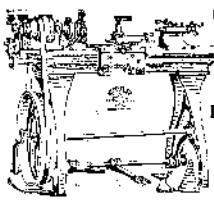



"Star" Lathes
Foot and Power Screw Cutting
Automatic Cross Feed
FOR FINE, ACCURATE WORK
Send for Catalogue B.
SENECA FALLS MFG. CO.
695 Water Street,
Seneca Falls, N. Y., U. S. A.



Engine and Foot Lathes
MACHINE SHOP OUTFITS, TOOLS AND SUPPLIES BEST MATERIALS. BEST WORKMANSHIP. CATALOGUE FREE
SEBASTIAN LATHE CO., 120 Culvert St., Cincinnati, O.

THE CLIPPER CLIP
Its triangular shape prevents entangling and gives three times the capacity of any other Clip for attaching papers together.
Best & Cheapest. All Stationers.
CLIPPER MFG. CO.,
401 West 124th St., New York, U.S.A.
For free samples and information write to us.



ICE BOATS!
If you want to know how to make an Ice Boat, buy SCIENTIFIC AMERICAN SUPPLEMENT 1556. Complete working drawings and a thorough description are published. Order from your newsdealer or from Munn & Co., 361 Broadway, New York

Keystone Well Drills
for Artesian and Ordinary Water Wells; Mineral Prospecting and Placer Testing for Dredgers; Deep Drilling for Oil and Gas; Contractor's Bore Holes; Drilling, River and Harbor Exploration, etc. Our five catalogs are text-books in these lines.
KEYSTONE WELL WORKS
Beaver Falls, Pa.



THE BARKER MOTOR
has from the first shown itself to be of superior design. Mechanical ideas of proven worth, combined with the best materials and careful attention to details make it
THE LEADER OF ITS CLASS.
C. L. BARKER, NORWALK, CONN.



Nickel Plate Road Again Selling Colonist Tickets to the Pacific Coast.
Extremely low rate tickets on sale daily February 15 to April 7 to Pacific Coast and other points in the Far West. Tickets good on any of our trains and in tourist sleepers. For full information write A. W. ECCLESTONE, D. P. A., 385 Broadway, New York City.

Mustard & Company
GENERAL IMPORTERS AND COMMISSION AGENTS
Plumbing Supplies, Safes and Scales. The largest Hardware, Machinery and Tool House in China
9a NANKING ROAD SHANGHAI, CHINA

ALL About PAINT FREE
My New Big Paint Book tells you all about paint, how to know good paint from bad. Tells why my made-to-order PAINTS are the best and safest for all purposes. Guaranteed eight years. Two full gallons to try, free if you are not satisfied. Largest, handsomest paint book ever made, has great double pages color samples in greatest variety of tints. Costs us 75c to make, but free to you. Write today—Address O. L. CHASE, The Paint Man, 21 S. Olive St., St. Louis

SUBSTITUTES FOR COAL
Are described from the technical standpoint in the following Scientific American Supplements.
Each Supplement named costs 10 cents by mail:
COMMERCIAL USES OF PEAT. SCIENTIFIC AMERICAN SUPPLEMENT 1324. The article enumerates the principal peat bogs and states their financial possibilities.
GERMAN BRIQUETTING MACHINERY IN AMERICA. SCIENTIFIC AMERICAN SUPPLEMENT 1411. A valuable economic report.
A NEW ELECTRICAL PROCESS FOR THE MANUFACTURE OF PEAT FUEL. SCIENTIFIC AMERICAN SUPPLEMENT 1492. The paper fully describes the Bessey process.
LIGNITE, PEAT, AND COAL DUST FUEL. SCIENTIFIC AMERICAN SUPPLEMENT 1426. A careful consideration of German methods.
MOOR CULTIVATION AND PEAT INDUSTRY IN GERMANY. SCIENTIFIC AMERICAN SUPPLEMENT 1481. An excellent critical review.
DOMESTIC COKE AND BRIQUETTES FROM RETORT COKE OVENS. By R. M. Atwater, SCIENTIFIC AMERICAN SUPPLEMENT 1211. A valuable monograph by an expert.
THE WHITE MINERAL PRESS FOR BRIQUETTING. SCIENTIFIC AMERICAN SUPPLEMENT 1224. An article describing and illustrating an American briquetting machine.
Price 10 cents each, by mail.
Order through your Newsdealer or from
MUNN & COMPANY
361 Broadway NEW YORK

Notes and Queries.

