

What is its explosive force compared with rifle powder or nitro-glycerine, and why is it not used for explosive purposes? A. The claim that one ounce of gold fulminate could destroy New York City is absurd. The fulminates are all explosive; only one has any commercial use, and that is the mercury fulminate. It is used as detonator only. The fulminates are all far too expensive, and are also too unstable for any use as explosives. Mercury fulminate can be used for rifles, but it is never done, for reasons specified.

(9031) A. M. Works asks: What should be the diameter and width of an under-shot waterwheel to develop about two horse power when fixed in a current of six miles an hour. A. The area of each bucket should be 4 feet; the most suitable shape may be 4 feet wide, 1 foot deep, and have an immersion of 1 3/4 feet above the periphery. The wheel should be 8 feet in diameter, have 12 buckets, and should run at from 9 to 12 revolutions per minute according to its work.

(9032) J. A. S. writes: Please inform me in regard to the elevation of the Mississippi River; as to whether it is higher at its mouth than at its source, and please state how much, if possible. A. The Mississippi River, on the gravity plane, is about 426 feet higher at St. Louis than at its mouth in the Gulf of Mexico. All levels on the globe are referred to the gravity plane, which is about 13 1/4 miles nearer the earth's center at the poles than at the equator. This plane is the true basis upon which all level data are made. Uphill and downhill always refer to the gravity plane. Its relation to a perfect sphere is the cause of much misunderstanding and discussion among people, either from the desire for a catch argument or from want of truthful knowledge of the facts. Water never runs uphill, although St. Louis is nearer the earth's center than the mouth of the Mississippi River.

(9033) W. F. H. asks: 1. In a permanent steel ring [O] magnet are there any poles? If so, what determines their location? A. In a magnetized steel ring the poles may be placed at any points desired by making those points the places from which the magnets leave the ring when the ring is magnetized. That is, pull the ring from the magnets, or the magnets from the ring, at the points where you desire poles to be located. Of course it is easier to place the poles at diametrically opposite points of the ring. 2. Are the magnetic lines of force the same in a permanent steel magnet as in an electro-magnet? If so, why could not the permanent magnetic field be made to revolve an armature as well as an electro-magnet field? A. Permanent magnets were first used for the fields of dynamos and motors. They are not now used because they cannot be made as strong as electro-magnets, and they are liable to lose their magnetism by jars, etc. 3. Why is there a neutral point midway between the poles of a magnet? A. The neutral point of a magnet is the point or line on which there is just as much positive as negative force, and not the point or line of no force. Break a magnet on the neutral line and two poles are found on the ends of the two pieces. They were there before the bar was broken. The pole at the end of a magnet is due to the fact that there is no magnetism of the opposite sort to render it inactive. Put the opposite poles of two magnets together, either bar or horse shoe, and the poles at the point of contact disappear, not because they are destroyed, but because their mutual attraction prevents any of the lines of force escaping into the air at that place. If all lines of force can find their way around the magnetic circuit without emerging into the air they are not discoverable from the outside and the circuit is not discoverable from the outside. The metal acts as if it were not magnetized. Only the lines which leak out of the metal are to be detected by any of our methods. 4. Will you please inform me how the noise and vibration of a heavy printing press, on the second floor of a business block, can be prevented or measurably deadened, to prevent the annoyance it causes to tenants on the first floor? A. It is a difficult matter to so deaden a floor that the noise from a heavy printing press will not be heard in the room below. A layer of deadening material could be put over the floor and a second floor laid on that with some advantage. A deadening layer of mortar or other material can be put into the space between the floor and ceiling below. A second ceiling can be put into the room below, enclosing an air space and reducing the height of the lower room by six to ten inches. These various expedients have all been employed and all together will reduce the annoyance as much as it can be reduced.

(9034) E. G. asks: Will you inform me how to prepare silk for making a small balloon to hold gas for about two or three weeks? Could I use paper instead of silk? The balloon must be about 3 feet long, 2 feet wide, and lift about 3 ounces. It is to be used indoors. Can I use anything besides above-mentioned materials? A. Silk is prepared for use in a balloon by varnishing it. It should be stretched tight, and the varnish applied in the usual way. When dry it can be used. Good boiled linseed oil forms an excellent coating for balloons. An India rubber coating may be used. It is prepared as follows: India rubber, 1 pound, cut small; oil of turpentine, 6 pounds; boiled linseed oil, 1 gallon. Digest the India rubber in the turpentine in a warm place for a week, frequently shaking the vessel; then place

it in a water bath, and heat slowly till the solution is complete. Next add the oil, previously warmed, simmer gently for five minutes, stirring all the while, after which closely cover it over, and when cold strain through flannel. You could probably make a balloon of such small size and for indoor use of tissue paper.

NEW BOOKS, ETC.

THE WOMAN WHO TOLLS. Being the Experience of Two Ladies as Factory Girls. By Mrs. John Van Vorst and Marie Van Vorst. New York: Doubleday, Page & Co. 1903. Pp. ix, 303.

This book may well be considered as a detailed study of one phase of the life which "the other half" lives, as Jacob Riis has told us. That the woman who toils is exposed to even greater temptations and to greater misery than the man who toils, many of us have perhaps suspected. Just what this woman must endure has been set forth by the two authors of this book in a way that is anything but cheerful. The picture is true; and because it is true it is gloomy. Here and there it is brightened a bit, particularly when the conditions that prevail in some of the better factories are described. On the whole, the conditions of the working girl as they are set forth in this book are decidedly deplorable, to say the least.

RACQUETS, TENNIS, AND SQUASH. By Eustace Miles, M.A. Illustrated with 54 photographs and 16 diagrams. D. Appleton & Co. 1903.

This work at once demands recognition as an authority upon the games mentioned above, owing to the fact that the author is a past-master in the art, and has made a deeper study of the theory of "games of the court" than any other living player. The work is divided into several parts; the first part being "Hints on Training," in which the author describes preparatory exercises, the proper methods of breathing, massage, work, rest, etc., preliminary to putting one's self in fit condition for the strenuous side of these sports. The chapter on food and diet will probably be viewed somewhat askance by the ordinary Anglo-Saxon, as the regime suggested by the author is somewhat too rigorous and crude for most people engaged in active forms of exercise. The author describes and illustrates a number of methods of developing the stroke at home, both for Tennis and Racquet, in which the ball is suspended by means of tackling in such a manner that the various strokes may be practised in leisure moments when the much-sought-after court cannot be obtained. Plans of both tennis and squash courts are shown, which will be of service to those who propose to lay out private grounds. Anyone who wishes to perfect himself in the game should certainly have this book before him, as it will soon be considered a standard authority. Lists of the winners of the championships in both America and England are published in the book. It will be noted that Mr. Miles has won the amateur tennis championship in England in 1899, 1901, and 1902, and also the American amateur tennis championship in 1900.

INORGANIC CHEMISTRY. With the Elements of Physical and Theoretical Chemistry. By J. I. D. Hinds, Ph.D. New York: John Wiley & Sons. London: Chapman & Hall, Ltd. 1902. 8vo. Pp. viii, 566. Price, \$3.

