must be movable, since a thick slide may re- become so perfectly united that the joint canquire an adjustment of the objective to make it sharp after it has been thrown upon the

(9946) H. H. H. asks: 1. In central station telephone exchange work, where they have party lines with as many as four 'phones connected with the switchboard with only two wires, how is the operator enabled to ring any one of the 'phones she wishes without disturbing the others? I understand they use an alternating current for ringing, and that the 'phones are all alike in construction, that any one of them could be used in place of any one, that is, they are interchangeable, provided that the connections in the instrument are properly changed. Is this right? Of about what potential is the current that is ordinarily used to actuate the ringer movestep-by-step movements for completing the calling circuit. 2. Those employing currents of different directions or polarity. 3. Those employing currents of different frequencies for actuating the different signals, a harmonic system. These several methods are fully discussed and described for 37 pages in Miller's for \$4, to which we would refer you for further information. 2. In winding the armature of a D. C. shunt motor, to carry a current of say ten amperes, is it necessary to select a size of wire that will carry ten amperes without heating, or is one of a five-ampere capacity large enough? Does not the current, on entering the armature, separate, and flow half around one way, and half the other? And how does the rule apply in the case of a dynamo? A. In a direct-current motor armature as ordinarily wound and connected, the current divides at one brush and goes in opposite directions, uniting at the opposite side at the other Each side carries but half the current, and thus need be wound with wire of a size suitable for half the current, 3. Can you give directions for recharging a battery of dry cells with a dynamo? About how many amperes would you force through, and for how long? Is the voltage of the charging current an essential factor? A. We have had no experience in recharging dry cells with a dynamo or otherwise, and do not think the game is worth the candle. The voltage of the charging current should be about 2 volts per cell in series

(9947) S. G. B. asks: (1) What strength approximately is required to break an egg held end to end between the palms of the hands, and why the resistance? (2) Can any living man perform this feat, i. e., is any man I enclose stamp for reply, although probably you answer no inquiries except through the columns of your paper. A. We have never seen any test of the pressure necessary to crush an egg shell in the direction of its longer axis. It is not probably very great. Any one trying this with his hands is a little uncertain of the result and does not really press so very hard. Doubtless many men can press hard enough to crush the simple arch of the shell. The force required can easily enough be determined by making a plaster cast to fit the two ends of of some intelligent people that the ice sinks the egg, and then applying pressure till the shell gives way. We answer many more question which was tions by mail than through our columns. Only put to us by our correspondent, those thought to be of general interest are

(9948) S. G. B. asks: In your reply March 1 to a question of mine relative to the longer axis you say that probably the resistance is not very great and that many men added the shell gave way. It is very difficult to balance the pressure satisfactorily, consequently I think that an egg offers a resistance of more than 74 to 80 pounds. My theory is that a resistance of 15 pounds per square inch (atmospheric pressure) must be overcome before there is any strain whatever on the egg-shell. An egg probably has from 7 to 10 melting point, just as ice has a melting point square inches of surface. Multiplied by 15 of 32 deg. Fahr. this would give a resistance of 100 to 150 pounds. Few men have such strength. Many pounds. Few men have such strength. Many strong men, local champions, have tried this experiment of breaking an egg between the naims of the hands and failed. A. Your observation of the breaking strength of an eggshell under direct and equally distributed pressure is very interesting. The figure you give the change was made the names were lett. In sure is very interesting. The figure you give that is correct, should you not have said, "bedoes not seem very large, and is probably quite near correct. We cannot agree with you that the pressure of the air resists the breaking of the shell, since that pressure is upon the outside of the shell all the time, and is balanced by a pressure from within just as it is upon our own bodies. It has no influence either way upon the power required to break the shell.

(9949) A. G. H. asks how to mend tortoise shell. A. Small pieces of good tortoise shell may be joined so as to form one large apparently seamless piece in the following this time the year had begun on March 25 manner: Slope off the margins of the shells Scotland had made the change in 1600, and for a distance of about 1/4 of an inch from water for some time. The pieces by this means 'Augustus.

not be seen. The filings and very small scraps may be softened in hot water and consolidated by hydraulic pressure in metal molds. Protracted heating of tortoise shell darkens it, and greatly lessens its beauty.