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, 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 price.
Minerals sent for examination should be distinctly marked or labeled.

(9878) E. J. J. asks: 1. Will a storage battery made up of a bundle of thin lead plates separated by thin layers of asbestos paper be efficient? A. A storage cell can be made by the use of thin sheets of lead between sheets of asbestos. It would not be heavy enough to be efficient. This is the first way a storage cell was made—by rolling sheet lead between sheets of cloth. 2. What would be the surface required to give a current of 10 amperes? A. A storage cell may give 4 to 8 amperes per square foot of negative plates, counting both surfaces of the plate. 3. What would be the effect of using a stronger solution of sulphuric acid than 10 per cent? A. Too strong an electrolyte will consume the plates, and spend itself without giving any return. Sulphate of lead will be formed, and the plate will be destroyed.

(9879) F. E. W. writes: The statements and process of reasoning of your correspondent J. F. in Notes and Queries No. 9840 are so obviously and fundamentally erroneous, that I am surprised that you should print it without some editorial comment. To begin with, there is no such quantity in mechanics as "accelerating velocity." Perhaps J. F. intended to speak of acceleration; but if we grant that it was acceleration that was meant, then the dimensions in which it is expressed are wrong, for acceleration is not "feet per second," but feet per second per second. In fact, all through his argument J. F. has hopelessly confused the terms used in mechanics, and finally concluded by an attempt to subtract two forces from two accelerations—quantities which are as radically different in their nature as are volumes and areas. When we speak of a freely falling body, we do not mean one that is falling in air or other retarding media, but one that is acted upon by the force of gravity alone. It is only under this latter condition that a constant acceleration is given to such a falling body. To show that a ball of lead and one of cork will not reach the ground in the same time if they are dropped at the same instant, let us first see what kind of quantities we have to deal with in the solution of the problem. Without going too deeply into the question of dimensions, we define both weight and force as being the product of two factors, or

$$\text{Weight} = \text{Force} = \text{Mass} \times \text{Acceleration, Velocity}$$

and acceleration is = $\frac{\text{Time}}$
When a body is allowed to fall in a vacuum, it is acted upon by the force of gravity alone. This force is equal, by definition, to the product of the mass of the body by the acceleration therein produced, or

$$F = M \times A$$

Now, suppose the same body to be allowed to fall in air. The resistance offered by the air to the passage of the body through it is a force (which we may call f) and acts in direct opposition to the force of gravity, so that the resultant force, acting downward on the body, is less than in the first case, and we may write:

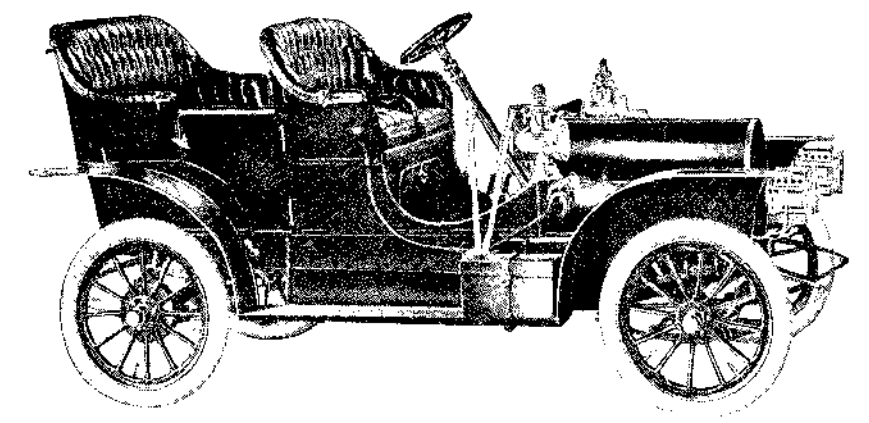
$(F - f) = M \times A'$
The left-hand member of this equation is obviously less than that of the preceding one, so therefore our right-hand member must also be less. But as the mass M is constant, the only factor that can have decreased is the acceleration, and therefore A' is less than A . This is the same thing as saying that gravity cannot accelerate a body so rapidly in a resisting medium as in a vacuum, a statement that ought to be self-evident. Let us consider now two balls of the same identical shape and size, but one weighing 40 pounds and the other 2 pounds. And suppose, for convenience, that each ball meets with a resistance of 1 pound when it is falling through the air at some uniform velocity = v , say. Then when the two balls are dropped in a vacuum, we have, by substitution in our first equation,

