michael F. Finnerty, Brooklyn, N.Y. A switch more especially designed for use on street railways is provided by this invention, its construction being such as to permit the motorman or gripman to readily set the switch as desired while the car is approaching it. The switch point is connected with a tar adapted to be shifted transversely, a lever is connected with the bar, and cam levers adapted to be actuated from the approaching car control the movement of the bar to shift the switch point to open or closed position. The device is simple and strong, and not liable to get out of order.

### Miscellaneous.

SEWING MACHINE RIPPER. -- Charles

ripping attachment is provided by this invention, readily applicable to any sewing machine, the knife of the attachment being secured to the needle bar and taking the place of the needle. A needle plate is also arranged to cover the feed device of the machine without interfering with its movements, the plate serving both as a guide for the ripping knife and a guide for the seam being operated upon. The shank of the knife is adapted to be secured in the needle receiving socket, and its blade is preferably razor-shaped, with either a straight or serrated cutting edge.

STAMP AFFIXING MACHINE.—Sinclair Tousey and Elia De Long, New York City. To facilitate putting stamps on envelopes or packages, this machine provides for moistening the place where the stamp is to be affixed, has a reservoir for the stamps, and an automatic mechanism drawing one stamp at a time from the reservoir to a plunger, one movement of the hand placing the stamp on the moistened envelope or package and operating the plunger to fix the stamp in position. Stampreceiving receptacles may be introduced at will in the machine, providing for a supply of stamps of different denominations, to be used as desired.

AUTOMATIC DUMP FOR HOISTING BUCK-ETS.-Matthew Liston and Luther Wilson, Ward, Col. 'This improvement comprises an inclined and pivoted frame on which slides an attached cage shaped to receive the buckets and having at its upper end inwardly projecting hooks which engage the upper end of the bucket the latter sliding the cage up the frame until the bucket overbalances the frame and its contents are discharged. Supporting slide bars are attached to the frame and extend therewith inside the cage, supporting the bucket above the cage, so the bucket will not engage the cage to slide it upward until the bucket is entirely within the cage and engages the hooks upon the upper end.

FOUR-WHEELED VEHICLE.-John W. According t struction provided for by this improvement, the bottom of the vehicle body is below the top plane of the wheels. owing to the upward curve of the bolsters. The bolsters have their ends turned upward and then downward, truss bars connecting the downwardly turned portions, and the wheels having axle bearings in the downwardly turned portions. Bifurcated ends of a bolster embrace each pair of wheels.

COAT HOLDER. - Robert J. Stuart, New Hamburg, N. Y. To assist people who, from rheumatism or other cause, find it difficult to put on a coat or similar garment, this invention provides a holder having two horizontal bars with forwardly extending clamping fingers, a spring acting on an arm to clamp the fingers together to support a coat, the device being connected with a standard or support, there being also a foot lever and connections by which the clamping fingers may be operated.

Lock.-Giuseppe Piccioni, Montefiore, Italy. According to this invention, the wards of the lock are pivoted to yield on the insertion of a tool, preventing the obtaining of a duplicate of the key by mak-H. Stuart, Newark, N.Y. A simple and inexpensive ing an impression of the wards, and the key has a cen. of this paper.

tral socket with grooves and shoulders to act on the wards of the lock after the fashion of bits, but the socket is so formed that no impression can be taken of its shape from which to make a duplicate of the key.

Buckle.—Charles F. Francisco, San Diego, Cal. This invention is for an improvement on a formerly patented invention of the same inventor, the buckle frame having a tongue bar to which is hinged a keeper, the tongue having a shoulder engaged with the keeper, and the latter having an end cross bar and an intermediate fulcrum bar which serves in rocking the keeper to lift the point of the tongue.

CURTAIN FIXTURE BRACKET. - Edward W. Farnham, Chicago, Ill. This device is stamped out of sheet steel, its main plate comprising a base wing with a screw hole for the fastening screw, and a flange or bearing wing, and both wings having slots in which fit lugs on a rib plate adapted to act as a screw driver in putting up the device and remaining secured to the bracket.

STAIR CARPET FASTENER.—Harry C. Adams, New York City. According to this improvement, plates extending nearly the width of the stairs are permanently attached at the angle of the riser and tread, such plates being bent toward each other and having serrated or toothed edges, the carpet as it is stretched in place being forced into the space between the opposing toothed edges of the fastener. The fastener may be made entirely of one piece of thin sheet metal, bent to right angle, with flanged toothed edges.

DUST PAN.-Lloyd P. Ray, Seattle, Washington. This pan is made to lie close to the floor from which the dust is to be taken, and has a thin strong plate along its receiving edge. It has a removable and adjustable handle, and a spring fastening device adapted to hold the handle at an angle to the pan when the latter or permitting the handle to he carried to sition parallel with the pan, the handle also serving as a neans for suspending the pan.

BLACKING BRUSH AND DAUBER. -Louis Barberie, Brooklyn, N. Y. This device is adapted for either shoe or stove blacking, the main brush having in the sides of its back, near the front end, pivot arms adapted to carry a dauber socket which may be swung up, with the dauber, over the back of the brush, or turned down in position for use, the dauber being moved and held in proper position by a finger piece. vice is very simple and can be cheaply manufactured.

### Designs.

SLATE. - Belle McConnellogue, New York City. According to this improvement, a narrow box adapted to receive percils, etc., is fitted to and extends across one end of the slate and its frame, the box having a hinged lid and a catch to hold it closed.

Note.-Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date

### NEW BOOKS, ETC.

ROMAN AND MEDIEVAL ART. By W. H. Goodyear. 1897. Meadville, Pa.: Flood & Vincent. The Chautauqua-Century Press. Pp. 307. Price \$1 Meadville, Pa.:

This is a revised and enlarged edition of a work which was published in 1893. It contains much additional information and a large number of new illustrations. Those who are acquainted with the work of Professor Goodyear will expect that the present volume will be up to his "Renaissance and Modern Art," and his "History of Art," and in this they will not be disappointed, for it would be hard to find in any language a clearer or more concise history of Roman and medieval art, and all reduced to the smallest compass. There is a continuity of thought running through the book from the first to the last page which shows that the author is a perfect master of his subject. It will be readily seen that Professor Goodyear is a believer in the "picture book," and in this he is entirely correct. Art works should always be illustrated freely by photo-engravings from the monuments. eschewing perhaps the more artistic wood cut. The 196 illustrations in the present book, though many of them are of small size, are admirably selected and are very well reproduced. We can cordially commend this book to our readers as a safe guide, which, unfortunately, many socalled art works are not.

THE PROSPECTOR'S FIELD BOOK AND GUIDE IN THE SEARCH FOR AND THE EASY DETERMINATION OF ORES AND OTHER USEFUL MINERALS. By Prof. H. S. Osborn, LL D. Illus-trated by fifty-eight engravings. Third edition. Revised and enlarged. Philadelphia: Henry Carey Baird & Company. 1897. Pp. xxii, 274. Price **\$**1.50.

This is the third revised and eularged edition of a work which has already demonstrated its value. It treats of crystallography, surveying, the analysis of ores by the wet and dry methods, and each of the metals is taken up in turn and a great deal of information is given about each with special reference to what is usually required by the prospector. Petroleum, asphalt, gems, and precious stones are not neglected. This is probably the most practical work which can be put in the hands of the inexperienced prospector.

THE PRINCIPLES OF FRUIT GROWING. By L. H. Bailey. New York: The Macmillan Company. Pp. 508. Price

One who is just starting out to grow fruit, for pleasure or profit, may obtain in this book a most excellent guide and teacher, and there are few whose experience has been so extended that they may not learn from it much of value. It treats very completely and specifically of location and climate and the tillage and fertilizing of fruit lands as prime factors in attaining high success; and with much detail of the planting and secondary and incidental care of the fruit plantation, including diseases, insects and spraying, and closes with a highly valuable chapter on the picking and packing of fruit, its

storage and shipment to market. It would be well if every one who has it in mind to start, or has the opportunity to care for, an orchard, or a less number of valua ble trees, would first master the subject as it is set forth in this book.

THE CIVIL SERVICE GUIDE. By L. M. Bryan. New York: Dick & Fitzgerald. Pp. 112. Price \$1.

A manual for applicants for government positions under the United States civil service examinations is here presented in revised form. It contains rules, spe cimen examination questions, requirements of applicants salaries, etc., with full instructions for applicants for positions in all branches of the classified civil service of the United States, including the government printing department, the post office, custom house and internal revenue service, as well as the departmental business and the non-classified consular service. It cannot fail to be useful to intending applicants for posi-

The Superior Drill Company of Springfield, O., make of a neatly bound pocket memorandum book, with celluloid title and calendar, an appropriate advertisement of their business.

### SCIENTIFIC AMERICAN BUILDING EDITION

AUGUST, 1897. - (No. 142.) TABLE OF CONTENTS.

No. 1. Two perspective elevations (one in colors) and floor plans of a cottage at Binghamton, N. Y recently erected at a cost of \$3,500 complete Mr. Elfred Bartoo, architect, Binghamton, N. Y. An attractive design in the English style.

No. 2. A cottage at Scranton, Pa., recently erected for Mr. E. Healy, at a cost of \$7,000 complete. Perspective elevation and floor plans. A modern design well treated. Mr. Edward H. Davis, architect, Scranton, Pa.