This volume is intended to supply a rather complete text-book on inorganic chemistry and a handy reference-book for all students and teachers of chemistry. The author has endeavored to present an orderly and systematic treatment of the subject without reference to any teaching method, so that the teacher may go from chapter to chapter as his own method requires. Part I. contains a good general introduction to chemistry and a logical division of the subject into its principal branches. Part II. gives such an outline of physical chemistry as is necessary to the full understanding and appreciation of the descriptive portion of the work. Part III. discusses theoretical chemistry with more than usual thoroughness. It is the purpose of Part IV. to treat, with the fullness which it deserves, every known chemical element, and the compounds which are of commercial and theoretical interest. In classification and treatment the periodic system has been closely followed. We are pleased to note that the author has adopted the modern spelling of chemical terms, recommended by the Chemical Section of the American Association for the Advancement of Science.

THE DESIGN OF SIMPLE ROOF-TRUSSES IN WOOD AND STEEL. With an Introduction to the Elements of Graphic Statics. By Malverd A. Howe, C.E. New York: John Wiley & Sons. London: Chapman & Hall, Ltd. 1902. Pp. 129. Price \$2.

In his preface Prof. Howe modestly asserts that very little, if anything, new will be found in the pages of his book. Nevertheless, the book finds its justification in the fact that it has brought together in small compass all the essentials required in the proper designing of roof-trusses. Although the timber roof-truss is considered by many engineers somewhat antiquated, Prof. Howe has deemed it worthy of discussion, and not without reason, we think. His treatment of the steel truss is contained in the sixth chapter of the book, in which he says what he has to say in a terse, technical

way. The method of discussion which Prof. Howe has adopted is both graphical and mathematical.

ANIMALS BEFORE MAN IN NORTH AMERICA. Their Lives and Times. By Frederic A. Lucas. New York: D. Appleton & Co. 1902. 12mo. Pp. vii, 291. Price, \$1.20.

This book pictures the early life of our continent, tells something of the fishes that once swam about its shores, of the reptiles that splashed through the swamps, and of the great mammals that once roamed over the western plains. All this Mr. Lucas has told with a certain charm that relieves his work of much of the monotony that would be expected of a subject of so scientific a character. His book may be said to occupy a position midway between the technical manual and the popular description of historical animals.

THE THERMODYNAMICS OF HEAT-ENGINES. By Sidney A. Reeve. New York: The Macmillan Company. London: Macmillan & Co., Ltd. 1903. 12mo. Pp. xi, 316. Price \$2.60.

The author has divided his book into two parts. The first is devoted to theory, and the second to the application of theory to practice. In the first part he discusses the general principles of energetics, the cycle, the thermal properties of matter, the steam engine cycle, and the laws of permanent gases, gas engine cycles, hot air engines, heat engine possibilities, and refrigerating machines. In the second part he discusses the simple steam engine, the compound steam engine, and the Otto gas engine. The appendix is comprised of tables.

HARDENING, TEMPERING, ANNEALING AND FORGING OF STEEL. By Joseph V. Woodworth. New York: Munn & Co. 1903. 8vo. Pp. 288, 200 illustrations. Price \$2.50.

A new work from cover to cover, treating in a clear, concise manner all modern processes for the heating, annealing, forging, welding, hardening and tempering of steel, making it a book of great practical value to metal-working mechanics in general, with special directions for the successful hardening and tempering of all steel tools used in the arts, including milling cutters, taps, thread dies, reamers, both solid and shell, hollow mills, punches and dies, and all kinds of sheet metal working tools, shear blades, saws, fine cutlery, and metal cutting tools of all description, as well as for all implements of steel both large and small. In this work the simplest and most satisfactory hardening and tempering processes are given. The uses to which the leading brands of steel may be adapted are concisely presented, and their treatment for working under different conditions explained, also the special methods for the hardening and tempering of special brands. In connection with the above numbers of "kinks," "ways" and "practical points" are embodied, making the volume a text book on this highly important branch of modern tool-making.

A chapter devoted to the different processes for case-hardening is also included, and special reference made to the adoption of machinery steel for tools of various kinds. The illustrations show the mechanic the most up-to-date devices, machines and furnaces which contribute to the attainment of satisfactory results in this highly important branch of modern tool-making.

DIES; THEIR CONSTRUCTION AND USE FOR MODERN WORKING OF SHEET METALS. By Joseph V. Woodworth. New York: Munn & Co. 1903. 8vo. Pp. 384, 505 engravings. Price \$3.

A treatise upon the designing, constructing and use of tools, fixtures and devices, together with the manner in which they should be used in the power press, for the cheap and rapid production of sheet-metal parts and articles. Comprising fundamental designs and practical points by which sheet metal parts may be produced at the minimum of cost to the maximum of output, together with special reference to the hardening and tempering of press tools, and to the classes of work which may be produced to the best advantage by the use of dies in the power press. A complete treatise on the subject and the most comprehensive and exhaustive one in existence. A book written by a practical man for practical men, and one that die-makers, machinists, toolmakers or metal-working mechanics cannot afford to be without.

This work shows engravings of dies, press fixtures and sheet-metal-working devices, from the simplest to the most intricate in modern use, and the author has described their construction and use in a clear, practical manner, so that all grades of metal-working mechanics will be able to understand thoroughly how to design, construct and use them, for the production of the marvelous variety of sheet-metal articles and parts which are now in general use. Many of the dies and press fixtures shown and described herein were constructed by the author, others under his supervision; while others were constructed by some of our most skillful mechanics and used in some of the largest sheet-metal goods establishments and machine shops in the United States. A very much needed book and an important addition to the literature of mechanics.

THE JOURNEY'S END. A Romance of Today. By Justus Miles Forman. Illustrated by Karl J. Anderson. New York: Doubleday, Page & Co. 1903. 12mo. Pp. 240. Price \$1.50.

KALENDER FÜR ELEKTROCHEMIKER SOWIE TECHNISCHE CHEMIKER UND PHYSIKER FÜR DAS JAHR 1903. VII. Jahrgang. Herausgegeben von Dr. A. Neuberger. Mit einer Beilage. Berlin: Verlag von M. Krayn. Pp. xxx, 600.

REPORT OF THE MINISTER OF AGRICULTURE FOR THE DOMINION OF CANADA FOR THE YEAR ENDED OCTOBER 31, 1902. Printed by Order of Parliament. Ottawa. 1903. Pp. lxiii, 284.

SMITHSONIAN INSTITUTION. Bureau of American Ethnology. J. W. Powell Director. Bulletin 27. Tsimshian Texts. By Franz Boas. Washington: Government Printing Office. 1902. Pp. 244.

SPECIFICATIONS FOR LANCASHIRE BOILER AND BOILER SEATING. By Inspector M.I.M.E. Manchester: Technical Publishing Company, Ltd. 1903. 8vo. Pp. 23.

THE MENTAL STATUS OF CZOLGOSZ, THE ASSASSIN OF PRESIDENT MCKINLEY. By Walter Channing, M. D. Brookline, Mass. From the American Journal of Insanity. Pp. 46.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

May 12, 1903,

AND EACH BEARING THAT DATE.