(9950) T. K. asks: 1. Will you kindly explain, in your notes and queries, the mechanism and working of a wattmeter? A. Wattmeters are instruments which have two coils, one a fixed coil of coarse wire in which the current is proportional to the amperes, and the other a movable coil of fine wire in which the flow is proportional to the volts. The instrument is an electro dynamometer; the flow in the coarse coil produces a magnetic field varying with the current in amperes, and the swing or rotation of the movable coils is made to act upon the index or motion of the been included in the book, and in general we ments? A. The methods for selective calling indexes upon the dials according to the prod. may say that it is probably the most compreupon party lines of telephones are divided by uct of the intensities, of volts and amperes, hensive work of its kind that has so far been Miller into three classes: 1. Those employing or watts. 2. How does the feeding and regu-placed before the public. lating mechanism of an arc light act? Most of the arc lamps regulate the feed of the upper carbon by means of a clutch. When the arc becomes too long the current through the arc is reduced, and the current through the shunt circuit which controls the clutch becomes greater, and the clutch releases the upthe arc and the decrease of current in the shunt.

(9951) A. L. R. asks how to make fire-proof roofing. A. After the paper is put on take coal tar and lime (burnt, but not slaked), and boil them together in the proportion of 15 pounds lime to 100 pounds tar. Put it on To pulverize the lime, sprinkle it with a little water and sift it. To avoid the tar boiling over, stir the lime in the boiling tar very slowly. The mixture must always heated before putting on. The lime and tar form a chemical connection, which is fire proof, cannot be melted by sun heat or dissolved by steam or hot water, and makes a smooth, glazed roof.

(9952) M. C. writes: Referring to inquiry 9916, p. 238, my observation is: On inland lakes, where the ice often melts without wind to disturb it, the surface of the lake will appear to have a quite solid covering of ice, and often will sustain a man's weight after a frosty night, and all disappear in a few hours, which gives the impression that it sinks. In reality, ice in thawing becomes very porous, and if disturbed will fall into "nails." as often described. This may be seen in a block of ice lying in the sunshine a short time. Ice in this condition may be a foot or more in thickness, but a slight disturbance will cause it to fall into the small pieces and dissolve in a few minutes. Persons not noticing carefully think it sinks, which of course is impossible. A. The reason given above for the disappearance of ice on a pond in the spring is doubtless the true one, but the question put to us was as to the origin of the belief that the ice sinks when it disappears. This we cannot give. We should have accounted for the disappearance of the ice as our correspondent does, but this does not explain the belief

(9953) V. R. K. asks: I would be pleased to have you inform me if there is anything that could be put in water to stop it. The book affords general information concernfrom freezing. I have used salt, but find that ing the by-products coke oven and its operastrength of an egg in the direction of its it freezes after it gets a certain amount of cold. It must not contain spirits, so as when heated to cause an explosive gas; it must also can doubtless crush an egg held end to end flow freely. What action has salt on water between the hands. With a plaster cast fitting against cold? A. Calcium chloride brine, such as is used in cold storage houses for refrigerathe ends of an egg I applied pressure until as is used in cold storage houses for refrigera-the shell gave way. It bore a resistance of tion, will be what you require. Put 3 to 5 74 pounds. When 7 or 8 pounds more were pounds of calcium chloride to the gallon of water, and its freezing point will be reduced to 39 deg. below zero Fahr. Salt and water will freeze at a little below zero. The melting point of a mixture of salt and ice is 7.6 deg. below zero Fahr. Below this temperature the salt and ice are solid; above that point the mixture is liquid. That temperature is its

(9954) R. G. H. asks: In answer No. September (7th), October (8th), etc., were so the change was made the names were left. If ginning with March"? A. Our use of the phrase "beginning with January" had no reference to the beginning of the year now or at any other time. It happens that the year as ordered by Julius Cæsar began January 1, in order to bring the vernal equinox on the 25th of March as it had been in the time of Numa. the 46th year before the birth of Christ. We in castings is also discussed. were asked to explain the number of days in the months, and kept strictly to the question asked. The beginning of the year on January 1 was instituted by England in 1752. Before France in 1563. It is not correct so far as the the edge. Then place them so that the margins overlap one another; and thus arranged put them in an iron press and immerse in boiling water for some time. The places by this means

NEW BOOKS, ETC.