$$40 = m_1 \times a_1 \text{ for the heavy ball, and } 2 = m_2 \times a_2 \text{ for the light ball.}$$

The masses m_1 and m_2 being proportional to the weights of the balls, the accelerations a_1 and a_2 are equal to each other, and the balls fall in equal times.

Now, if dropped in air, when the balls are falling at the velocity v , we will have:
 $(40 - 1) = m_1 \times a_1'$ for the heavy ball, and
 $(2 - 1) = m_2 \times a_2'$ for the light ball,

FRANKLIN



Type G Four-cylinder Light Touring-car. Shaft drive. 1400 pounds. \$1,800.

How does "Franklin air-cooling" make a more powerful engine, and an abler car for less money?

By creating a more efficient temperature in the combustion chambers than is possible in any other engine. By also getting rid of weight. By saving repair-cost and weight-cost; and by giving more days' work in a year.

The Franklin auxiliary exhaust does what no other invention ever did for a motor-car cylinder; lets out the hot, used gases before they have a chance to over-heat the cylinder. It prevents flame being carried out along the main valves to burn or pit them, and cause them to leak compression. It permits the cylinders, being cooler, to take in a larger charge, and enables the charge to do its full work freely and unhampered.
And here is an equally important fact: while Franklin cylinders do not over-heat, they also do not under-heat. A certain degree of constant heat is necessary for the best work in a gas-motor cylinder. Franklin direct air-cooling creates exactly the most efficient working temperature in the cylinder, while the Franklin auxiliary exhaust maintains this temperature constantly.

Thus the Franklin engine yields its full ability from the start, and keeps it up continuously—produces big power, saves a large percentage of the power that is lost in standard cylinders, and delivers to the Franklin rear wheels an exceptional amount of active working energy.
The weight of water-cooling apparatus—pipes, pumps, tanks, radiator, water; and the heavier frame needed to carry them—a total of some 200 useless pounds—are all dispensed with; and the power left free to carry people; and to go. No water-cooling repairs are needed. Fuel and oil bills are small because of light weight and reduced friction. The light weight makes an enormous saving on tires.
There's nothing to freeze. A Franklin car is ready for use any minute, in any climate—365 days in the year. That brings down the cost for every day's use.

Send for the handsomest and clearest of all motor-car catalogues.
4-cylinder Runabout, \$1400 4-cylinder Touring-car, \$2800
4-cylinder Light Touring-car, \$1800 6-cylinder Touring-car, \$4000
Prices f. o. b. Syracuse, N. Y.

H. H. FRANKLIN MFG. CO., Syracuse, N. Y. M. A. L. A. M.

BUILD YOUR OWN BOAT



BY THE BROOKS SYSTEM

There is no reason why you cannot own as good a boat as the best boat factory can produce if you will use your leisure time to advantage and build it yourself. The fact that anyone using the Brooks System, no matter how inexperienced he is in the use of tools, can build his own boat at the cost of a little lumber and a few nails, has brought boats within the reach of all. All the boats built last year, by all the boat factories in the United States, combined in one fleet, would not equal the number of boats built during the same time by novices using the Brooks System. Our catalog gives pages of testimonials with photographs of the boats built by amateurs using the Brooks System.

The Brooks System consists of exact size printed paper patterns of every piece that goes into the boat, a complete set of half-tone illustrations showing an actual picture of each step of the work properly done, detailed instructions to build, covering the entire construction of the boat and an itemized bill of all material required and how to secure it.

We tell you how to lay the pattern of each particular part on the proper piece of material and exactly how to cut—you cut. We then tell you how to fasten each part in its right place—what kind of a nail to use—how to drive it—you drive it. You need no mechanical ability, the Brooks System supplies this—how is shown in the catalog.