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

Table listing inventions with patent numbers. Includes items like Acetylene generators, Acid in products of combustion, Acid or other liquid distributing system, Aerating liquids and bottling same, Air brake pipes, Air brake system attachment, Air compressor, Air means for filtering, Aluminum and its alloys, Annealing box, Annealing metal plates, Apparel, Armor for ships, Artists' outfit, Ash receiver, Auger, Automatic switch, Awning, Axle bar, Bag holder, Baling press, Baling press feeding apparatus, Band cutter and feeder, Basket, Battery connector, Bearing, Bell, Belt, Belt shipper safety lock, Belt support, Conveyor, Bending machine, Bicycle, Bicycle attachment, Bin, Binder, Block, Boat gunwale, Boiler tube, Bolling by electricity, Bolt or spike puller, Bonnet, Bookcase, Book mark, Boring tool, Bottle dose indicator, Bottle, non-refillable, Bottle, non-refillable, Bottle stopper, Bottle stopper head, Bottle washing machine, Bottled goods, Box, Box lid supports, Braiding machine, Brake lever, Braking device, Branding iron, Brick mold, Brick molding machine, Brush, bath, Brush holder, Brush soap feeding attachment, Brush, tooth, Bubble blower, Buckle, Building construction, Burglar trap, Butter, lad, Button, Button, collar, Cabinet, Cabinet, revolving, Cable terminal, Camera multiplying attachment, Can, See Oil can, Can forming and seaming machine, Can opener, Candy pulling or aerating machine, Car, Berrye, et al., Car, E. W. Summers, Car, box or produce, Car, combination steel, Car coupling, Car coupling, C. A. Tower, Car door operating device, Car, Christianson, Car, express or mail protection, Car fender, Car frame, motor, Car, gonola, Car, hopper, Car, low side gonola, Car, railway, Car, railway, L. A. Shepard

(Continued on page 402)

Valuable Books!

1902 EDITION All the World's Fighting Ships

By FRED T. JANE Author of the Naval War Game (Kriegspiel) Used as a text-book in European navies. The only absolutely correct and complete work of the kind published.

NOW READY. Modern Machine Shop Tools

Their Construction, Operation and Manipulation, Including Both Hand and Machine Tools. By W. H. VANDERVOORT, M. E.

An entirely new and fully illustrated work treating the subject of Modern Machine Shop Tools in a concise and comprehensive manner. Special care has been taken to eliminate all matter not strictly pertaining to the subject, thus making it possible to give the reader complete information pertaining to machine shop tools and methods in a single volume at a moderate price.

DIES

THEIR CONSTRUCTION AND USE For the Modern Working of Sheet Metals.

By JOSEPH V. WOODWORTH Octavo. Cloth. Very Fully Illustrated. Price \$3.00 Postpaid.

This book is a complete treatise on the subject and the most comprehensive and exhaustive one in existence. A book written by a practical man for practical men, and one that no tinsmith, machinist, toolmaker or metal-working mechanic can afford to be without.

HARDENING, TEMPERING, ANNEALING and FORGING OF STEEL

By JOSEPH V. WOODWORTH Author of "Dies, Their Construction and Use." Octavo. 280 pages. 200 Illustrations. Bound in Cloth. PRICE, \$2.50

A new work from cover to cover, treating in a clear, concise manner all modern processes for the Heating, Annealing, Forging, Welding, Hardening and Tempering of steel, making it a book of great practical value to metal-working mechanics in general, with special directions for the successful hardening and tempering of all steel tools used in the arts, including milling cutters, taps, thread dies, reamers, both solid and shell, hollow mills, punches and dies, and all kinds of sheet metal working tools, shear blades, saws, fine cutters, and metal cutting tools of all description, as well as for all implements of steel, both large and small. In this work the simplest and most satisfactory hardening and tempering processes are given.

GAS, GASOLINE AND OIL ENGINES

By GARDNER D. HISCOX, M. E. 365 Pages. Large Octavo. Illustrated with 270 Handsome Engravings. Price \$2.50

The only American book on an interesting subject. Full of general information about the new and popular motive power, its economy and ease of management. Also chapters on Horseless Vehicles, Electric Lighting, Marine Propulsion, etc. Revised and much enlarged.

Horseless Vehicles, Automobiles and Motor Cycles

Operated by Steam, Hydro-Carbon, Electric and Pneumatic Motors. By GARDNER D. HISCOX, M. E. Large 8vo. 316 Illustrations. Cloth. 460 Pages. Price \$3.00

A practical Treatise for Automobolists, Manufacturers, Capitalists, Inventors, Promoters and everyone interested in the development, care and use of the Automobile. This work is written on a broad basis, and comprises in its scope a full description, with illustrations and details, of the progress and manufacturing advance of one of the most important innovations of the times, contributing to the pleasure and business convenience of mankind. This book is up-to-date and very fully illustrated with various types of Horseless Carriages, Automobiles and Motor Cycles, with many details of the same. It also contains a complete list of the Automobile and Motor Manufacturers, with their addresses as well as a list of patents issued since 1856 on the Automobile industry. A full illustrated catalogue will be sent free to any address.

Full descriptive circulars of above books will be mailed free upon application.