BEER BOTTLERS' HANDY BOOK. By Philip Dreesbach. Wahl-Henius Institute, 1906. 12mo.; pp. 765. Price, \$5.

This elaborate book is partially based upon the lectures delivered at the Wahl-Henius Institute of Fermentology, and it is intended to serve as a practical volume to meet the many problems apt to confront practical beer bottlers. The author goes very thoroughly not only into the immediate subject embraced in the title, but in a general way as well into the science of brewing with its many subdivisions. Besides this the business phase of the industry is discussed in separate chapters by competent writers. Even many details of work bearing on the brewing industry, which are usually performed by outside contractors, have

GRAINING, ANCIENT AND MODERN. William E. Wall. Somerville, Mass.: Published by the Author, 1905. 12mo.; pp. 137; 50 illustrations. Price, \$3.

The subject under discussion is unquestionis stopped by the increase of the current in modern house painting and decorating, and cannot be treated in a complete and satisfacthe author has handled this in as comprehensive a manner as the importance warrants. The book is splendidly illustrated by full page cuts, showing the various grainings of woods in color, and it will prove of the greatest value to members of the trade. The author's experience in work of this character has fitted him to choose the most necessary matters for discussion, and to eliminate such as have no practical value for the practical man. only is the actual work of the graining fully explained and elaborated, but the mechanical side of the trade, the necessary paints, tools, brushes, etc., is also discussed.

> MODERN DYNAMOS AND BATTERIES FOR AMATEURS AND STUDENTS. By S. R. Bottone. London: Guilbert Pitman, 1906. 12mo.; pp. 172. Price, \$1.

This is the second volume of Electrical Engineering for Students, and in it the author has treated, in a simple and accurate manner, of the construction of many useful appliances required in practical work with current or dynamic electricity. Nearly all the apparatus and machines described can be made by any one possessed of a little perseverance, with the tools usually found at home. The book contains full constructional details and working drawings for making dynamos, motors, battery cells, measuring instruments, and other accessories. A carefully selected list of questions will enable the student to test his knowledge at any time.

THE UNITED-OTTO SYSTEM OF BY-PRODUCT COKE OVENS. New York: The United Coke and Gas Company, 1906. Quarto; cloth; pp. 146; 65 illustrations.

It not infrequently transpires that among best contributions to scientific literature are the publications of certain of the great It includes, probably for the first time, a manufacturing, engineering, or industrial comfairly complete survey of the scientific activity panies, publications which, while often pro- of a country at a given period. As a refduced for advertising purposes rather than for erence book for the field it covers, it may be the propagation of knowledge, are nevertheless even more useful in academic circles than capable of use as reference or text books of "Who's Who in America." Unfortunately, ably must be included in the latter category. tion; and as it is intended primarily for those not familiar with the subject, it avoids to a large extent all unnecessary details of a purely theoretical and technical character. The subject is handled in a most thorough manner, while the language is clear and concise. Among usual biographical data of birth, residence, etc., other subdivisions are included chapters on as well as the best-known work and the chief coal, types of ovens, retorts, products, by- field of endeavor. products and their use and general arrangement of plants. The book is splendidly illustrated with many engravings, charts, and tables, and is a beautiful example of the print-

PRACTICAL PATTERN MAKING. Edited by Paul N. Hasluck. Philadelphia: David McKay, 1905. 12mo.; pp. 160; 300 diagrams. Price, \$1.