Many professional men are taking up the Brooks System for mental relaxation—for the pleasure of working with their hands and for exercise.
We have started hundreds in the boat building business. One man built sixteen boats from one set of patterns last season. Another built ten. The materials cost very little. We furnished the design, they did the work and sold the boats at a big profit.

You need buy nothing from us but the patterns. We have them of all kinds and sizes, from small Row-boats and Canoes to Sea-going Yachts. We have over fifty styles and sizes of boats and boat patterns, each one perfect in design for its purpose. Our catalog illustrates the product of the best staff of designers in the world.
Over ten thousand amateurs throughout the world successfully built boats by the Brooks System in 1905.

When so ordered, Patterns are Expressed, Charges Prepaid, C. O. D., Allowing Examination.

KNOCK DOWN BOATS
complete from keel to cushions and fittings. We send you a complete Knocked Down Boat, even to the paint at a cost of very little more than the cost of the raw material.

ILLUSTRATED CATALOG OF ALL OUR BOATS FREE
BOOKS WE PUBLISH:
Useful Information for the Amateur Yachtsman and Boat Builder. Price 25 cents
The Principles and Operation of Marine Gasoline Motors. Price 25 cents
Book of Designs for Practical Boat Builders. Price 25 cents

BROOKS BOAT MFG. CO.
Originators of the Pattern System of Boat Building
401 Ship Street Bay City Mich., U. S. A.



From this we see that

$$a_1' = 39/40a_1 \text{ and } a_2' = 1/2a_2.$$

Therefore the percentage decrease in the acceleration due to gravity is only 2½ per cent for the heavy ball, while for the light ball it is 50 per cent. Therefore the heavy ball is accelerated most, and falls the faster. It is thus clear that the retarding force of the air due to the passage of the balls through it, which is assumed to be the same on each ball, is not a quantity that can be subtracted from a velocity, as J. F. would have it, but one that enters the equations of motion in an entirely different way. A. There is perhaps no proper defense for having printed Query 9840 without a refuting comment, but it was done to show a type of reasoning which very often comes to our desk. Indeed, this matter of falling bodies retarded by the atmosphere is probably the most prolific in our correspondence, only a very small portion of which gets into print. The demonstration you give is probably quite too technical for the average reader of Notes and Queries, whom we are always obliged to keep in mind in deciding what to insert in the column. The new expression for acceleration, "feet per second per second," is correct, but in the editor's experience with classes it is in no way an improvement over the older mode of expressing the same fact, if indeed it is not really a block to understanding. To meet the needs of those whom we must keep in mind, who are not versed in mathematical mechanics, we must avoid the equation as much as possible, and make our explanations in words. This is not as satisfactory to the mathematician, of course, but we are confident that it meets the needs of our average reader.

(9880) J. R. W. asks: Please explain the following phenomena in the Notes and Queries department of the SCIENTIFIC AMERICAN: About four years ago, at 3 o'clock P. M., two friends and myself witnessed the falling of a meteor near Springfield, W. Va. The sun was shining and we were looking toward the east. A mountain about 1,000 feet higher than where we were standing lay one mile east of us. The meteor was brilliant red, and about the size of the planet Mercury. When first observed it seemed about 500 feet higher than the top of the mountain. It fell nearly vertical, and seemed to drop on the mountain about one-third way down from the top, and was so plain that we located where it seemed to fall, by a tree. On examining the place no trace of it could be found. A few days after I read an account of a large meteor falling in Clark County, Va., on the same day and hour. Do you think the meteor we saw was the same one that fell in Clark County? The distance is 40 to 50 miles. A. It is very easy to believe that the meteor described as seen above a mountain top was in reality 40 miles away. There is no possible way to estimate distances in the sky, in the line of sight. An error is most easily made in judging the distance of such an object.

(9881) M. L. C. asks: How could I arrange so that I would get electric sparks by sliding a silken cushion (or any other material) along a glass rod back and forth? A. It is not possible to obtain sufficient electrical energy by rubbing a glass rod with a rubber held in the hand to produce sparks. A plate swiftly rotated as in the various machines is needed. The best which can be done with a rod and rubber in the hand is to have the rubber of silk or woolen and lined with some strips of tinfoil connected to a wire which extends out so that the electricity which is generated may be conducted to the place where the spark is desired. Of course, the best way to get electric sparks is by the electrophorus. The making of this is easy. You can find out how to proceed by getting St. John's "How Two Boys Made Their Own Electrical Apparatus," a fine book which we send for \$1.