MUNN & CO., Publishers, 361 Broadway, New York

Table listing various technical items and their prices, including: Ores, chlorinating and brominating, Hawkins & Fox, Oxidizing furnace, metal, J. W. H. James, Packing, O. T. Raymond, Paper holder, roll, L. T. Arnold, Parcel carrier, J. B. Phillips, Paste jar, C. B. Gordon, Pasting device, C. E. Dulin, Peanut or coffee roasting and warming device, C. North, Permanganates, products of, W. Hickman, Phosphate distributor, E. V. Johnson, Photographic printing apparatus, H. H. McIntire, Piano pedal locking attachment, A. J. Newby, Picket stick hammer, G. Swift, Picture apparatus, moving, G. M. Higgins, Pie rolling machine, H. H. Jones, Piling and means for sinking same, sectional sheet, H. A. Miller, Piling, composite, A. E. Brown, Pipe crimping machines, shaping wheel for sheet metal, A. G. Scherer, Pipe former, sheet metal, S. M. Schmeltzer, Piston, C. L. Haase, Jr., Placket closure, M. L. Perrotot, Planter, cotton, or pea, P. J. Smith, Plants from streams, apparatus for removing, A. King, R. V. E. Rasmussen, Plow, double, R. V. E. Rasmussen, Plow plant protector attachment, L. W. Bass, Plug machine, W. R. Montgomery, Pneumatic brake, double acting, A. A. Fickenscher, Pneumatic spring, B. L. Sanders, Pocket knife, J. Well, Post office cabinet, H. G. Wagner, Precipitating apparatus, P. W. McCaffrey, Printer's galley, E. Hall, Printer's galley, W. A. Faucett, Projectile, M. C. Regan, Protractor, triangle, and curve, combined, F. W. Otis, Pruning saw, pneumatic, W. Young, Pruning shears, pneumatic, W. Young, Pulley, R. W. Dull, Pulp screen, centrifugal, J. H. Baker et al, Pump motor, J. A. Werkman, Sr., Pump, rotary, W. E. ... Push button electric, J. Y. Parke, Puzzle, Ingram & Wyatt, Radiator, air heating, J. A. McDaniel, Radiator support, H. D. Kellogg, Railway carriage coupling, automatic, J. Willison, Railway carriage, slip, B. Kirsch et al., Railway guard rail support, O. Paulhus, Railway joint, T. Higgins, Railway rail joint base plate, H. B. Charlton, Railway signal, A. W. Ohnd., Railway signal controlling system, electric, G. Gibbs, Railway tie, J. T. Shaw, Railway tie, metallic, C. S. Seitz, Railway track rails, method of and apparatus for making continuous lengths of, C. E. Mark, Recreation device, J. Wilson, Refrigerator, J. Rossi, Register, J. L. Giles, Rivet cutter, E. F. Galloway, Jr., Roadways, sidewalks, etc., construction of, G. D. Wansbrough, Rollers with india rubber, etc., machine for covering, R. Milne, Rope clamp, J. S. Hermonson, Rotary engine, H. C. Essington, Rotary engine, N. S. Taylor, Rotary engine, E. Blucher, Rotary engine, A. Box, Rotary steam engine, S. Olsen, Rule gage, E. A. Birchen, Rule, measuring, W. E., Sand box and mechanism for actuating same, J. W. Eudean, Sash fastener, C. H. Hook, Sash fastener, F. Keilwerth, Sash holding device, G. F. Lyman, Sash lock, J. MacVane, Sashes, automatically operating window, C. Rupp, Scale and chord indicator, E. L. Sanford, Scale, weighing, Swihart & Hoyt, Scraper or self loading cart, wheeled, C. H. Sawyer, Screen or storm window attachment, R. Ellingson, Screw anchor, T. Tribe, Seal press, ratchet, E. J. Brooks, Sealing and stamping machine, letter, J. N. Stacy, Sealing apparatus, jar, W. H. Heniss, Sealing means, vessel, J. M. Hicks, Seaming machine, automatic double, J. G. Hedgen, Sectional boiler, L. R. Libby, Shade cloth trimmer, F. McDaniel, Shade roller bracket, B. F. Johnson, Shaft connection, adjustable, G. P. Clark, Ships at sea, system of coaling, A. K. Finlay, Shirt sleeve shortener and cuff fastener, S. O. Grave, Show case, W. Beaver, Shuttle, self threading, B. Cutting, Sickle bar clip ball bearing, I. Trimble, Signaling or calling system electrical, C. B. Smith, Sink strainer, E. E. Weed, Siphon, S. W. Miller, Slaughtering apparatus, J. H. Cook, Sleigh runner attachment, vehicle, E. Kaiser, Sliding gate, A. Mason, Smoke in furnaces, preventing, Wilson & Kemp-Welch, Socket cover and shade holder, combined, E. Gething, Sound recorder, automatic, Emerson & Capps, Sound recording tablet, J. W. Jones, Speed changing box, Le Blend & Greene, Spindle. See Spinning spindle, Spinning frame bolster rail, D. A. Tempkins, Spinning spindle, M. E. Sullivan, Stairway, traveling, I. H. Venn, Stamp, chromometric, F. A. E. Burda, Stamp mill, C. C. Lane, Steam engine, C. Crumpton, Steam generator, vertical, E. Establie, Stitching machines, machine for feeding pamphlets, etc., to, J. C. Rodgers, Steker, mechanical, P. J. Harleman, Stove, hot blast, J. Kennedy, Stove or range, B. F. Allen, Stoves, ranges, etc., composition for destroying and removing carbon or soot from, A. R. Radtke, Striking bug, R. Reach, Submarine construction, L. L. Rinaldi, Suspender belt coupling, Galdin & Glickman, Suspenders, H. C. Hine, Suspenders, H. L. Seidel, Swage block, H. B. Blood, Switchboard and circuits, electric, V. G. Apple, Switchboard, electrical, E. B. Ellicott, Synchronizing apparatus for alternators, F. T. Dew, Syringe, hypodermic, T. A. Chappell, Tablets, etc., apparatus for forming, E. Duhring, Tank, R. G. Stone, Tanning extracts, making, M. Heug, Telephone, M. R. Hutchison, Telephone, W. L. Denie, Telephone and fire alarm system, combined, W. L. Denie, Telephone call annunciator, G. K. Jackson, Telephone line signaling apparatus, F. E. Green

American Success Abroad. Wien, den 7. Feber 1903. Die grösste einzelne Bestellung die jemals gemacht wurde, ist von der österreichischen Regierung plaziert worden. Translation of above: "Vienna, Feb. 7th, 1903. The greatest single order for typewriters ever given was placed by the Austrian Government." For 1,200 Smith Premier Machines. After three months of exhaustive competitive tests, it was ordered by the Ministry of Justice that all Courts of the Austrian Empire should be equipped exclusively with the great success, The Smith Premier Typewriter. AMERICAN SUCCESS BOOKLET MAILED FREE ON REQUEST. In "The American Invasion" of Europe, the Smith Premier is a leading and important factor. The Smith Premier Typewriter Co. Syracuse, N. Y., U. S. A.

Shipped On Approval. We will ship any bicycle C.O.D. on approval without a cent deposit and if accepted allow 10 DAYS FREE TRIAL before purchase is binding. New 1903 Models: "Bellis," complete \$8.75, "Gossack," High Grade \$10.75, "Siberian," Road Racer \$12.75, "Houdorf," Road Racer \$14.75. MEAD CYCLE CO., Dept. 59-C, Chicago.

GIANT STEAM SHOVELS. Toledo Ohio, U.S.A. The Vulcan Iron Works Co.

Universal Safety Tread. Made to walk on with perfect safety. For Elevators or wherever you walk, safety is always secured by its use. UNIVERSAL SAFETY TREAD CO., 45 Broadway, New York.

SEARCHLIGHT. Clear View Acetylene Searchlight. For Steamboats, Sailboats, Yachts, Docks, Camping Grounds, Fire Hunting, Signal Lights, Locomotive Headlights, etc. AMERICAN ACETYLENE STOVE CO., 503 Masonic Temple, Minneapolis, Minn.

If you want the best CHUCKS, buy Westcott's. Little Giant Double Grip Drill Chucks, Little Giant Drill Chucks, Improved, Oneida Drill Chucks, Cutting-off Chucks, Scroll Combination Lathe Chucks, Geared Combination Lathe Chucks, Plain Universal Lathe Chucks, Independent Lathe Chucks. Made by Westcott Chuck Co., Oneida, N. Y., U. S. A.

GASOLINE ENGINES. Marine & Stationary from 1-4 to 16 H. P. A thoroughly satisfactory engine at a moderate price. Write for catalogue. THE CLIFTON MOTOR WORKS, 233 E. Clifton Ave., Cincinnati, O.

MARINE Gasolene MOTORS. Experts for years have ranked our engine with the highest grade, and it is now being copied by other builders. We always endeavor to be on top, and for 1903 offer an engine built from Brand New Parts, with new and original features—just what other engines will have five years hence. ROCHESTER GAS ENGINE CO., 683 Driving Park Ave., ROCHESTER, N. Y., U. S. A.