No. 3. A residence at Prohibition Park, S. I., recently erected for Mr. J. W. Hoban, at a cost of \$3,300 complete. Excellent design of modern American style, with Colonial treatment and detail. Mr. John Winans, architect and builder, Prohibition Park, S. I. Two perspective elevations and floor plans.

No. 4. A suburban school house at Overbrook, Pa., de signed to resemble a private residence instead of a public building. An exceedingly attractive design. Mr. William L. Price, architect, Philadelphia, Pa. Two perspective elevations and

No. 5. Residence at Larchmont, N. Y., recently erected for Mr. Henry A. Van Liew. Pleasing design, with many excellent features. Two perspective elevations and floor plans; also a view of stable with ground plan. Mr. H. C. Stone, architect, New York City.

No. 6. Cottage at Clinton Township, N. J., recently erected for the Protective Building and Loan Association, at a cost of \$1,500 complete. Two perspective elevations and floor plans. Messrs. Hobbs Brothers, architects, Newark, N. J. A neat design.

No. 7. A residence at Larchmont, N. Y., recently erected for Miss Flint. 'Two perspective elevations and floor plans. The design presents a good, modern, sensible house of pleasing appearance treated with Colonial detail. Messrs. G. E. Harney and W. S. Purdy, architects, New York.

No. 8. Residence at Prince's Bay, Staten Island, recently erected for A. W. Browne, at an approximate cost of \$8,000. A rustic design of much artistic merit. Perspective elevation and floor plan. Mr. F. W. Beall, architect, New York

No. 9. Cottage at Forest Hill, N. J., recently completed for Mr. Charles W. Clayton, at a cost of \$3,800 complete. An attractive design. Perspective elevation and floor plan. Mr. H. Galloway Teneyck, architect, Newark, N. J.

No. 10. Residence at Evanston, Ill., recently erected for Mr. C. B. Congdon. A substantial and dignifled design. Two perspective elevations and floor plans. Messrs. A. M. F. Colton & Son, architects, Chicago, Ill.

No. 11. A pulpit of the Cathedral of Treves. Half page

No. 12. Washington Monument, Philadelphia, Presented to the city by the State Society of the Cincinnati and unveiled by President McKinley. One of the most important and imposing monuments ever erected in the United States. Cost \$250,000. Designed by Mr. Rudolph Siemering,

No. 13. Miscellaneous Contents: Palais Royal to be demolished.-Largest hotel on earth.-A quick piece of work.-Drawing materials, surveyors instruments, etc.-Statue of Mercury at the Nashville Exposition, illustrated. — Compoboard.-Improved heaters and furnaces, illus trated.-Stair builders' goods.-Architects' and builders' directory.

The Scientific American Building Edition is issued monthly. \$2.50 a year. Single copies, 25 cents. Thirty two large quarto pages, forming a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates and fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects. All who contemplate building, or improving homes or structures of any kind, have in this handsome work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

The Fullness, Richness, Cheapness and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural Publication in the world. Sold by MUNN & CO., PUBLISHERS. all newsdealers.

361 Broadway, New York.

### Business and Personal.

The charge for insertion under this head is One Dollar of line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the follow

Marine Iron Works. Chicago. Catalogue free. "U. S." Metal Polish. Indianapolis. Samples free. Yankee Notions. Waterbury Button Co., Waterb'y, Ct. Handle & Spoke Mchy. Ober Lathe Co., Chagrin Falls, O. For Business Opportunities in Virginia, address Paul Scherer, Industrial Agt. N. and W. Ry., Roanoke, Va. Improved Bicycle Machinery of every description. The Garvin Machine Co., Spring and Varick Sts., N. Y. Concrete Houses - cheaper than brick, superior to

stone. "Ransome," 757 Monadnock Block, Chicago. The Air Line Limited-New York to Boston, 5 hours in transit. From Grand Central Station 1 P. M. week days only.

For static machines for all purposes, and X ray apparatus, write Reedsburg Electric Mfg. Co., Reedsburg, Wis., U. S. A

The celebrated "Hornsby-Akroyd" Patent Safety Oil Engine is built by the De La Vergne Refrigerating Machine Company. Foot of East 138th Street, New York.

The best book for electricians and beginners in elec tricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4. Munn & Co., publishers, 361 Broadway, N. Y. Send for new and complete catalogue of Scientific

and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.



HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and

some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred

to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of

Minerals sent for examination should be distinctly marked or labeled.

(7187) G. T. M. writes: I would like to have information on melting gold. I melted some in a crucible, and all the gold went through the bottom and left a hard hall that looked like iron. When I went to look for the gold, I could find none. Will you inform me how to prevent the same? A. Mr. C. A. B. says: We advise your correspondent to start with sound crucible. Use saltpeter and borax with gold in melting and have a strong fire.

(7188) G. R. B. writes: As I intend to make the small eight light dynamo described in SCIEN-TIFIC AMERICAN SUPPLEMENT, No. 600, but wish to use it as a regular shunt wound machine, could you kindly let me know what gage wire I should use on the fields and armature, and about how much? I should like to get the same voltage and amperage; perhaps greater amperage, if possible. I should like to put one length of wire on the fields, instead of in sections. A. Use No. 16 American wire gage in the armature, with 10 turns in each coil, making a total of 480 conductors in the armature. Same sized frame as original. Use No. 20 A. W. gage in the field. On each field wind 1,200 turns, making a total of 2,400 turns. This gives about one ampere more than the original design. A field regulator or outside resistance should be used containing about 10 ohms

### TO INVENTORS.

An experience of nearly fifty years, and the preparation of more than one hundred thousand application for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office Scientific American 361 Broadway, New York.

### OF INVENTIONS INDEX

For which Letters Patent of the United States were Granted

AUGUST 10, 1807.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

ч	Acid and making it, naphthylenediamin-sulfo,	
Н	Rosenberg & Krecke	587,757
1	Acid, apparatus for producing carbonic, G.	-
t	Tresenreuter	588,037
	Acid, obtaining oxalic, G. F. Zacher	587,777
	Adjustable wrench, W. J. Jones	587,972
. 1	Aerating and refrigerating liquids, means for, G.	-
	Mills	587,987
١,	Alarm. See Burglar alarm. Electric alarm.	-
,	Electropneumatic alarm.	
	Ammunition, subcaliber, F. J. Rabbeth	587,857
	Animal trap, J. W. West	587,894
1	Armature, S. H. Short	587,871
	Armature for dynamo electric machines, S. H.	
1	Short	587,765
٠l	Armature windings, wire for, S. H. Short	587,764
1	Atomizer, H. B. Weaver	587,890
1	Ax. J. B. Latimer	588,072
	Axle for vehicles, antifriction, S. W. Taylor	588,032
	Bag. See Bicycle tool bag. Hot water bag.	
- 1	Rag holder J. Littleichn	588.073

### Mdvertisements.

### ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line Back Page, each insertion, - - \$1.00 a line 13 For some classes of Advertisements, Special and Higher rates are required.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.



### Foot power Star \* Foot pov Screw... ...cutting athes Automatic Cross feed

9 and 11-inch Swing. New and Original Features Send for Catalogue B. Seneca Falls Mfg. Company, 695 Water St., Seneca Falls, N. Y.

SCIENTIFIC AMERICAN SUPPLE-MENT.—Any desired back number of the Scientific American Supplement can be had at this office for 10 cents. Also to be had of newsdealers in all parts of

## POWER & FOOT SHAPERS, PLANERS. ATHES, MACHINE SHOP OUTFITS SEBASTIAN LATHE CO. 120 CULVERT ST. CINCINN

### THE HALL BRASS PIPE WRENCH.

A PERFECT TOOL WITH FRICTION GRIP. Bushings for all sizes and shapes.

Highly polished pipes made
up without scar or injury.

For Circulars and Prices WALWORTH MFG. CO., 16 Oliver St., BOSTON, MASS.

Queen's Patent "Triple Plate" Toepler-Holtz Electrical Machine.



Can be used at all times of year and in all kinds of weather. Prices range from \$50 to \$50. Lef Circular on application. We carry a complete line of Electrical and Physical Instruments and Apparatus.

QUEEN & CO., inc.
1011 Chestnut St.
Philadelphia, Pa.

Philadelphia, Pa.

### ROCK DRILLS AIR COMPRESSORS SIMPLEST, MOST EFFICIENT and DURABLE.

RAND DRILL CO. 100 Broadway, New York, Send for Catalogue.

## WORK SHOPS

of Wood and Metal Workers, without steam power, equipped with BARNES' FOOT POWER MACHINERY \_

machineky
allow lower bids on jobs, and give
greater profit on the work. Machines
sent on trial if desired. Catalog Free.
W. F. & JOHN BARNES CO.
1999 RUBY ST., ROCKFORD, ILL.

## "It - Cells - About - Cools"



Every Mechanic, Metal Worker, or person interested in Machinery Supplies should have our new 1897 Tool Catalogue. It contains Tilpages, size 10½x7½, and is an exhaustive and instructive list of all tools that may be required. Handsomely bound in cloth, express paid on receipt of \$1\$. Money paid for book will be refunded with first order amounting to \$10 or over. Send stamps or money order.

### MONTGOMERY & CO. MAKERS AND JOBBERS IN

FINE TOOLS, 105 Fulton Street, New York City

The Coburn Patent Trolley Track

## Store Ladders.

PAIR OF STAIRS ALL ALONG THE LINE OF SHELVES. Send for Book.