iournal Work. The book goes thoroughly into the construction of foundry patterns, core boxes, and patterns and molds for iron columns. Other patterns which are discussed are those for steam engine cylinders, worm wheels, lathe beds, headstocks, poppets, and slide rests. Miscellaneous patterns and core boxes are also described, and the book has three chapters on the jointing and finishing of patterns, and the making of those of circular form. The con-This was struction of core boxes and the coring of holes

> FOOD AND DIET IN HEALTH AND DISEASE. By Robert F. Williams, M.A., M.D. Philadelphia: Lea Brothers & Co., 1906. 12mo.; pp. 392. Price, \$2.

The section of the book devoted to "Food in Health" is interesting as being based upon

"Food in Disease" takes up the subject of diet in a thorough manner. The book will prove of use to the doctor, the nurse, and the layman.

VALVE GEARS FOR STEAM ENGINES. By Cecil H. Peabody. New York: John Wiley & Sons, 1906. 8vo.; pp. 142; 33 folding plates. Price, \$2.50.

There can be little question that there is no feature of steam-engine design of greater importance than the valve and the valve gearing. There are many valuable works on this phase of mechanical engineering, which treat the subject thoroughly from a scientific as well as a practical standpoint. Among the latest publications is the second edition of this book by Prof. Peabody, and it undoubtedly is one of the best contributions to steam engine design. The work is intended to give engineering students instruction in the theory as well as the practice of designing valve gears. As the vast number of valves and gears proposed and in use at the present time would make an exhaustive treatment in a textbook rather difficult, the author's aim appears to be rather to give the learner a firm grasp of the principles and some facility in their application. Graphical methods are used throughout, both for demonstration of principles and for design of gear. In an appendix analytical demon-"American Telephone Practice," which we send per carbon, which drops a little. Its sliding ably one of the most important phases of strations are given of certain principles that tory manner by instruction alone. Common and well-known methods and processes have been used in most cases, though certain features are doubtless original. The changes that have been made from the earlier edition have tended to make the book more simple and more easily understood, and the transfer of all analytical work to an appendix has tended to avoid discontinuity in the graphical presentation of the subject.

DAS VERZINNEN, VERZINKEN. By Friedrich Hartmann. Vienna: A. Hartleben's Verlag, 1906. 12mo.; 5 illustrations; pp. 228. Price, 75 cents.

The covering of one metal with a thin layer of another is of such importance to-day, not only for the usual industrial purposes, but for scientific, chemical, and electrical uses as well. that a practical and thorough handbook on this subject is doubtless of value. Recent years have produced in metallurgy countless improvements and innovations, and this also holds true in that phase of the subject discussed by the author. In this, the fifth edition of his work, he has brought it as nearly as possible up to date, and includes therein the best European practice and methods. Considerable space is given to the discussion of the alloy known as magnalium, a mixture of aluminium and magnesium, and which possesses many remarkable characteristics as yet little known among technical men. Electro metallurgical methods are also thoroughly discussed and developed.

AMERICAN MEN OF SCIENCE. ical Directory. Edited by J. McKeen Cattell. New York: The Science Press, 1906. Large 8vo.; pp. 364.

This book is doubtless a valuable contribution to the organization of science in America. the greatest value, and this work unquestion-there scarcely exists among scientific men the recognition of common interests and the spirit of co-operation which would help to give science the place it should have in the community, and it is hoped that this work will be of service in making scientific men better acquainted with one another and with one another's work. As far as possible each name is followed by a short historical account, which includes the

GLUE, GELATINE, AND THEIR ALLIED PRODUCTS. By Thomas Lambert. London: Charles Griffin & Co.; Philadelphia, 1905. 12mo.; pp. 151. Price,

The glue and gelatine industry has made an immense advance during the last few years. Old methods of working have given way to new, and this changed condition of things, due This book contains in a convenient form for terials and their treatment, necessitates are every day use a comprehensive digest of inforvision of the literature. The work before us to a better scientific knowledge of the raw ma-

INDEX OF INVENTIONS

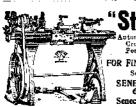
For which Letters Patent of the United States were Issued for the Week Ending

April 17, 1906.