Volt Ammeters. Pocket size, but large enough for accuracy and practical use. Various ranges for testing batteries, electric light, telephone and other circuits, etc. Also, Voltmeters and Ammeters for general measurements. L. M. PIGNOLET, 80 Cortlandt Street, New York, N. Y.

Marine Gas Engines. Launches, Row Boats, Canoes and Boat Fittings. Our prices are right, our work is right. Catalogue free. THE GENESSEE LAUNCH & POWER CO., Rochester, N. Y.

ARTESIAN. Wells, Oil and Gas Wells drilled by contract to any depth from 50 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 1200 feet. Write us stating exactly what is required and send for illustrated catalogue. Address: PIERCE WELL ENGINEERING AND SUPPLY CO., 136 LIBERTY STREET, NEW YORK, U. S. A.

SPECIAL IMPROVED Tools and machinery are used in making the cylinders, pistons and important parts of the Olds Gas & Gasoline Engine. Each part is mathematically exact and mechanically perfect. Our new catalogue gives full particulars. Olds Motor Works, 216 River St., LANSING, MICH.

THE EASTERN GRANITE ROOFING CO. IRVING BUILDING, NEW YORK. 1885 1903. PERFECTED GRANITE ROOFING WHICH HAS BEEN ADOPTED BY THE LEADING RAILROADS, MANUFACTURERS, ARCHITECTS AND BUILDERS AS THE STANDARD READY ROOFING. WRITE FOR TESTIMONIALS, PHOTO PAMPHLET AND SAMPLES.

Marine Gasoline Engines. 3 1/2 to 10 H. P. Highest Grade Materials and Finishes. Latest Improvements. The Best Sparking Device on the Market. THE PINCKNEY COMPANY, Nyack, N. Y.

COLD GALVANIZING. Save all the Spelter consumed in galvanizing by the hot process by using our Patent Cold Galvanizing Process, as the amount of spelter lost as drops in the hot process if used in our process will give sufficient protection to any kind of work to make it rust-proof even against salt. AMERICAN COVERED SPARKING-PLUG. is so constructed as to prevent oil or moisture bridging insulation on outside of plug. Especially adapted to marine work. Perfectly water-tight. Fitted with Patent Double Insulated Mica Core and fully guaranteed. Price, \$5.00. Price, special sizes, on application. AMERICAN COIL CO., 28 Newburn St., West Somerville, Mass.

Columbia
Automobiles
Electric and Gasoline

Vehicles for Touring, Pleasure Driving, Private Carriage Service and all kinds of business uses



Columbia Electric Tonneau

By substituting a rumble seat or a hamper in place of the removable rear body, or by leaving the rear platform vacant for heavy luggage, the style of the vehicle may be changed to meet a variety of special requirements

Our New Catalogue will be mailed on request

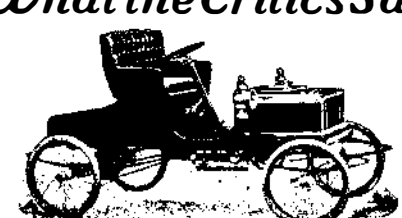
In print and illustration this catalogue is the most artistic book of its kind ever issued. The pictures and description cover the full line of Columbia automobiles, including **Electric Runabouts, Victorias, Phaetons, Surreys, Tonneaus, Cabriolets, Coupés, Broughams, Hansoms, Busses, Special Service and Delivery Wagons, Trucks** and the new **24-H. P. Columbia Gasoline Touring Car.**

Orders for Broughams and Coupés for September delivery should be placed immediately.

Electric Vehicle Co.
HARTFORD, CONN.

New York Salesroom: 134-136-138 W. 39th St.
Opp. Metropolitan Opera House
Boston: 74-76-78 Stannhope St.
Chicago: 1421 Michigan Ave.

What the Critics Say



Automobilists throughout the country and many abroad give the greatest possible praise to the **CONRAD Gasoline Motor Vehicles** for their beauty, comfort, simplicity, reliability and durability. Carefully selected materials and the best and most skilled mechanics are employed. Illustrated descriptive booklet sent on application.

CONRAD MOTOR CARRIAGE CO., Buffalo, N. Y.

THE TURNER BRASS WORKS
57 MICHIGAN ST., CHICAGO.
ALUMINUM, BRASS AND BRONZE CASTINGS
MACHINING, STAMPING, SPINNING, POLISHING,
PLATING.
ESTIMATES FURNISHED ON SPECIAL WORK.

America's Motor Makers

We are still perceptibly in the lead as manufacturers of Automobile and Marine Gasoline Motors. We take pride in making them perfect. Let us also satisfy you.

Buffalo Gasoline Motor Co.
Dewey and Bradley Sts.,
BUFFALO, N. Y.

A man bought a house for \$5300, painted it with **Patton's SUN-PROOF Paint** and sold it for \$6000—That's paint profit.

Patton's Sun-Proof Paint guaranteed for five years. Often lasts a decade.

Patton Patent Co., 32 Lake St., Milwaukee, Wis.