The Coburn Trolley Track Mfg. Co. HOLYOKE, MASS.



### Going to Build?

Use the best Hardware, which costs so little more than the poor stuff so often used. "Sargent's Book of Designs" will help you and will cost you nothing. If you purpose building, send for it to Sargent & Co., 37 Chambers Street, New York.



## & F. Drill Holder Attachment converting a Breast or Hand Drill into a Bench Drill. Readily clamped to table and holds almost any size or pattern of drill stock. Price \$1.50.

Send stamp for catalogue of machinists tools.

CHANDLER & FAROUHAR. 38 Federal Street, BOSTON, MASS.



	_
Basket making machine, E. Horton. Bearing, step, T. H. Springer Bed, folding, E. A. Ohliger Bed, invalid, P. Jermain. Bed slat, Ryan & Weber. Beer drawing apparatus, H. Metzger. Belt tightener, A. F. Snyder. Bicycle, H. W. Hoeft. Bicycle, T. D. & A. S. McCall. Bicycle balancer, D. J. Reardon. Bicycle brake, E. D. Rockwell. Bicycle brake, W. D. Smith. Bicycle brake, W. D. Smith. Bicycle brake, W. D. Smith. Bicycle fork crown, A. T. Matthews. Bicycle handle bar fastening, R. Dawes. Bicycle handle bar fastening, R. Dawes. Bicycle holder, J. F. Bengert. Bicycle lamp support, L. J. Atwood. Bicycle cok, P. A. Chevalier. Bicycle ock, P. A. Chevalier. Bicycle saddle support, W. L. Decker. Bicycle saddle support, W. L. Decker. Bicycle speed gearing, adjustable, L. T. Buckler Bicycle support, E. W. Gram. Bicycle support, E. W. Gram. Bicycle sol bag, D. D. Frothinsham.	587,734 588 117
Bed, folding, E. A. Ohliger Bed, invalid, P. Jermain	587,853 587,736
Bed slat, Ryan & Weber	587,864 587,844
Belt toupling, J. C. Hosnor	587,906 587,877 588 100
Bicycle, T. D. & A. S. McCall. Bicycle balancer, D. J. Reardon.	587,992 587,859
Bicycle brake, E. D. Rockwell. Bicycle brake, W. D. Smith.	588,088 588,023
Bicycle chain adjustment, W. L. Decker	587,710 587,984 587,982
Bicycle holder, J. F. Benge rt. Bicycle holder, S. Elliott.	587,917 587,945
Bicycle lamp support, L. J. Atwood. Bicycle lock, P. A. Chevalier.	587,912 587,793
Bicycle pedal, H. Tudor	588,039 588,038 587,711
Bicycle speed gearing, adjustable, L. T. Buckler Bicycle support, E. W. Gram.	587,787 587,811 588,059
Bicycle speport, E. W. Gram. Bicycle tool bag, D. D. Frothingham. Bicycles, power driver for, J. H. Fox. Bicycles, rear fork end for, R. G. Cornforth Bicycles, etc. transportation chest or trunk for.	588,059 587,806 587,933
Bicycles, rear fork end for, R. G. Cornforth  Bicycles, etc., transportation chest or trunk for, C. E. Benton  Bin. See Coal bin.	587,933 588,050
Bin. See Coal bin. Binder, cloth sample. M. Steinthal	
Bin. See Coal bin. Binder, cloth sample. M. Steinthal Binder, temporary, Miller & Bauer. Boat, folding. H. R. Young. Bobbin and thread holder, T. J. Murdock. Boiler. See Water heating boiler. Boiler cleaner, J. M. McMichael. Boilers, apparatus for supplying oil to, W. R. Park.	587,986 587,986 587,905 587,748
Bobbin and thread holder, T. J. Murdock Boiler. See Water heating boiler.	587,748
Boilers, apparatus for supplying oil to, W. R.	587,999 587,854
Boilers, apparatus for supplying oil to, W. R. Fark.  Boring machines, combined gage and stop for, H. W. McCormick.  Bottle, C. B. Wilte.  Bottle, C. F. Young.  Bottle and stopper therefor, C. R. Gibson.  Bottle stopper, J. B. Burrow.  Bottle stopper, C. De Quillfeldt.  Bottle stopper, C. De Quillfeldt.  Bottle stopper, C. Beg.  Box. See Folding box. Musical box. Work box.  Brake. See See Bicycle brake.  Brake system, F. M. Ashley	587,993
Bottle, C. B. White. Bottle, C. F. Young	587,895 587,776 587,955 587,790
Bottle stopper, J. B. Burrow.	587,955 587,790
Bottle stopper, O. Selg	588,009 587,759
Brake. See See Bicycle brake. Brake system, F. M. Ashley587,690, 587,691,	587,911 587,926
Bridge, draw, W. H. Breithaupt Broom holder, H. A. Swan	587,926 588,030
Brush, H. E. Henry. Brush, fountain, M. Arbuckle	587,964 588,047 588,007
Burglar alarm, C. Coleman. Burglar alarm, C. L. Knapp.	587,931 587,977
Cabinet or paper case, J. T. Hoyt	587,977 588,066 587,729
Camera, kinetographic, J. Rous	588,014
Can. See Oil can. Cannon muzzle attachment, J. H. Hammer. Canvas stretcher. H. G. Tarnke. Capstan, E. H. Whitney Car and brake pipe coupling, combined, J. W. Bryan. Car equalizer. T. C. Kennedy. Car fender, H. Burden. Car fender, H. Burden. Cars, automatic switching device for street railway, B. J. Titus. Carbids, process of and apparatus for making metallic, I. L. Roberts. Carbureter, F. H. Shaver. Carding engine, R. Griffin.	587,731 587,882 587,897
Car and brake pipe coupling, combined, J. W. Bryan.	588,052
Car equalizer, T. C. Kennedy Car fender, H. Burden	587,834 587,789 587,880
Car fender, street, J. Steele	587,880
Carbids, process of and apparatus for making metallic. I. I. Roberts.	588,036 588,012
Carbureter, F. H. Shaver	587,867 587,813
Carding engine feeding mechanism, J. Hearn Carpet fastener, C. H. Crawford	587,867 587,813 587,815 587,935 587,755 588,081
Carriage, papy, J. Paulsen Carriage wheel, W. A. Pentecost	587,755 588,081 587,849
Carbureter, F. H. Shaver. Carding engine, R. Griffin. Carding engine feeding mechanism, J. Hearn. Carpet fastener, C. H. Crawford. Carriage, baby, J. Paulsen. Carriage wheel, W. A. Pentecost. Carriage wheel, W. A. Pentecost. Carrior, W. F. Morse. Carton blank, W. B. Howe et al. Catridge clip, temporary, T. C. Johnson. Case. See Retailing case. Cash register, T. Carney.	587,967 587,970
Case. See Retailing case. Cash register, T. Carney	
Chain, drive, F. A. Foster Chair. See Reclaining and folding chair. Chair or stool combination. I Mitchell	587,950
Chair or stool, combination, J. Mitchell	587,845 587,863 587,978
Cigarette, W. A. Hudson	587,827 587,825
Cigarette machine, continuous, Hudson & Harti-	587,828 587,858 587,826
Cigarettes, making, W. A. Hudson	587,826
Cigarette ripping machine, E. Rankin Cigarettes, making, W. A. Hudson. Cigarettes, process of and apparatus for making, W. A. Hudson. Circuit breaker, H. Lemp.	587,824 587,838
Clamp. See Tentering machine clamp. Clamp, F. J. Yockel. Cleaner. See Boiler cleaner. Clip. See Paper clip.	
	587,927
Coal bin, A. G. Hamburger. Collar fast ener, P. Mullane Commutator and lead, S. H. Short	587,959 587,850 587,868 587,954
Compass, ship s, L. Gathmann	587,868 587,954
	587,799 587,842
Condenser, vapor, S. G. Merrick. Conveyor, W. W. Willson. Copper, hardening, J. Reuter. Cord or twine cutter, H. E. Evans.	587,901 587,861 587,716
Cork, L. Danuau	587,716 587,835
Murtrie	587,751 587,981
Murtrie. Corking apparatus, C. Von der Linden. Corkscrew, W. A. Williamson. Corn sheller, J. Q. Adams.	587,900 587,906 588,028
Corn sheller, J. Q. Adams	588,028
coupling. Crate, shipping, S. E. McDougal	587,995 588,001
Crate, shipping, S. E. McDougal. Crib child's, F. D. Palmer. Cultivator, wheeled, H. G. Thompson Cuttain fixture, A. Southwell. Cutter. See Cord or twine cutter.	588,033 588,024
Cutter. See Cord or twine cutter. Cutter head and knife, J. B. Vuncanon	588,041
Cutter head and knife, J. B. Vuncanon	587,856
kins.  Depurator, K. L. Sandrowski.  Display rack, J. W. Ennis.	588,082 588,092 587,946 587,823
Door closing appliance, Holbrook & Goodwillie Door, panel, J. Martin	587,823 587,983
Depurator, K. L. Sandrowski. Display rack, J. W. Ennis. Door closing appliance, Holbrook & Goodwillie. Door, panel, J. Martin. Drill bit sharpening and dressing apparatus, B. F. Anderson. Driving wheel, chain, H. Morrison.	587,909 587,848
Egg beater, W. J. Johnson	588 112
Electric alarm, K. Penney	588,044 588,004 587,733
Electric currents, apparatus for generating constant, C. N. Black Electric machines, field magnet for dynamo, S.	587,921
H. Short	587,869 587,798 587,769
H. Snort. Electric meter, J. F. De Bauw. Electric motor, J. L. Thoma. Electric motors, means for controlling, S. H.	
Short	588,021 587,937
	587,822
Electrochemical treatment of fibrous material, method of and apparatus for, G. H. Pond Electrochemical treatment of straw or other	588,085
fibrous materials, process of and apparatus for, G. H. Pond Electrodepositing device, J. Bossard	588,084 587,782
Electrodepositing device, J. Bossard	
Electrolysis, apparatus for, A. E. W. Boucher Electrolysis of underground pipes and locating	587,829 587,696
transmission losses annaratils for detecting	587,698 588 035
H. P. Brown.  Electrolytic apparatus, W. Thum.  Electropneumatic alarm, G. W. MacKenzie  Elevator. See Water elevator.  Elevator bucket, A. W. Brash  Elevator controller lock, W. C. Fahy  Engine. See Carding engine. Gas engine. Rotary engine. Steam engine.	588,035 587,998
Elevator bucket, A. W. Brash	587,697 588,106
Engine. See Carding engine. Gas engine. Rotary engine. Steam engine.  Engine igniter avalogiva P Mueller	
engine. Steam engine. Engine igniter, explosive, P. Mueller	587,747 588,078 587,898
Envelope or paper box, carton, K. Lanz Eophones or sound receiving instruments screen	587,898 587,836
for, L. E. Thorne  Excavating and conveying machine, J. L. Potter	588,034 588,006
Excavating and conveying machine, J. L. Potter Exercising machine, E. Sandow.  Extractor. See Lemon juice extractor. Fastening device, B. Wolhaupter.  Felt buffing or finishing machine, C. E. T. Dedicke	587 772
	588,055
Fences, device for applying stay wires to wire, C.	588,065
Fencing device, C. M. Graham	587,810 588,045
Fertilizer diatributer, hand, E. F. Anderson Filaments for incandescing mantles, making, W. L. Voelker	
L. Voelker. File cutting machine, J. Turner. Filter, barrel, E. D. Sloan. Filter, barrel, E. D. Sloan.	588,040 587,885 587,874
Filter, barrel, E. D. Sloan.  Filter cleaning apparatus, I. H. Jewell.  Filtering cane juice, machine for, J. A. Lombas	588,074