(9882) W. E. B. asks: Please inform me, through Notes and Queries, what material is needed, and how to construct the so-called water-pail forge. A. The materials needed to construct a water-pail forge are a pail, some salt water, and some sheet lead. Place the sheet lead so as to nearly or quite cover the bottom of the pail, and have a strip extend up out of the salt water, so as to attach the positive wire to it. The negative wire is attached to the piece of metal to be heated, and the metal is dipped into the salt water. Instantly a flash of light occurs, and in a second or two it is white hot. The forge cannot be worked with much less than 220 volts.

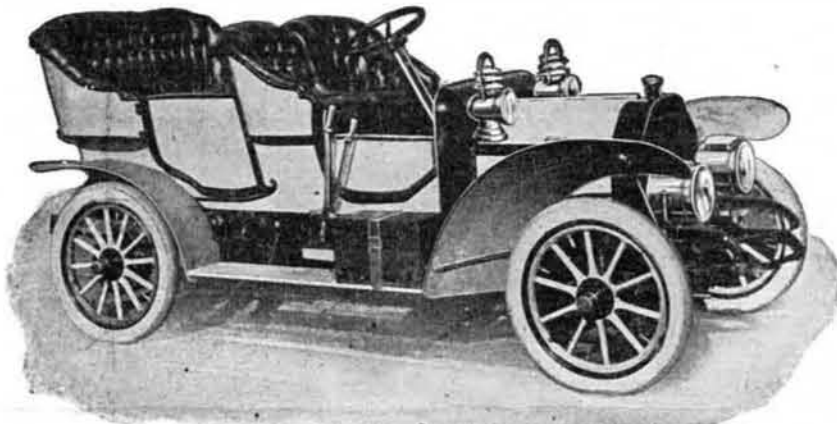
(9883) J. W. asks: 1. What is the increase of velocity of a falling object per second? A. The velocity of a falling body increases 32.16 feet or 980 centimeters each second of its fall. 2. How long would it take an object to fall 3,000 feet? A. The time required to fall freely through any distance is found by the formula $S = \frac{1}{2}GT^2$. In this formula, $G = 32.16$; S is the space, and T is the required time. To solve your problem, put 3,000 feet as the S and solve for T . 3. What is the speed at which an object will take fire through friction with the air? A. The speed at which an object will take fire from friction against the air varies with the density of the air. It is not speed which determines the matter simply, but time which must be taken into account. See books of astronomy for this under meteors, since these take fire and shine by reason of the friction against the air as they fly swiftly through the air.

OLDSMOBILE



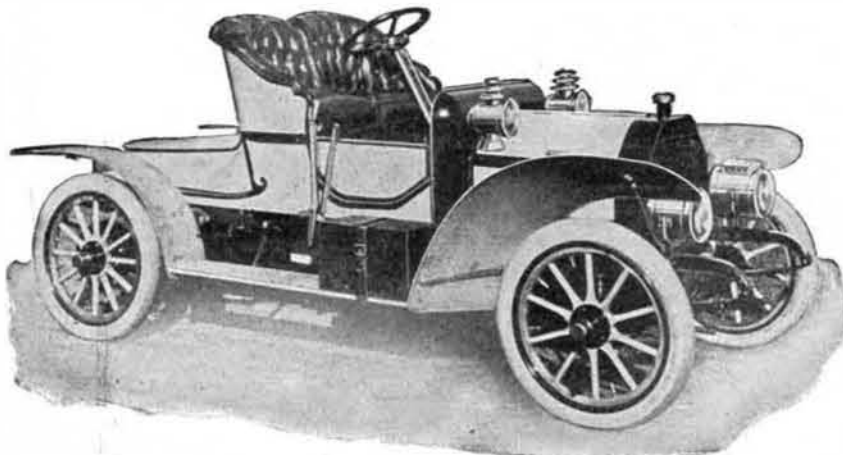
MODEL S, 4-Cylinder, 26-28 h. p. Price \$2250 (with complete lamp and horn equipment.)