AND EACH BEARING THAT DATE

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

Air bressure and vacuity indicator. H. A.	Cotton compress, W. Hill 818,17 Couch or bed, combined, E. M. Hulse 818,27 Crushers and pulverizers, preliminary breaker for, M. F. Williams. 818,32 Cullnary vessel, O. M. Knox 818,03 Cultivator, J. E. Jones 818,25	& Holden 818,368 Kitchen utensil, E. H. & H. E. Vuillemot. 818,463 Knitting machine, J. B. Hipwell 817,775 Knitting machine, J. E. Rowe 818,295 Knitting machine picker mechanism, J. B.	Rail joint, R. Romine
Arch structure, D. B. Luten. 815,356 Ax, folding, A. E. Veon. \$17,859 Axle, G. M. Smith 817,851	Curvert, H. G. Moats 3 Curtain fixture, H. H. Forsyth 9 Curtain pole fixture, F. N. Martinaale \$18,06 7 Curtain pole lifter, C. S. Armstrong \$17,76 6 Curtains, means for plaiting hanging, French 8 Pluch 9 Cuspidor, F. A. Keiff 518,66	ham 817,872 Ladder, aerial, A. W. Shaw \$18,384 Lamp, oil, J. E. Foxlee 817,967 Lamp socket, incandescent, W. J. Jones 818,253 Lamp, ultra-violet, T. B. Kinraide \$17,976 Lamps, match holder attachment for, A. H. Stow	H. W. Perry 818,116
Axle box lubricator, A. G. Elvin. 818,021, 818,022 Bag cutting machine, S. H. Jones. 817,915 Baling hay and similar materials, J. & W. H. North. 817,935 Baling press, J. & W. H. North. 817,935 Baling press, W. R. Colman 818,231 Ball mill, tubular, M. F. Abbe. 818,211 Bandages, device for facilitating the removal of, C. P. Williams. 817,946	2 Derrick, S. P. Mitchell S17,95 0 Display form, glove, Lane & Swift S18,15 0 Display rack, A. C. Wood S18,32 0 Division plate and tablet holder, H. W. 1 Andrews S18,01 2 Door fastener, sliding, W. H. Booth S18,14 1 Door holding and releasing device, S. S. 1 Door holding and releasing device, S. S.	3 Land roller, J. C. F. Kelch 815,097 4 Lantern, J. H. Hill 817,914 5 Last, E. C. Woodard 817,828 Last, A. G. Fitz 817,926 2 Last, shoe, G. Raisbeck 818,648 3 Latch, A. Shepard 817,878 4 Latch, alarm, C. E. C. Edey 818,368 5 Latch, alarm, C. G. Taylor 817,875 6 Latch, alarm, C. G. Taylor 817,857	signaling and switch setting for, B. 0. Wagner \$18,133 Refrigerator, E. C. Kindrick 817,782 Regist er Dement & Hull 818,234 Register I. S. Dement \$18,235
Bar. See Boring bar. Bar knife, W. H. Kingsley	Door securer, E. Dengler	2 Lifter. See Curtain pole lifter. 5 Lifting jack, I. C. Huffman	Retort, R. Ziesing \$18,282 Retort, R. Ziesing \$18,070 Revolvers, cylinder stop for, M. Bye. \$18,975 Robe, invalid's, E. Clark \$18,351 Rock drill, R. Binnie, Sr. \$18,015 Roller. See Land roller. Rolling mill, P. M. Weber, reissue. 12,472 Rolling tubular bodies or blanks, apparatus