(Continued on page 120)

### Lathe and Outfit of Tools \$6 SPECIAL OFFER!

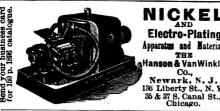
For \$65 cash, with order, we will deliver to any part of the U. S. East of the Mississippi River, one of our 9 x 2 Screw Cutting Foot Lathes complete, as described in our catalogue, with a set of ten metal-working tools, se of four dogs, one 5" chuck with two sets of jaws, fitte to lathe, and a set of twist drills, 1-16 to 16" by 32nds. This is a Special Offer, and only for immediate acceptance. This Adv. will not appear again. Satis faction guaranteed or no sale. Add ess SEBASTIAN LATHE CO., 120 Culvert St., Cincinnati, O



THE TIN PLATE INDUSTRY IN THI Onited States.—An interesting paper, showing the extraordinary development of the tin plate industry in this country, and the serious competition into which is now entering with the British industry. With 18 illustrations. Contained in SCIENTIPIC AMERICAN SUPPLE MENT. Nos. 1019, 1029, 1021, 1022 and 1023 Price 10 cents each, or 50 cents for the series. To be had at this office and from all newsdealers.



. . PHYSICAL AND SCHOOL APPARATUS INDUCTION COILS for experiments in X rays and other electrical work. Catalogue Free E. S. RITCHIE & SONS, BROOKLINE, MAS



A mill for crushing ores.

Equal in efficiency to a five stamp battery, and at the prospector and mining capitalist. Send for catalogue.

GATES IRON WORKS, Dept. C, 650 Elston Ave., Chicago, U, S. A.

THE CHICAGO DRAINAGE CANAL. Description of a great engineering work undertaken prevent the contamination of the city's water supply with 6 lliustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1017. Price 10 cents. To had at this office and from all newsdealers.



## **Draughting**

Established in 1848. And Supplies for Architects.

Engineers, and Instruments Draughtsme

FROST & ADAMS CO., 39 Cornhill, Boston, Mass



Combination Lathe Chucks, Plain Universal Lathe Chucks, Independent Lathe Chucks. Made by Westcott Chuck Co., Oneida, N. Y., U. S. Ask for catalogue in English, French, Spanish or Germa FIRST PRIZE AT COLUMBIAN EXPOSITION, 1893.

## Famous Springs at Deer Park

A million and a half gallons of the purest water or arth, is the daily out-put of the famous Bolling Springe Garrett County, Maryland. In order that nothing car contaminate the Springs, one bundred acres of land surrounding it, are fenced in. In addition, a wire building covers the Springs, so that leaves cannot fall into the water. It is from these extraordinary Springs that Deer Park Hotel receives its water supply, the water being piped direct to the hotel. The medical fraternity now concede that in the matter of health, the question of pure water stands at the head and front. No summer resort combines so many healthful features. The air is wonderfully pure and invigorating; cool nights, with absolutely no mosquitoes; the finest cuisine, with persanitary arrangements, makes Deer Park Hotel the ideal resort. - News item.