Telephone or other cables, device for re-insulating electric and aerial, J. Daggett 727,756
Telephone selecting device, W. D. Watkins 728,147
Telephone special directory, L. M. Bannan 727,880
Telephone system, C. B. Smith 727,701
Telescope, G. Forbes 727,770
Temperatures, the liquefaction of gases, and the separation of the constituents of gaseous mixtures, apparatus for producing low, C. Linde 728,173
Temperatures, the liquefaction of gases, and the separation of the constituents of gaseous mixtures, producing low, C. Linde 727,650
Thill coupling, G. S. Eagler 727,604
Thread cutter, Wehner & Keunst 727,867
Timber, preservation of, R. Kroll 727,875
Tire, G. H. Radovich 728,009
Tire fastening, J. F. Byers 727,746
Tire for vehicles, rubber cushion, A. H. Brintnell 727,582
Tire joint fastening device, pneumatic, B. Perceval 728,002
Tire, resilient, A. W. Heckman 728,106
Tire, rubber, R. Austin 727,877
Tobacco pipe, M. F. Hahn 727,789
Torch for destroying insects, S. M. Hess 727,628
Trace, harness, J. Ziegler 727,730
Trolley contact device, C. L. Fitch 727,608
Trolley catcher, E. Limaugé 727,649
Truck, M. Hansen 727,618
Truck bolster, L. A. Shepard 728,030
Truck, car, E. W. Summers 728,043
Truck, radial car, R. L. Ellery 727,918
Tube. See Mailing tube.
Tube bending machine, J. E. O'Donnell 727,676
Tube compressing machine, R. Kuhn 727,642
Tuning pin, Clevenger & Field 727,589
Tunnel construction, D. L. Hough 727,799
Turbine, A. Schenck 727,698
Turbine, elastic fluid, C. G. Curtis 727,912
Turbine regulating device, steam, J. Stumpf 728,041
Turbine, steam, F. D. Shepherd 728,138
Twyers, cap and peep hole for blast furnace, G. R. Johnson 728,111
Typewriter attachment, G. A. Danielson 727,595
Typewriter inking appliance, S. W. Turner 728,050
Typewriter table and cabinet, M. S. Eylar 727,922
Typewriting machine, C. F. Hopkins 727,951
Typewriting machine key action, R. J. Fisher 727,687
Typewriting machine tabulating mechanism, C. A. Joerissen 728,170
Umbrella, J. H. Sprague 728,035
Vacuuming and double seaming machine, Norton & Hodgson 727,675
Valve, gas engine rotary, S. H. Dyer 727,917
Valve mechanism, J. T. Fenton 727,772
Vehicle controlling mechanism, motor, F. O. Farwell 727,923
Vehicle draft attachment, C. J. Belte 727,886
Vehicle, motor, B. V. Covert 727,910
Vehicle storm shield, I. O. Deuman 727,598
Vehicle storm shield attachment, J. J. Russell 727,844
Vessel, marine, J. McMillan 727,827
Vessel or diving apparatus, submarine, R. Sinclair 728,031
Vise, C. W. Orvis 727,679
Voting booth, Barrow & Bowers 727,735
Voting machine, W. A. Swaren 728,045
Vulcanizing apparatus rack or holder, W. R. Smith 727,856
Wagon brake and end gate, W. Ellis 727,920
Wagon brake, automatic, W. H. Beard 727,737
Wagon, delivery, J. V. Macdonald 727,817
Wagon wheel, J. McCallum 727,825
Warp stop motion, F. A. Whitmore 727,728
Washer manufacturing machine, G. Fraser 727,931
Watch, stem winding and setting, W. W. Dudley 728,090
Watchmaker's cabinet, P. C. Hall 727,938
Water level indicator, J. Dewrance 727,599
Watering device, automatic, J. M. Day 727,597
Watering tank, stock, F. E. & C. E. Richards 728,133
Weeder, F. J. Kelly 727,844
Welding, electric, Schurek & Giesler 728,023
Welding machine, automatic electric chain, C. A. Leuenberger 728,119
Well drilling tool wire rope socket, Double & Kerten 727,759
Wheel and rail brake, combination, J. Redmond 728,136
Wheel chair and hammock, combined, L. C. Bullock 728,082
Windmill, G. B. Edgar 727,762
Winding spindles, stop motion for twine, B. B. Bowers 727,888
Window, C. Bickel 727,582
Window dust and air guard, J. T. Guleser 727,936
Window screen, E. L. Lloyd 728,121
Wire rope making machine, S. W. Coriasco 727,751
Wire to other objects, rigidly securing, E. P. Lehmann 728,118
Wood impregnating apparatus, J. L. Ferrell 727,928
Wrapping machine, H. Felmlee 727,927
Wrench, W. H. Preston 728,007
Wringer. See Mop wringer.
Writing apparatus, cipher, G. W. Dudley 727,915
Yoke, animal, W. M. Landers 727,976
Yoke, neck, R. W. Sparks 728,033

DESIGNS.

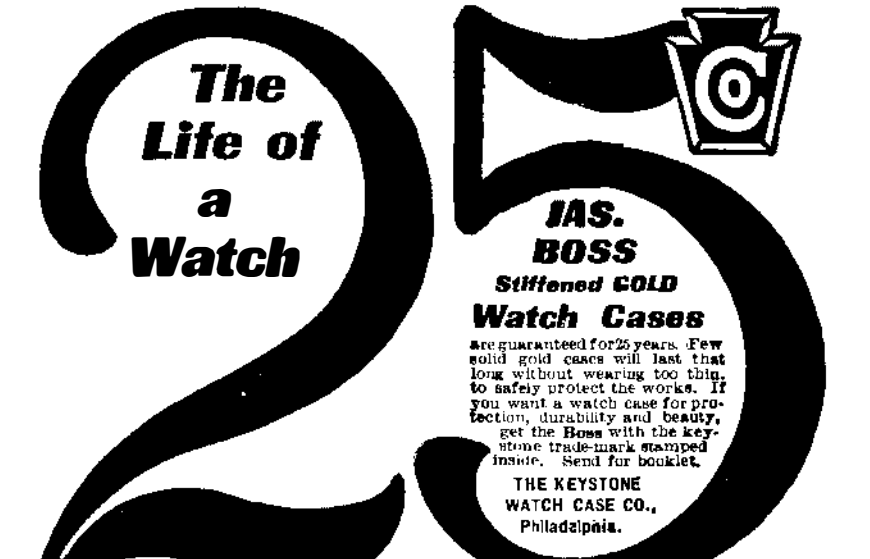
Advertising clock case, R. S. Wiesenfeld 36,319
Badge or similar article, J. P. Blogg 36,314
Box cover, H. L. Croll 36,317
Chandelier, G. H. Ullman 36,326
Divan frame, D. Pepper 36,328
Fabric, textile, C. Sackman 36,329
Inkstand, D. C. Cahalane 36,318
Lamp, illuminating, W. De Freitas 36,320
Range, G. W. Cepe and W. L. Bertram 36,334
Spoons or similar articles, handle for, E. C. S. Carter 36,315
Steve, cooking, A. F. Harter 36,321
Steve, heating, A. F. Harter 36,323
Steve ornament, F. E. Lee 36,325

TRADE MARKS.

Antipyretics, narcotics, and seporifics, J. O. Hunnicke 40,361
Asphalt and asphalt compositions, G. C. Warren 40,319
Beverage, certain named, F. S. Doud 40,349
Bituminous composition or cement, Warren Brothers Co. 40,320
Bookcases and filing cabinets, sectional, Yawman & Erbe Mfg. Co. 40,325
Boots and shoes, ladies' leather, H. E. Gup-till 40,303
Boots and shoes, leather, J. A. & W. Bird & Co. 40,364
Cement for uniting rubber or leather surfaces, waterproof, Q.H. Rubber Co. 40,322
Cement, Portland, Illinois Steel Co. 40,321
Cleaning agent for wood, metal, and other articles, A. Davin et Cie. 40,318
Cleaning preparation, certain named, Williams & Sanders Mfg. Co. 40,342
Cloths and stuffs of wool, worsted, or hair, Wm. Fulton & Sons 40,368
Coats, trousers, and overalls, men's, Mero-tek Mfg. Co. 40,365
Coffee, C. H. Conrad 40,350
Confectionery, Hazen Confectionery Co. 40,346
Confectionery, J. A. Dowie 40,347
Corsets, corset waists, and underwaists, Dr. Bevoise Waist Co. 40,298
Dental filling and remedy, antiseptic, E. W. Dodez 40,353
Dental preparations, certain named, T. L. Hill 40,352
Dentifrices, Hall & Ruckel 40,307
Dietetic preparations, A. C. A. Holzapfel 40,344
Disinfectant and germicide, Cyphers Incu-water Co. 40,306
Dress shields, Canfield Rubber Co. 40,366
Dyestuff or coloring mixture for leather, Stamford Manufacturing Co. 40,341
Fertilizers, manufactured, Swift Fertilizer Works 40,329
Food substances, oleaginous or unctuous, Schwarzschild & Sulzberger Co. 40,317
Foods, baked cereal, Price Cereal Food Co. 40,316
Game, certain named, G. S. Mumford 40,314

(Continued on page 405.)

The Life of a Watch



IAS. BOSS
Stiffened **COLD** Watch Cases

Are guaranteed for 25 years. Few solid gold cases will last that long without wearing too thin, to safely protect the works. If you want a watch case for protection, durability and beauty, get the Boss with the key-stone trade-mark stamped inside. Send for booklet.