Webster 818,318 Bearing, wheel, G. A. Anderson 818,218 Bed attachment, invalid, I. Baker 317,951 Bed, convertible sofa, G. E. Holmes, et al. 818,085 Bedspring attachment, W. A. Perry 318,085 Bedspring fastener, R. Naysmith 818,113 Bedspring support, R. Naysmith 818,111 Bedspring supporting device for spring, 818,112	Electric cut out, R. H. Read	1 and the like, T. Wilcox	for cross, J. H. Nicholson \$17,796 Roofing plate, H. Baden \$18,303 Rotary engine, K. A. A. Staahlgren \$17,814 Rotary engine, A. H. Wright \$18,309 Rotary engine, trailing cylinder head, H. A. King \$18,029 Rowing mechanism, bow facing, D. R. Sheen \$17,510 Rubber soles on shoes, mechanism for mold- ing and vulcanizing, T. Miller 817,791
C. H. Johnson 817.918 Beehive, G. W. Mann 818.276 Beer cooler, F. H. Strobel 818.057 Belt reel, D. F. Geiger 818.157 Belting, pressed, A. Kislik 818.031 Billiard cue tip fastener, Allen & Beach 318.031 Bollers, system of water regulation for flash, H. Lemp 818.382 Book leaf, detachable, M. G. Swan 818.136	0 Electrical circuit and device, R. J. Hewett. 818,15 6 Electroplating tank, Backus & Wallace 817,85 1 Electrostatic apparatus, L. I. Blake 817,75 1 Embroidering machine shuttle, E. Berger. 817,75 1 Engine attachment, traction, J. M. Bartosh 817,85 2 Engine tank, traction, G. A. Anderson 818,21 2 Engine tank, traction, G. A. Anderson 818,21 2 Engine tank, traction, G. A. Anderson 818,21 3 Engraving machine P. V. Avril 818,137 to 818,13	1 Loom shedding motion, G. Giussani \$17.763 9 Loom shuttle cheek, J. Laforet \$18,034 0 Loom shuttle spindles, device for applying cops to, M. Hellich \$17,770 2 Loom stoppindicator, J. A. Collins \$18,148 4 Loom stopping mechanism, J. Coldwell \$18,332 3 Loom warp stop motion, N. Foerster \$18,387 6 Loom weft fork, T. Hilton \$17,915 1 Loom weft fork, T. Hilton \$17,915	Rule, O. E. Wycoff S17,401 Rule, bevel square, T. S. Ross \$18,051 Safe or vault door seating machine, H. D. Hibbard S17,774 Salt shaker, C. R. Gilbert \$17,774 Salt shaker, C. R. Gilbert \$17,844 Salts, making phenylglycin, Behaghel & Schumann \$18,347 Sap receiving receptacle, E. A. McKov. \$18,278
Book leaf, detachable, M. G. Swan	88 Elvelop, malling, J. Sawdon \$11,55 9 Eraser, E. G. Dann \$17,85 4 Excavator, A. M. Anderson \$18,214 \$18,21 Exercising device, T. R. Geisel \$18,22 2 Expansible bit, S. H. Tucker \$18,60 Byeglass holder, M. J. Russell \$13,25 3 Eyeglasses, G. L. Williams \$13,25 Faucet knob H. A Ruster \$17,96	Lubricating system, H. W. Elliott 818,384 Lubricator, C. E. Graebing 818,160 Magnifying glasses, reflector for, C. E. Bunker 817,902 Mail collection and delivery box, J. I. Fullwood 818,241 Marble manufacture of plates or slabs imitating, O. Devillers Match box B. I. Hoofer 817,963	Sash fastener, C. G. Seaman. 118,304 Sash opener, greenhouse, N. R. Evans. 817,758 Sash trimming machine, M. E. McAfee. 117,366 Saw dressing device, T. W. Roach. 1815,195 Saw jointer, A. O. Reppeto. 1818,125 Saw swage, S. T. Lipsey. 1817,948 Sawmill carriages, set works for, W. H. 17,388
of, P. Wagret 818,134 Bracelet, J. M. Clark, 2d. 818,144 Brake, J. W. Tapp 817,942 Brake hanger, C. K. Pickles 817,573 Brake hanger, E. H. Scofield 817,994 Brake shoe, C. W. Armbrust 817,893, 817,894 Brake shoes, making, W. D. Sargent 818,304 Breakwater, fleating, T. D. Cook 817,904	4 Feeding device time L. A Stahmer \$17.85	Match box, B. M. Whiteker \$18,324	Scaffold, D. Leuz