	Scientif	ic	
_			
5	Fire extinguisher, hand chemical, Pomfret & Keating. Fishing nets, lead line controller for, T. Lindsay Flushing apparatus, C. I. Daggett. Folding box, R. H. Filmer. Fork. See Pitchfork. Frame joint, Billing & Partridge. Fumigator, O. Sallady. Furnace. See Melting furnace. Furnace, J. Cruze. Furnace charging mechanism, J. P. Eck Furnace door operating device, H. B. Sprague Gage. See Track gage.	588,005 587,839	
of 25	Folding box, R. H. Filmer	587,804	
in et ed	Frame joint, Billing & Partridge Fumigator, O. Sallady Furnace. See Melting furnace.	587,695 588,090	
te 8-	Furnace, J. Cruze	587,796 587,942 588,025	
0.	Gage. See Track gage. Garment binding, G. H. Stedwell	587,879 587,832	
7	Garment binding, G. H. Stedwell. Garment supporting loop, E. W. Jewett. Gas, apparatus for producing acetylene, C. F. J. B. Becherel. Gas engine, H. C. Hart	587,914 588,062	
	Gas, incandescent, R. Moscheles. Gases, apparatus for causing chemical changes in, V an der Sleen & Schneller. Gases, apparatus for mixing liquids with, O.	588,077 587,770	
•	Gases, apparatus for mixing liquids with, O. Franz. Gate operator. C. E. Morris.	587,952 587,847 588,064	
	Franz.  Gate operator, C. E. Morris. Gearing, chain, T. Hewett. Glassware, apparatus for manufacturing, E. Robinson.	588,064 588,013	
	Glassware, apparatus for manufacturing, E. Robinson. Gloves, hand measurer for, T. C. De II sie Gold separator, hydraulic, Barr & Johnson. Grave platform, B. P. Walker. Grinding mill, M. F. Abbe Guide post, O. Leuschner. Gun barrel, C. D. Durnford. Harwesters, bundle carrier for corn, J. W. Pridmore.	587,940 587,780 587,888	
Ē	Guide post, O. Leuschner.	587,688 587,744 587,801	
in it	Harmonica, W. B. Fairfield Harvesters, bundle carrier for corn, J. W. Prid-	588,107 588,008	
8- E- 3.	Harvesting machine bundle carrier, M. Kane Hat brime machine, G. Segschneider	587,833 588,020	
ad		587,944 587,741 587,709	
•	Hay press, J. C. Couch	587,717 587,724	l
•	Holder, J. F. Gates. Horse detacher, J. L. Bouma. Horse rake, C. S. Sharp. Horse tail controller, F. M. Sharp. Horsebac G. Singleton	587,717 587,724 587,924 587,762 587,763 588,022 587,758 587,919 587,722	
<b>\$</b>	Horseshoe, G. Singleton Horseshoe, elastic, J. F. Seiberling	588,022 587,758 587,919	
***	Horseshoe, soft tread, F. Galley	587,722 587,902	
•	Horse tail controller, F. M. Sharp Horseshoe, G. Singleton Horseshoe, elastic, J. F. Seiberling. Horseshoe elastic, J. F. Seiberling. Horseshoe pad, H. W. Billington Horseshoe, soft tread, F. Galley. Hose pipes, device for draining, drying, and preserving, W. P. Wilson. Hot water bag, Z. Yamabe. Hot water heater, S. H. Paxton. Hub, wagon wheel, J. D. Mattison. Ice chest or box, J. A. Hilcken, J. H. Martin. Injector, W. T. Me ssinger. Ink, making printing, D. J. Ogilvy. Insulator, wire, G. Ashby. Jack. See Lifting Jack. Jewels hy Roentgen rays, device for examining,	588,043 588,003 587,841	
•	Ice chest or box, J. A. Hilcken	587,819 587,840 587,843	l
	Ink, making printing. Ď. J. Ogilvy Insulator, wire, G. Ashby Jack. See Lifting jack.	587,852 588,048	l
	Javels by Roentgen rays, device for examining, E. Thomson	<b>587,88</b> 3	
	knife. R. W. Gormly	587,957	l
s.	Lamp, W. J. Smart Lamp, bicycle, I. M. Rose Lamp, electric arc, J. McLaughlin	587,875 588,115 587,750	l
Ĺ	Knitting machine, R. W. Gormly. Lamp, W. J. Smart. Lamp, bicycle, I. M. Rose. Lamp, electric arc, J. McLaughlin. Lamp with bracket, bicycle, Williams & Meyer. Lantern, W. J. Bycraft. Lathe or planer indicator, F. Coffin. Lead from lead sulfate and lead chloride, mak-	587,791 587,930	
g	Lathe or planer indicator, F. Coffin. Lead from lead sulfate and lead chloride, making oxysalts of, S. Ganelin. Lead pigments, process of and apparatus for manufacturing white, A. B. Walker. Leather, coloring. W. M. Norris. Leather splitting knife, F. J. Bringham 587,783, Lemon juice extractor and grater, H. H. Wines. Lever and grip, controlling, G. Harmelink. Lifter. See Pan or plate lifter. Lifting jack, J. C. Hackett. Lightning arrester, E. M. Hewlett.	587,808 588.042	
ial.	Leather, coloring. W. M. Norris. Leather splitting knife, F. J. Bringham587,783, Lemon nince extractor and grater H. H. Wines.	588,000 587,784 587,903	
(le	Lemon squeezer, F. A. Redmon. Lever and grip, controlling, G. Harmelink Lifter. See Pan or plate lifter.	587,860 587,732	l
Y.	Lock. See Bicycle lock. Master key pin lock.		
<b>-</b>	Lock jaw wrench, Keith and Colton. Locomotive, electric, R. Eickemeyer 588,104, Locomotive, road, E. K. Dutton. Loom, electrically operated, Chaplin & Halloran Loom, lappet, E. H. Ryon. Loom reeds, process of and apparatus for clean- ing and polishing, M. Walter. Mail sack delivering apparatus, L. A. Fisher. Manhole closure, A. Hewens. Master key pin lock, H. R. Stadtmuller. Match safe and cigar cutter, combined, J. Bond. Meat block trough, J. L. Foltz. Melting furnace, portable, H. W. Falk. Merchandise in transit, receptacle for, H. D. Bokop.	587,974 588,105 587,714	
Ē	Loom, electrically operated, Chaplin & Halloran Loom, lappet, E. H. Ryon Loom reeds, process of and apparatus for clean-	588,101 587,865	ŀ
ŧ	ing and polishing, M. Walter.  Mail sack delivering apparatus, L. A. Fish er  Manhole closure, A. Hewens	587,892 587,721 588,063	
	Mater key pin lock, H. K. Stadtmuller. Match safe and cigar cutter, combined, J. Bond. Meat block trough, J. L. Foltz	588,026 587,781 588,057	١
ŧ	Merchandise in transit, receptacle for, H. D. Bokop.  Merchandise receptacle, A. E. Williams.	587,718 587,923	l
_	Metal mould, Griffith & Slattery.  Meter. See Electric meter.  Mill See Chiefith Windmill	587,899 587,728	
to ly.	Merchandise receptacle, A. E. Williams. Metal mould, Griffith & Slattery. Meter. See Electric meter. Mill. See Grinding mill. Wind mill. Mining machine, H. H. Bliss. Mining machine, C. E. Davis (reissue). Mould. See Metal mould.	588,051 11,625	١
be 			
3	Motion, apparatus for transmitting rotary, E. K. Dutton.  Motor. See Electric motor. Water motor. Music leaf holder, Wood & Wilkinson.  Music leaf turner, Knout & Cook.  Musical box, G. Bourquin.  Musical box, G. Bourquin.  Musical instrument bridge, H. E. Townsend.  Night robe, C. Arnold.  Nipple, nursing, W. M. Decker.  Numbering machine, E. G. Bates.  Nut for spindles, lock, A. Josephs.  Nut lock, J. H. Hartman.  Nut lock, J. Walker.  Nuts on bolts, machine for putting, J. S. Broughton.	587,774 587,742 587,925	
	Musical box, P. C. Jaccard. Musical instrument bridge, H. E. Townsend Night robe, C. Arnold.	587,831 587,884 587,910	
	Nipple, nursing, W. M. Decker Numbering machine, E. G. Bates Nut for spindles, lock, A. Josephs.	587,939 587,913 587,737	
ı	Nut lock, J. H. Hartman Nut lock, J. Walker Nuts on bolts, machine for putting, J. S. Brough-	587,962 587,889	١
ı	ton	587,785 588,011 588,076	
_	ton. Oil can, E. Robards. Ore, treating sulfd, B. Mohr. Organ, reed, S. Jenkinson. Packing and storing vessel, W. C. Snow. Packing for Journal boxes, E. B. Johnston. Pad. See Horseshoe pad. Padlock, permutation, C. P. Chase. Padlock, permutation, E. S. Hodgson, Jr. Pan or plate lifter, F. Carlson. Paper bag fastener, O. M. Chesney. Paper bag machine, E. E. Claussen. Paper lip, J. H. Grant.	588,067 587,876 587,971	
	Padlock, permutation, C. P. Chase	587,703 587,821	١
n.	Paper bag fastener, O. M. Chesney. Paper bag machine, E. E. Claussen.	587,928 587,929	١
e.	Paper feeding device, C. F. Forste	588,058 587,918	1
в.	Paper oag macnine, E. E. Claussen. Paper fleding device, C. F. Forste. Paper feeding device, C. F. Forste. Paper making machine, Bidwell & Reynolds Pedestal, folding, J. H. White Peroxids and caustic alkalies, process of and apparatus for manufacturing metallic, L. P. Hulin. Photographic plate holder, Mutschler, & Robert.	587 220	
t's	Huin Photographic plate holder, Mutschler & Robertson Son Pick, P. Bishop Pin. See Clothes pin.		
	Pin. See Clothes pin.		
	Piston for rotary pumps, blowers, etc., Ames &	587,907 587,980	١
ed he	Planter, corn, W. L. Beall	587,694	
	Pocket knife, J. Ball	587,692	1

Pocket knife, J. Ball.

Polishing wheels, process of and apparatus for manufacturing. A. Johnston. 587,692 | Second | S

(Continued on page 127)

## Buy Telephones

THAT ARE GOOD--NOT "CHEAP THINGS."
The difference in cost is little. We guarante our apparatus and guarantee our customers against loss by patent suits. Our guarantee and instruments are both good. WESTERN TELEPHONE CONSTRUCTION CO. 250-254 South Clinton St., Chicago. Largest Manufacturers of Telephones exclusively in the United States.



DRILLING MACHINES of all kinds and sizes, for drilling wells for house, farm, City and Village Water Works, Factories, Ice Plants, Breweries, Irrigation, Coal and Mineral Prospecting, Oil and Gas, etc. Latest and Best. 30 years experience. WRITE US WHAT YOU WANT.

137 Mention this paper, LOOMIS & NYMAN, Tiffin, Ohio.

### POWER? POWER? POWER! Fifty per cent. increase at no additional expense.

VICTOR VAPOR ENGINE. Steam and Vapor Launches Row and Sail Boats.

Send for catalogue. Specify one wanted.
THOS. KANE & CO.
64-66 Wabash av., Chicago.

This beats Wind, Steam or Horse Power. We oder the WEBSTER 2½ actual horse power GAS ENGINE

for \$150, less 10% discount for cash Built on luterchangeable plan. Built of best material. Made in lots of 10% therefore we can make the price. Box-ed for shipment, weight 200 pounds. Made for Gas or Gasoline. 127 Write for Special Catalogue,

WEBSTER M'F'G CO., 1074 West 15th Street, CHICAGO.

### % H. P. Pierce Gas or Gasoline Engine for any light work. ¾ H. P.

**Marine and Launch Outfit** STATIONARY ENGINES

to 25 H.P. Send for catalog, stating size wanted.

PIERCE ENGINE CO., 17 N. 17th Street, Racine, Wis.

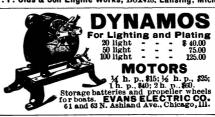


Motor controlled from bow. Valve movement, 12 to 1. 16 to 60 ft. Launches. Twin Screws a specialty. 1, 2, 3, 5, 7, 12, 14 and 20 h. p. No licensed engineer or pilot required. Speed and Safety guaranteed. No dangerous Naphtha or Gasoline used. No disagreeable vibration. Marine Vapor Engine Co., ft. Jersey Av., Jersey City, N.J.



USE OF HOT AIR IN DRYING.—BY E. M. Cook, A paper in which the author demonstrates the great economy of the use of hot air over that of steam for drying many materials, especially those in lumps, grain, or powder. With 3 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 1022 and 1023. Price 10 cents each. To be had at this office and from all newsdealers.





### THE IMPROVED GAS ENGINE.

Two cylinders in one casting. Occupies less space and weighs less for its power than any engine made. Can be used wherever power is required. Either stationary or marine. No fire. No heat. No smoke. No licensed engineer required. SINTZ GAS ENGINE CO., Grand Rapids, Mich., U. S. A.