THE KEYSTONE WATCH CASE CO., Philadelphia.

HANDS GRIMY?

Gre-Solvent instantly dissolves and removes machine grease, paint and ink. Miles ahead of soap. Harmless. Antiseptic. By mail, prepaid, 15c. and 25c. stamps. Sample free to dealers. Correspondence solicited.


THE UTILITY CO., 227 Greenwich St., New York.

Rawhide Pinions and Accurate Metal Gears

Can furnish anything in this line. Get our prices

THE NEW PROCESS RAWHIDE CO., Syracuse, N. Y.

The Century Tourist
7 H. P. GASOLINE CAR



A Light Touring Car at a Reasonable Price

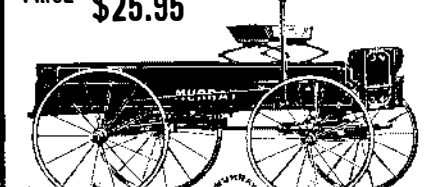
F. O. B. \$750
Factory

The Most for the Money Ever Offered in an Automobile.

Write for Catalogue, Terms and Full Particulars
CENTURY MOTOR VEHICLE CO., Syracuse, N. Y., U. S. A.

MURRAY

PRICE \$25.95



MURRAY ONE HORSE FARM WAGON.

SEVENTEEN YEARS


of honest, straightforward and enviable business reputation is back of every "Murray" Vehicle. Harness and Saddle. And they cost no more than the "unknown kind." We guarantee every "MURRAY" Vehicle that leaves our factory against breakage for two years. Our line is most complete, consisting of Buggies, Surreys, Phaetons, Road Carts, Road Wagons, Milk Wagons, Mail Wagons, Bakers' Wagons, Butchers' Wagons, Laundry Wagons, Pony Vehicles, Farm Carts, Farm Wagons, Contractors' Carts, Contractors' Wagons, Dump Carts.

SADDLES and HARNESS

We will be glad to mail you our Large Illustrated Catalog No. 33. It's free for the asking.

WILBER H. MURRAY MFG. CO., CINCINNATI, OHIO.

Gas Engine IGNITER



Complete with spark coil, \$12.00. The Best Thing on the market. Latest and most improved model. Send for Circular.

For PIPE-THREADING or CUTTING

there is no machine on the market that can compare for ease of operation and excellence of work with **FORBES PATENT DIE STOCK**

Vise is self-centering and dies are adjustable to any variation of the fittings. Parts can be duplicated at slight cost when worn out. Will thread and cut up to 1 1/2 in. pipe. CATALOGUE FREE.

MACHINE No. 30
Range 1/2 in. R. & L.

CURTIS & CURTIS CO., 6 Garden St., Bridgeport, Conn.

Carlisle & Finch Co., 233 E. Clifton Av., Cincinnati, O.

Magnetic Metal Separator

Separates iron turnings, filings, etc. from brass and other metals. Brass stock so cleaned can be used for best work.

MANUFACTURED BY **EZRA SAWYER,** 81 Hermon St., Worcester, Mass.

PATENTS THE WEALTH OF NATIONS PATENTS

A PATENT GIVES you an exclusive right to your invention for a term of seventeen years. You can sell, lease, mortgage it, assign portions of it, and grant licenses to manufacture under it. Our Patent system is responsible for much of our industrial progress and our success in competing in the markets of the world. The value of a successful Patent is in no degree commensurate with the almost nominal cost of obtaining it. In order to obtain a Patent it is necessary to employ a Patent Attorney to prepare the specifications and draw the claims. This is a special branch of the legal profession which can only be conducted successfully by experts. For nearly sixty years we have acted as solicitors for thousands of clients in all parts of the world. Our vast experience enables us to prepare and prosecute Patent cases and Trade Marks at a minimum of expense. Our work is of one quality and the rates are the same to rich and poor. Our unbiased opinion freely given. We are happy to consult with you in person or by letter as to the probable patentability of your invention.

Hand Book on Patents, Trade Marks, Etc., Sent Free on Application.

MUNN & CO., Solicitors of Patents,
Branch Office, 625 F Street, Washington, D. C.
Main Office, 361 BROADWAY, NEW YORK.

HENRY CAREY BAIRD & CO., INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS, 810 Walnut St., Philadelphia, Pa., U.S.A.

Our New and Revised Catalogue of Practical and Scientific Books, 93 pages, 8vo., a Catalogue of Books on Metallurgy, Mining, Prospecting, Mineralogy, Geology, Assaying, Analysis, etc.

ROSE POLYTECHNIC INSTITUTE Terre Haute, Ind. A College of Engineering, Mechanical, Electrical, Civil Engineering, Chemical course, Architecture. Extensive shops. Modernly equipped laboratories in every department. Expenses low. This year. For catalogue address

C. L. MEES, President.



WHAT IS Schapirograph?

THE DUPLICATOR that cleanly multiplies anything written with pen or typewriter, also music, drawings, etc. One original gives 150 copies.

Thirteen Beautiful Descriptive Books FOR 26 CENTS.

In the list of literature published by the Boston and Maine Railroad Passenger Department are thirteen books entitled:

- "The Merrimack Valley."
"Among the Mountains."
"Lakes and Streams."
"Lake Sunapee."
"Lake Memphremagog and About There."
"Southeast New Hampshire."
"Southwest New Hampshire."
"Hoosac Country and Deerfield Valley."
"Valley of the Connecticut and Northern Vermont."
"Central Massachusetts."
"Al Along Shore."
"The Monadnock Region."
"Fishing and Hunting."

The books give a delightful description of the different resorts of New England, each book containing from thirty to sixty pages of interesting reading matter and beautiful illustrations.

Table listing various scientific and technical products with prices, including Games, ball propelling, Strauss Manufacturing Co., Gelatin, prepared, Whitman Grocery Co., Hair preparation, R. G. Edwards, Hosiery, Lord & Taylor, etc.

LABELS.

Table listing labels for various products like 'Always Ready Lowney's Sweet Chocolate Powder', 'Best', 'Bug Axe', 'Butter Ball', etc.

PRINTS.

Table listing various prints and patterns like 'Carpet Magic', 'Contrast', 'Reward', 'Star Band Carriers', etc.

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 10 cents, provided the name and number of the patent desired and the date be given.

THE HARRINGTON AND KING PERFORATING CO. PERFORATED METALS OF EVERY DESCRIPTION FOR ALL PURPOSES FOR SCREENS OF ALL KINDS. No. 225 NORTH UNION ST CHICAGO, ILL. U.S.A.

A. W. FABER Manufactory Established 1761. LEAD PENCILS, COLORED PENCILS, SLATE PENCILS, WRITING SLATES, INKS, STATIONERS RUBBER GOODS, RULERS, ARTISTS' COLORS. 78 Reade Street, New York, N. Y. GRAND PRIZE, Highest Award, PARIS, 1900.