Brick, manufacture of, G. A. Riddle	8 Firearm, J. L. Saget	7 Measuring instrument, electrical, J. Patrick \$17,869 Metal heating apparatus, F. J. Clinch Jones 818,147 Metallic compounds, manufacture of, S. Parfitt 818,044 Metallic tie, J. A. Wilkinson \$18,047 Meters, J. A. Tilden \$11,857	Seal, E. J. Brooks
Buckle book, W. W. Reid	4 N. Weikly 818,32 6 Fluid pressure engine, E. Roach. 818,12 6 Fluid pressure engine, E. Roach. 818,14 Folding apparatus, J. W. Minton. 818,15 Folding machine, A. R. Nauer 817,92 0 Foot rest, E. Galbraith 817,97 7 Fork scraper. Kormil & Radloff. 818,10	ment for, R. L. McCartney. 818,276 Miter clamp, R. Dunne 817,996 Mold filling device, J. A. Johnson 818,093 Mold opening tool, A. G. Woodford 817,829 Molding apparatus, E. L. Aiken 817,831	Sewage treating apparatus, M. V. Smith. 817,996 Sewing cabinet, V. H. Bogardus
Cabinet, credit, Ellett & Vick. 818,08 Cables, etc., system for supporting, E. 818,26 Lodder 818,26 Calculating machine, interest and percentage, W. M. Braly 818,22 Camera attachment, R. A. Woodall 818,12 Can body machine, locked seam, J. H. McElroy 818,10 Can making machinery, J. H. McElroy 818,10	real from peat by means of the ejectric specific recreat, producing, 5. B. Bessey 817,82 Funigating plants, R. Hand 817,84 Funigating plants, R. Hand 817,85 Funace, W. G. Wise 818,35 other substances, Robeson & Bettington 817,95 fon 817,95 Game apparatus, H. Medley 817,95 Game apparatus, H. Medley 817,95 Funiform 817,95 for substances apparatus, H. Medley 817,95 for substances f	Kuster 817,856 Musical instrument, stringed, E. A. Randall \$18,229 Needle, etc., T. A. Edwards \$18,152 Oil burner, R. G. Kirkwood 818,030 Oil feeding or charge delivering device, H. 0.8 H. E. Spade \$17,997 Oil press, C. Nelson \$17,997 Oil press, C. Nelson \$19,926	Sten
Car dumping device, automatic, Hansen &	9 Game apparatus, F. Sieder	ore concentrator, B. Ballentyne 818,334 Ores, electrical apparatus for determining the location of metallic, F. H. Brown. 817,749 Oven, gas, T. E. Taylor. 818,331 Package tie, E. M. Comstock. 818,354 Packing ring for shafting, W. L. R. Emmet 818,365	Slideway, spiral, W. H. Logan. \$18,383 Smoke consumer, B. Haigh \$18,024 Snap, harness, M. D. Wood \$18,330 Snap hook device, harness, J. Reichert. \$18,299 Snap switch, F. W. Sanford \$18,299 Snow melting machine, J. F. Blake \$18,072 Soap holder, C. H. Pinches \$17,985 Soap holder, S. Thornton, Jr. \$18,004 Sod and cornstalk cutter, P. C. & T. O.
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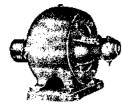


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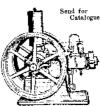
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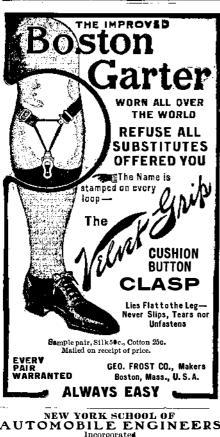
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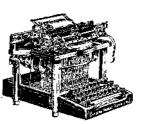
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