### MAGAZINE Cameras BU CAPACITY, 18-4 X 5 PLATES

BULLARD CAMERA CO., WHEELING, W. VA BEAUTIFUL AND FAULTLESS CATALOGUE FREE.



Make money printing for others. Our \$18 Press prints a newspaper. Type setting easy, printed rules. Send stamp for catalogue, presses and supplies, to the factory.

SURVEYING AND MAPPING
Coal & Metal Mining: Prospecting; Electricity;
Machine Design: Stationary, Locomotive and
Marine Engineering; Architecture; Plumbing;
Allerd Railroad, Municipal, 31 COURSES Hydraulic Municipal, 31 COURSES & Bridge Engineering; Sheet Metal Pattern Cutting; Mechanical and Architectural Drawing; Book-Keeping; Shorthand; Euglish Branches. All who GUARANTEED SUCCESS. fees Moderate, Advance or Installments.

Orcular Free; State subject you wish to study.

International Correspondence Schools, Box 942, Serante



A State technical school. Practical work. Special facilities for men of age and experience. Elective system 45 weeks a year. Non-resident tuition \$150 a year. For Catalogues, address
DR. M. E. WADSWORTH, President, Houghton, Mich.

### LEHIGH PREPARATORY SCHOOL

Best recommendations. Young men are prepared for Lebigh University, Yale, Harvard, Cornell, Princeton, etc. Over seven hundred pupils of this school have been admitted to Universities during the past eighteen Lebign Danson and the period of the period o

Bliss School of Electricity

The only institution teaching practical electrical engineering exclusively. Laboratory equipment excellent.

Courses open October 1st. Catalogue on application.

Shorthand by Mail Thoroughly taught by re-porters. Catalogue and first lesson Free. Potts Shorthand College, Williamsport, Pa.



EDGE TOOLS-•~ are often nearly ruined by using a grindstone not adapted to the work. Our
quarries produce a large variety of grits
suitable for grinding any tool.

B May we send you our Catalogue,
which will give you some information?

GRAFTON STONE COMPANY,
No. 80 River Street,
Grafton, Ohio

### STEREOPTICONS, MAGIC LANTERNS

and all accessories for School and Church Entertainments and adult and juvenile amusement and instruction. Microscopic instruments for physicians and all professional uses. Feat for free litustrated catalogue to CHAS. HESELER. Es





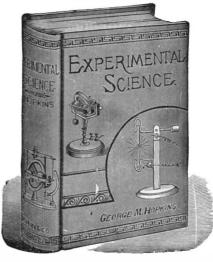
DRY BATTERIES.—A PAPER BY L. K. Bohm, treating of open circuit batteries, historical dry batteries, modern dry batteries, Heliesen's battery, Bryan's battery, Koller's battery, and the efficiency of dry cells. With three illustrations. Contained in Scri

## MODELS UNION MODEL WORKS & GEARS 193 CLARK CHICAGO.

## Experimental *S*cience

By GEO. M. HOPKINS.

17th Edition Revised and Enlarged.



840 pages, 782 fine cuts, substantially and beautifully bound. Price in cloth, by mail, \$4. Half morocco, \$5.

This splendid work is up to the times. It gives young and old something worthy of thought. It has influenced thousands of men in the choice of a career. It will give anyone, young or old. information that will enable him to comprehend the great improvements of the day. It furnishes suggestions for hours of instructive recreation.

Send for illustrated circular and complete table of contents. . . .

MUNN & CO., Publishers,

Office of the . . SCIENTIFIC AMERICAN, 361 BROADWAY, - NEW YORK. Ready September 1st.

Stage Illusions and Scientific Diversions Including Trick Photography.

COMPILED AND EDITED BY ALBERT A. HOPKINS

WITH AN INTRODUCTION BY HENRY RIDGELY EVANS.

Over 500 pages. Over 400 illustrations.

This is a new and unique work on magic art. It contains exposés of the sleight-of-hand feats and illusions of the most famous conjurors of modern It is profusely illustrated with over 400 engravings. The subjects treated include interesting Biographies of Celebrated Conjurors, the Mysteries of Modern Magic, Ancient Magic, Science in the Theater, Automata, Curious Toys, and Photo-graphic Diversions. The very latest developments in each line will be given. Thus, under photography the projection of moving pictures is taken up for the first time in book form.

An illustrated circular of this work is now ready, and

will be mailed on request to any part of the world. The book will be sent, postpaid, on receipt of \$2.50.

MUNN & CO., PUBLISHERS, 361 BROADWAY, NEW YORK CITY.

THE NEW BRISTOL COUNTER



Registers an accurate account of work done on printing presses, grain tallies, weighing, measuring and other automatic machines. Counts up to 1,000 000 and repeats automatically. Simple, accurate, durable. Special counters to order. F. Send for circular.
C. J. ROOT, Bristol, Conn, U. S. A.

### HANDY WHEN IN A HURRY



A new article which no machine shop should be without. Keeps all drills compact, with their gauges adjoining. Can lay your finger in a second on the exact drill you want. THE WEISS DRILL CASE

is of east iron with spring hinge bar that raises at touch of the fin-ger. Contains 60 round bottomed receptacles, bolding as many sizes of drils, with drill-rauge oppo-site. Louis T. Weiss, 231–235 Graham St., Brooklyn, N. Y.

WE ARE RELIABLE MAKERS OF HIGH GRADE



## Stereopticons and Tagic Canterns

arranged for electric light lime and oil light and accessories. All our leaving our factory. We charanteed newfers of the control of the cont struments, etc., are guaranteed perfect before leaving our factory. Write to PETERS, MANTZ & CO. (many years with the late Mr. Chas. Beseler), 125 and 127 Worth Street, New York City.

### WORK MODEL

We are prepared to assist the trade and inventors in solving mechanical problems, also manufacturing models and stock.

CENTURY MACHINE CO., 576 W. Broadway, New York Complete outfit of modern machinery and tools.



WOODEN TANKS.

For Railroads, Mills and Manufactories. Builders of Steel Towers and Tanks. La. Red Cypress Wood Tanks a specialty. W. E. CALDWELL CO., 217 E. Main Street, Louisville, Ky.





**ELECTRIC STOVE.** Enameled slate base. Hot in two minutes. Emergency cooking or heating—always ready. Price \$5.00. Complete, ready for use, with cord and plug. Give make of lamp socket and voltage.

AMERICAN ELECTRIC HEATING CORPORATION, Havemeyer Bldg., New York. Monadnock Bldg., Chicago.



ELECTRO MOTOR, SIMPLE, HOW TO make.—By G. M. Hopkins. Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from abattery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With II figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 641. Price 10 cents. To be had at this office and from all newsdealers.



UP TO DATE!

Sash, window, G. Moore
Saw, cross cut, S. Hershey
Scissors, J. W. Jahn
Scraper, F. Sisson
Screen. See Window screen.
Screw cutting machine, A. Green.
Screw cutting tool, F. G. Echols.
Seal and tag, E. J. Brooks
Seed drill disk shoe, W. Stephenson.
Seeds, apparatus for treating oleaginous, A. Euston.
Separating machine, O. M. Morse . 587,727 . 588,056 . 588,100 . 588,027 ton. 587,800

Separating machine, O. M. Morse. 587,990
Separator. See Gold separator. 587,908
Sewing machine, Ammerman & Toof. 587,908
Sewing machine binders, tension device for, Coan & Eaton. 587,707
Sewing machine binding attachment, P. Schoen. 588,019
Sewing machine feeding device, Coan & Eaton. 587,706
Sewing machine, shoe, Alley & Winkley. 587,708
Sewing machine, shoe, Alley & Winkley. 587,708
Sheller. See Corn sheller. 580,083
Shoe is steening, E. Pohn. 588,083
Shoe stretchers, expansible cover for, J. Herbst. 587,935
Sifting attachment for ash chutes, T. Connor. 587,932
Signal receiving apparatus. W. F. Banks. 57,832
Sink draining board and support, J. Foran. 587,949
Skate, H. & P. Thielscher. 587,768
Smocking, machine for making, Blount & Robin. 588,089
See Control of the Control o

 Smocking, machine 10r measure.
 500,057

 80n.
 568,066

 Spark arrester, J. H. Swartzbaugh.
 583,096

 Stamp, mucilage, W. E. Gibbs
 587,726

 Steam engine, L. Serpollet
 587,760

 Steamer, wheat, J. D. Nagel
 588,079

 Sterilizer, liquid, J. C. Nielsen
 587,851

 Stone, manufacture of objects of initation, L. A.
 Carchev

Valve, C. E. Drown.
Valve, H. H. Riggin.
Valve, H. H. Riggin.
Valve, Balanced slide, I. C. Griffith
Valve for air or gas compressors, etc., J. Clayton.
Valve for air or gas compressors, etc., J. Clayton.
Valve for air or gas compressors, etc., J. Clayton.
Valve registering device, C. L. Quimby.
Vault, grave, F. C. Rheubottom.
Vehicle, motor, C. E. & J. F. Duryea.
Vehicle, motor, C. E. & J. F. Duryea.
Vehicle, self-propelled, F. Damour.
Velocipede handle protector, M. Goodman et al..
Velocipede steering gear, T. H. Simmonds...
Vending apparatus, prepayment, Morgan &
Blakeslee.
Visc, G. A. McKenzie.
Visc, G. A. McKenzie.
Visc, G. A. McKenzie.
Wagon body angled of the complete of

### TRADE MARKS.

Bicycles, Iver Johnson Sporting Goods Company.. 30,496 Biscuit, crackers and pilot bread, New York Biscuit 

### DESIGNS.

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for city or country. No bath room necessary. With and without heater. Moderate cost. Twenty of Tabs, Heaters, etc.