MENNEN'S BORATED TALCUM TOILET POWDER. A Positive Relief For PRICKLY HEAT, CHAFING, and SUNBURN, and all affections of the skin. Removes all odor of perspiration. De-lightful after Shaving. Sold everywhere, or mailed on receipt of 25c. Get Mennen's (the original). Sample Free. GERHARD MENNEN COMPANY, Newark, N.J.

TOOLS AS A TOPIC must be interesting to every hand-craftsman. Montgomery & Co.'s Tool Catalogue which enumerates thousands of tools. Capital handbook of reference. Profusely illustrated. Sent by mail for 25 cents, discount sheet included.

I Print My Own Cards. Circulars, newspaper, Press, \$5. Larger size, \$18.00. Money saver. Big profits printing for others. Type setting easy, rules sent. Write for catalog, presses, type, paper, etc., to factory, The Press Co., Meriden, Conn.

DRAWING INSTRUMENTS Complete Set \$2 to \$5 German Silver Highest Grade ILLUSTRATED CATALOGUE FREE SHOWING FULL LINE DRAWING MATERIALS SPECIAL DISCOUNT TO ARCHITECTS-DRAFTSMEN INDIANAPOLIS BLUE PRINT CO. 142 N. ILLINOIS ST INDIANAPOLIS, IND.

TRANSLUCENT FABRIC UNQUALLED for SKYLIGHTS or for other similar uses. Guaranteed not to crack, break or leak, while freely admitting light. Better than glass in every way and less expensive. Protects against fire better than glass does and can be put in place by any workman.

LOCKE ADDER ONLY \$5.00 ADDS SUBTRACTS MULTIPLIES DIVIDES. Capacity, 999,999,999. C. E. LOCKE MFG. CO. 25 Walnut St. NEW YORK, N.Y.

A Perfect Typewriter The New Improved Odell No. 4 Only \$5.00. A practical and durable typewriter that we guarantee to be accurate and satisfactory.

WE MAKE OR PLATE ANYTHING IN METAL. SEND SAMPLE FOR ESTIMATE. THE T. F. MOORE CO 334 DEARBORN ST. CHICAGO, ILL.

PROPOSALS. SEALED PROPOSALS WILL BE RECEIVED AT the office of the Light House Engineer, Tompkinsville, N. Y., until one o'clock P. M., Monday, May 25, 1903, and then opened, for extending and repairing the wharf at the New London Light House Depot, New London, Conn., in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application.

"THIS BEATS NEW JERSEY." Charters procured under South Dakota laws for a few dollars. Write for Corporation laws, blanks, by-laws and forms to PHILIP LAWRENCE, late Ass't Sec. of State, Huron, S. Dak. or Room K, 20th floor, 220 B'way, N. Y.

MODEL AND EXPERIMENTAL WORK. Electrical and Mechanical Instruments. Small Mach'y. EDWARD KLEINSCHMIDT, 82 W. Broadway, New York.

SPECIAL MANUFACTURING SPEC. MACHINERY MODELS. EXPERIMENTAL WORK, DIES AND STAMPING. PROMPT GLOBE MACH. & STAMPING CO. 970 HAMILTON ST. CLEVELAND, O.

BUILDERS of Special Machinery. Models and Experimental work. Inventions developed. THE FENN-SADLER MACH. CO., Hartford, Conn. American Institute of Inventors Co., Inc. Buffalo, N. Y. U. S. A. Patents sold, placed on royalty and companies formed.

MODEL MACHINE & Experimental WORK. PATTERN SHOP. GEO. KIRKEGAARD, Mechanical and Electrical Engineer, formerly with Thos. A. Edison, 514 Pearl Street, corner of Centre, New York City.

Magical Apparatus. Grand Book Catalogue. Over 700 engravings, 25c. Parlor Tricks Catalogue, free. MARTINKA & CO., Mfrs., 438 Sixth Ave., New York.

DIES, TOOLS and Special Machines. Models and Experimental Work. General Machine Work. PE. J. BENDER & SONS, Inc., 87 Frankfort St., New York.

ICE MACHINES, Corlies Engines, Brewers' and Bottlers' Machinery. THE VILPER MFG. CO., 838 Clinton Street, Milwaukee Wis.

F. N. Roehrich & Co. Machinery Designing, Mechanical Drawing. 102 FULTON STREET, NEW YORK. Telephone No. 2440-A JOHN.

MODELS & EXPERIMENTAL WORK. Inventions developed. Special Machinery. E. V. BAILLARD, Fox Bldg., Franklin Square, New York.

Experimental & Model Work. We wish to correspond with the manufacturer or well equipped machine shop, who would wish to change or increase their line of product. Ours is a legitimate business proposition showing a large margin of profit.

ELECTRICITY. Care Hotel Bucklen ELKHART, IND.

INVENTIONS DEVELOPED. WALTER K. FREEMAN, M.E. Special machinery, electrical and chemical apparatus made on short notice. Good accommodations for inventors. 403 E. 23d St., New York.

NOVELTIES & PATENTED ARTICLES. Manufactured by Contract. Punching Dies, Special Machinery. E. Koninglaw & Bro., 181 Seneca St. Cleveland, O.

MATCH MACHINERY. BIG MONEY IN MATCHES. We manufacture everything pertaining to the business. The Very Latest Process. We will furnish a manager or teach any purchaser the business. F. W. MURPHY & BRO., 1118 Ashland Block, Chicago, Ill., U. S. A.

LEARN RUBBER STAMP MAKING. Complete Outfit. Full Instructions. Profitable Business. Write for Catalog No. 29. R. H. Smith Mfg. Co., Springfield, Mass.

WANTED. Live agents to sell Dr. White's Electric Combs, patented Jan. 1, 1899. Cure dandruff, hair falling out, sick and nervous headaches, yet costs no more than an ordinary comb.

THE DR. WHITE ELECTRIC COMB CO., Decatur, Ill.

DRYING MACHINES. S. F. WORRELL, Hannibal, Mo.

MODELS & CHICAGO MODEL WORKS. ESTABLISHED 1867. 178 E. MADISON ST. CHICAGO, ILL.

MASON'S NEW PAT. WHIP HOISTS. Save expense and liability incident to Elevators. Adopted by principal storehouses in New York & Boston. Manfd. by VOLNEY W. MASON & CO., Inc. Providence, R. I., U. S. A.

MANUFACTURERS!!! Send us samples of any metal on which we are machining the flat surfaces of small arcs. We will grind same free and tell you cost of work if done on the BAYLDON DISC GRINDER BAYLDON MACHINE & TOOL CO., 28 Morris St., Jersey City, N. J.

SAFE TIRES \$3.98. Do not be misled into buying any other tire bearing a name similar to that of our PUNCTURE PROOF STERLING Puncture Proof tire, which is far superior to any other tire ever sold at so low a price.

THE RIGHT KIND OF "HOT AIR" is that supplied to users of the celebrated UTICA HEATERS which are adapted for all climates and all fuels.

STUDEBAKER ELECTRIC AUTOMOBILES. No Expert Chauffeur Needed. Can be Run Any Day in the Year by Any Member of the Family. Wide Touring Radius. A Successful Hill Climber. Smooth Operation. Reliable Brake Control. Great Strength of Construction. Quiet Running. Perfect Spring Suspension with resulting comfort in riding.