MOSELY FOLDING

MOSELY FOLDING

MOSELY FOLDING

SATH TUB CO.

358 K Dearborn St.

CHICAGO.

PAPER A Revolution in Photographic Printing. When exposed to the same light, prints 500 times quicker than albumen . .

GLOSSY or MATT. No dull or rainy weather to interfere with your work.

No dark rooms nor complicated manipulation.

Developed and toned as fast as the printing frames can be filled. Permanent prints.

The greatest paper for hot or damp climates. So cents in stamps brings two sample duzen cab's, developer and three sample prints. Nepera Platinoid, Enameled and Rough Bromide Papers are the best and most uniform in the market. Nepera P O P, an insoluble gelatine paper. Rembrandt, a Matt Printing-out Paper.

Nepera Chemical Go. Sole Manufacturers, NEPERA PARK, N. Y. Paris, France, 8 Rue Martel. Chicago, Ili., 21 Quincy St.

IMPROVED WASHBURNE'S PATENT SCARF FASTENER AND HOSE SUPPORTER.

It is more than a mere Scarf Fastener. With it you can attach together two articles of almost any kind—a pile of papers or the wristbands of your shirts. And, like the Hose Supporter, it holds tight, prevents slipping and will not injure or pierceany fabric. Samples of either, by mail, Io cents. Ilius. catalog free.

AMERICAN RING (70).

Dept. S. A., Waterbury, Conn.

New York Rubber Stamp

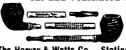
Received the only Medal award-ed to any Vulcanizer at World s Fair, Chicago. Circulars Free.

## STORAGE BATTERIES THE WILLARD BATTERY CO, CLEVELAND, O.

NO MORE "POISON IN THE BOWL"

No excuse for smoking foul pipes,
The "Mallinckrodt" Patent Nicotine Absorbent and Ventilated Tobacco Pipe
will render smoking a healthy enjoyment. Try
it and you will become convinced. See notice,
Sci. Am. of August 7, 97.

Manufactured only by



Manufactured only by
The Harvey & Watts Co., Station E, Philadelphia, Pa
and No. 275 Canal Street, New York.

Illustrated Circulars "S. A." mailed on application.



Automatic contro of the Vacuum Positive. Write for particulars to SWETT & LEWIS CO., Manu'rs o: X Ray Supplies, 11 Bromfield St., Boston, Mass.

ACETYLENE APPARATUS.—ACETY-lene number of the Scientific American Supplement, describing, with full illustrations, the most recent, simple, or home made and commercial apparatus for generating acetylene on the large and small scale. The gas as made for and used by the microscopist and student; its use in the magic lantern. The new French table lamp making its own acetylene. Contained SCIENTIFIC AMERICAN SUPPLEMENT, No. 1037. Price Il cents. To be had at office.



## Drying Machines

for Grain, Sand, Clays, Fertilizers, Phosphates, Green Coffee, Wet Feeds, Salt, Sugar, Chemicals, etc. 15 Years in operation. Send for 6th illustrated catalogue. S. E. WORRELL, Hannibal, Mo.

### Phonographs, Graphophones, Projectoscopes, Kinetoscopes,

RECORDS, FILMS, ETC.

36 page illustrated catalogue sent free on receipt of 2-cent stamp. The Edison Phonograph Co., 427 Vine St., Cincinnati, O.

ARBORUNDUM)=

CRYSTAL-WHEEL-SLAB A HONE OUM CO. NIA GARA FALLS: N.V. WHY NOT MAKE YOUR OWN

The cost is about one-third what you are now paying. Hand camera, requires no batteries. All work can be



Headquarters for **DUMPING** ORSE CARTS. Wide and narrow tires.
w rates of freight from
r works—Tatamy, Pa.—
all points.

HOBSON & CO. No. 4 Stone St., New York

VOLNEY W. MASON & CO., Friction Pulleys, Clutches & Elevators PROVIDENCE R. I.



PRINTING OUTFIT (DC.

Bets any name in one minute; prints 500 carde at nour. You can make money with it. A fonte pretty type, also Indelible Ink, Type Holder, Padund Tweezers. Best Linen Marker; worth \$1.00 for printing two lines 25c. postpaid.

65 Cortlandt St., New York.

### PROPOSALS.

U. S. ENGINEER OFFICE, ARMY BUILDING, New York, July 25, 1897.—Sealed Proposals, in Triplicate, for construction of riprap wall on eastern beach of Sandy Hook, N. J., will be received here until 12 M., Aug. 25, 1897, and then publicly opened. Information furnished on application. WILLIAM LUDLOW, Lieut. Col. Engineers.

WE BUY PATENTS, small novelties. Columbian Novelty Company, 766 Broad Street, Newark, N. J.

MODELS AND PARTS. Gears, Dies, etc. Catalogue Free. J. C. SEYL. 181 Madison Street, CHICAGO,

FILMS For the Best Projecterscope or Kinetoscope Films, new list. F. L. WILLA RD,
196 Lexington Avenue, Brooklyn, N. Y. Experimental Pattern and Model Work, Optical, etc., instruments, bicycle sundries. EMPIRE NOVELTY WORKS, 402 E. 30th St., New York.

MACHINES, Corliss Engines, Brewers' and Bottlers' Machinery. THE VILTER MFG. CO., 899 Clinton Street, Milwaukee, Wis.

MODEL AND EXPERIMENTAL WORK Draughting, Pattern Work, Special Machinery, etc. S. P. Denison, 143 Center St., New York City

TYPE WHEELS, MODELS & EXPERIMENTAL WORK, SMALL WORKS TO THE WINDS STENGL WORKS TOO MASSAU ST N.Y.

**Experimental & Model Work** 



PATENT FOR SALE OR ON ROYALTY.
Just the thing for Manufacturers of Novelties. Also
a Valuable Adjunct to the Iron Trade. Address CHAS.
PETERSEN, 6 Exchange Street, AUBURN, N. Y.



make ice cream
in 30 seconds. Best, purest, cheapent. Fro
milk only. Sares ice and salt. Made carily vit
Polar Star Instant Freezer.
Bapid, olean, economical. Always in orde
Presses with snow hard dry and smooth.
IT BONT SCRAPE III.

AMERICAN PATENTS. - AN INTEResting and valuable table showing the number of patents granted for the various subjects upon which petitions have been filed from the beginning down to December 31, 1894. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 1002. Price 10 cents. To be had at this office and from all newsdealers.



DESIGNS,
COPYRICHTS &c.
Anyone sending a sketch and description may
quickly ascertain, free, whether an invention is
probably patentable. Communications strictly
confidental. Oldest agency for securing patents
in America. We have a Washington office.
Patents taken through Munn & Co receive
special notice in the

SCIENTIFIC AMERICAN,
sutifully illustrated, largest circulation of
yscientific journal, weekly terms\$3.00 a year;
obsix mouths. Specimen copies and HAND
SE ON PATENTS sent free Address

MUNN & CO., 361 Broadway, New York.

CROOKES TUBES AND ROENTGEN'S Photography.—The new photography as performed by the use of Crookes tubes as a source of excitation. All about Crookes tubes. SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 181, 189, 238, 243, 244, 792, 795, 905, 989, 1050, 1054, 1055, 1056, 1057, also SCIENTIFIC AMERICAN, Nos. 7, 8, 10 and 14, Vol. 74. These profusely illustrated Supplements contain a most exhaustive series of articles on Crookes tubes and the experiments performed with them. Among them will be found Prof. Crookes' early lectures, detailing very fully the experiments which so excited the world and which are now again exciting attention in connection with Roentgen's photography. Price 10 cents each. To be had at this office and from all newsdealers.



**BRASS BAND** 

Instruments, Drums, Uniforms, Equipments for Bands and Drum Corps. Lowest prices ever quoted. Fine Catalog, 400 Illustrations, mailed free, it gives Band Illustrations, mailed free; it gives Band Music & Instructions for Amateur Bands. Music & Instructions for Amazon.
LYON & HEALY, 33-35 Adams St., Ch.cago.

## How to Build a Home



Those intending to build will find the very best practical suggestions and examples of Modern Architecture in the handsomest Architectural Magazine ever published . . .

### "The Scientific American **Building Edition.**"

Each number is illustrated with a Colored plate and numerous handsome engravings made direct from photographs of buildings, together with interior views, floor plans, description, cost, location, and architects' names and addresses The illustrations include seashore, southern, colonial and city residences, churches, schools, public buildings, stables, carriage houses, etc.

All who contemplate building, or improving homes or structures of any kind, have in this handsome work an almost endless series of the latest and best examples from which to make selections, thus saving time and money.

PUBLISHED MONTHLY. SUBSCRIPTIONS \$2.50 A YEAR. SINGLE COPIES 25 CENTS. For sale at all news stands, MUNN & CO., Publishers, 361 Broadway, New York

### Movertisements.

### ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line Back Page, each insertion, - - \$1.00 a line ★ For some classes of Advertisements, Special and Higher rates are required.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.



One secret of Columbia superiority lies in the infinite care taken to bring all the features into harmonious relation. Well rounded and thoroughly adjusted in its smallest details it may be examined with



with certainty of finding construction that is not equalled nor even approached. There is beauty and strength in every line. 1896 Columbias, \$60. HARTFORD BICYCLES,

> free from any dealer; by mail for one 2-c. stamp.

HALF A CENTURY OF CYCLES.—AN interesting history of the cycle from its orkin up to the present time. The first crank-driven bleycle. The "bone-shaker" and its successors. The tricycle. The modern wheel. Cycle building a science. Points of improvement. The pneumatic tire. A hand and foot cycle. With 9 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 1012. Price 10 cents. To be had at this office and from all newsdealers.



Charter Gas Engine Co. STERLING, ILL





Made to open in broad daylight for loading and adjustment. Che Adlake Camera

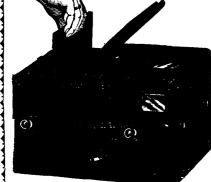
It has Simplified Photography.

kes 12 Pictures on dry plates at one loading.

inches.

'No Extras.





Ask your photo stock dealer to get you an "Adlake" for inspection. Our "Adlake Camera Book" tells all about it. Free for the asking. Sample mounted photograph 5 cents in stamps.

The Adams & Westlake Co., 108 Ontario St., Chicago

TO THOSE INTENDING BUILDING.

### To insure a perfect and permanent finish on all natural interior woodwork the use of the WHEELER PATENT WOOD FILLER

### BREINIG'S LITHOGEN SILICATE PAINT

is a paint that will outlast lead and oil, and is especially adapted for buildings exposed to sait air.

Architects and owners, in their own interests, should see their specifications carried out in full, and examine bills for the articles specified before accepting work as satisfactory.

The leading architects throughout the U.S. THE BRIDGEPORT WOOD FINISHING CO., New Milford, Conn.

THOROUGH INSPECTIONS INSURANCE AGAINST LOSS DAMAGE PROPERTY LOSSOFLIPE

INJURY TO PERSONS CAUSED BY TEAM-BOILER-EXPLOSIONS M-ALLEN-PRESIDENT WB-FRANKLIN-VICE PRESIDENT
B-PIERCE-SECRETARY F-B-ALLEN-22VICE PRESIDENT

IMPERIAL BALL BEARING AXLE A written guarantee with each set of axles



97 PATTERN
S,000 sets in use.

1 Indorsed by the leading carriage builders.
Reduces friction 75 per perfect. Can be put on old or new work.

Write for our Illustrated Catalogue and Testimonals, which we send free on application. Imperial Ball Bearing Axle Dent. 439 Wahash Avenue Chiana III mals, which we send free on application. Imperial Ball Bearing Axle Dept., 439 Wabash Avenue, Chicago, III.

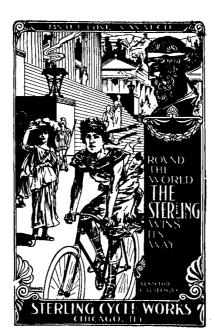


FIREPROOF, STRONG, LIGHT,

FLEXIBLE, EASILY APPLIED.

ASBESTOS MATERIALS, LIQUID PAINTS, STEAM-PIPE AND BOILER COVERINGS, STEAM PACKINGS, ETC. [37] Illustrated descriptive lists and samples free by mail.

H. W. JOHNS M'F'C CO. 100 WILLIAM ST., NEW YORK.
CHICAGO. PHILADELPHIA. BOSTON. LONDON.



THE BICYCLE: ITS INFLUENCE IN Health and Disease.—By G. M. Hammond, M.D. A valuable and interesting paper in which the subject is exhaustively treated from the following standpoints: 1 The use of the cycle by persons in health. 2. The use of the cycle by persons in health. 2. The use of the cycle by persons diseased. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, NO. 1002. Price 10 cents. To be had at this office and from all newsdealers.

THE CONDENSING STEAM RAM A Wonderful Device for Raising Water 50% IN FUEL, 50% IN TIME AND 50% IN ORIGINAL COST.
Send for Testimonials. THE ERWIN HYDRAULIC MACHINERY CO. 58 & 59 Loan & Trust Bidg., Milwaukee, Wis.

## Woodworkers'

Tools.

Do you use Woodworkers' Tools? If so, you should have the best. Our

Woodworkers' Tools

illustrates and tells all about the best—tells all about the prices too. 400 pages, 1800 illustrations of Tools and Machinery, sent postpaid for 25 cents.

The Chas. A. Strelinger Co. Address Box 1236.

# Sole manufacturers of the above articles Chicago, 215 E. Lake Street.

BREEDS RESPECT FOR THEIR

MATCHLESS QUALITIES OF DURABILITYAND RESILIENCY

HARTFORD RUBBER WORKS CO HARTFORD CONN. U.S.A. BOSTON. CHICAGO. BUFFALO. NEW Y PHILADELPHIA AND MINHEAPOLIS.

MANUFACTURE OF BICYCLES. — A very comprehensive article giving the details of construction of every part of these vehicles. With 15 engravings. Contained in Scientific American Supplement, 0.308. Pleue 10 cents. To be had at this office and from all newsdealers.



Roentgen Ray Apparatus Coile (Induction and High Frequency), Fluoroscopes, Motor-Generators, etc.

**MINIATURE** INCANDESCENT LAMPS, Candelabra, Series, Decorative, Battery

EDISON DECORATIVE & MINIATURE LAMP DEPT. Harrison, N. J.

### FISCHER'S CIRCLE DIVIDER AND ANGLE PROTRACTOR

This instrument divides a circle into as many parts as there are eighths or sixteenths of an inch in its radius, by means of the points, which are marked "8" and "16." It is a very useful and time-saving novelty.

Instrument in cloth covered pocket case, with directions, postpaid \$1.50. KEUFFEL & ESSER CO., Manufacturers, 44 Ann Street, New York.

## N. Y. Camera Exchange



50% Saved on all makes of Cameras Headquarters for Buying, Selling and Exchanging Cameras or Lenses. Large assortment always on hand.

Developing, Printing, etc.
Photo supplies of every description at lowest prices.

Send 2c. stamp for bargain list. Address N. Y. CAMERA EXCHANGE, 43 Fulton St., NEW YORK

At 4 Price Bicycles, Watches Guns, Buggles Harness, Sewing Machines Organs Planos Safes, Tools Seales of all varieties and 1000 otherarticles Lists free Circaso Scarz Co. Chicago 11.

## JESSOP'S STEELTHE VERY FOR TOOLS, SAWS ETC. WM JESSOP & SONS LE 9 91 JOHN ST. NEW YORK-

# New Supplement

An entirely New Supplement Catalogue is now ready for distribution; it includes all of the papers up to and including the first half of the year 1897. It is arranged on a clear and easily understood plan, and contains 10,000 papers more than the former one. It will be sent free to any address in the world on application.

A special edition on heavy paper, handsomely bound in cloth, has also been issued. It is supplied at the nominal cost of 25 cents, and thus enables the possessor to preserve this valuable reference catalogue.

MUNN & CO., Publishers, DETROIT, MICH. 361 Broadway, New York City.

## ribune 🥆 Hicycle

Tested and True.



The Easiest Running Wheel in the World. Send for Catalogue.

THE BLACK MFG. CO., ERIE, PA.

BALL BEARING AXLES AND RUB-DEADLING AALES AND KUB-ber Tires.—A paper read before the Carriage Builders' National Convention, Philadelphia, October, 1894, show-ing the advantage to be derived from the use of ball bearings and pneumatic tires in road vehicles. Con-tained in Scientific American Supplement, No. 942. Price 10 cents. To be had at this office and from all newsdealers.

### SMITH'8 ROLLER Spring Seat Post

All Sizes. % to 1 3/16. Price \$2.50.

GIVE HEALTH COMFORT SENT ON TRIAL.

Write, and We'll tell all about it. JOS. N. SMITH & CO.

30 Larned Street. Detroit, Mich.



SO SIMPLE A CHILD CAN USE THEM

SUNART MAGAZINE CAMERA. Folding Cameras. All sizes, ranging in price from \$5 to \$100. Sunart Junior, 3% x 3% picture, \$5.

137 Send 2 cent stamp for Illustrated Catalogue.

SUNART PHOTO CO. 5 AQUEDUCT STREET, ROCHESTER, N. Y.

## Preserve Your Papers.

Subscribers to the Scientific American and Scien-TIFIC AMERICAN SUPPLEMENT, who wish to preserve heir papers for binding, may obtain the Koch Patent File at the office of this paper. Heavy board sides, inscription "Scientific American" and "Scientific American Supplement" in gilt. Price \$1.50, by mail, or \$1.25 at this office. Address

MUNN & CO., 361 BROADWAY, NEW YORK



Falcon Camera FOR 8% .. 5% PICTURES.



Uses our Light-Proof Film Cartridges For 12

Exposures and LOADS IN DAYLIGHT.

Improved safety shutter, set of three stops, fine achromatic lens, view finder and socket for tripod screw. \*Booklet Free.\*

\$2,853.00 in Prizes For Kodak Pictures. \$1,475.00 in Gold.

EASTMAN KODAK CO.

ROCHESTER, N.Y.



PRINTING INKS

The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sta., Philadelphia, and 47 Rose St. opp. Duane, New York