Our Palace Touring Car, Model S, is the "top-notch" of 1906. It is a genuine American car, discounting European product at Wall Street rates. Send for booklet telling how we have packed more style, speed, stability and brains into Model S for \$2250 than can be found in any car in the world for anything like the same money.



MODEL L, 2-cylinder, 2-stroke cycle, 20-24 h. p. Price \$1250. (with complete lamp and horn equipment.)

The Double-Action Olds is a car with two working strokes for every revolution of the crank. It's the "Latest"—the "new thing"—in automobiles. It is free of valves, guides, cams, and other mysteries that usually terrify the uninitiated. Its motor has only three working parts. It's a giant for hill climbing and difficult roads. Its price, \$1250. Write for our "Double-Action" Booklet.



THE DOUBLE-ACTION OLDS, Without Tonneau.

For 1906 we have brought out, in addition to our well-known standard curved dash runabout (the "you see them wherever you go" kind), a straight dash or "piano box" runabout, which we sell at the same price, \$650. This style appeals strongly to a certain class of drivers. It is unique and attractive and possesses all the most desirable features essential to a satisfaction-giving runabout. It has a simple single cylinder motor, with 7 h. p. It is lever-controlled. Starts from the seat; has safety device to prevent all danger of back fire; effective and easily operated brakes, and many attractive and serviceable features, making it up-to-date and desirable in every way—a big-value for the money, and essentially a car for business utility. Use the Catalog Coupon below for further particulars.

OLDS MOTOR WORKS

Lansing, Mich., U. S. A.

Canadian trade supplied from Canadian Factory, Packard Electric Co., St. Catharines, Ont. Member of Association Licensed Automobile Manufacturers

CATALOG COUPON	CALENDAR COUPON	MOTOR TALK COUPON
Kindly send me information regarding cars checked. I am interested.	Enclosed find 10 cents for which send your large Art Calendar (free from advertising and suitable for framing) for 1906. Design by George Gibbs.	Enclosed find 25 cents for which have MOTOR TALK, a magazine devoted to automobilism, sent to me for 1 year. S.A.2
Model B..... Delivery Cars..... Model S..... Passenger Traf- S. A.2 Model L..... tic Cars.....	Name..... Address.....	Name..... Address.....

NEW BOOKS, ETC.

MODERN TURBINE PRACTICE AND WATER-POWER PLANTS. By John Wolf Thurston. New York: D. Van Nostrand Company, 1905. 8vo.; pp. 244. Price, \$4.

Modern turbine practice is thoroughly described in this book, whose object is to give such information with regard to modern turbines and their proper installation as is necessary to the hydraulic engineer in designing a water-power plant, and no attempt has been made to treat the designing of turbines. The writer has designed turbines both in America and in Europe, and has been connected in engineering capacities with water-power development aggregating nearly 200,000 horse-power, having been in charge of the hydraulic work during the planning and construction of some of the most important developments in Canada. He has had an excellent opportunity to study the subject from the point of view of the turbine builder and of the turbine user. In the first part of the book the author points out the direction in which improvement is to be sought in the present American turbine practice. On account of the great importance of the steam turbine and its close relation to the hydraulic turbine, the writer has included a chapter on this subject. It is an excellent work, and will prove of great value to the hydraulic engineer.

THE INDUSTRIAL PROBLEM. By the Rev. Lyman Abbott. Philadelphia: George W. Jacobs & Co., 1905. 12mo.; pp. 196. Price, \$1.

This book contains the lectures on Christian sociology given under the auspices of the Rev. William L. Bull Lectureship during the present year. The four lectures by Dr. Abbott are on the Industrial Problem; the Political Solution—Regulation; the Economic Solution—Reorganization; and the Ethical Solution—Regeneration. It is unnecessary to state that these lectures are in Dr. Abbott's most characteristic style, and that they contain much of interest on this, the greatest problem of our day.

PRÉCIS D'HYDRAULIQUE. LA HOUILLE BLANCHE. By Raymond Busquet. Paris: J. B. Baillière et Fils, 1905. 12mo.; pp. 317, 49 illustrations. Price, \$1.50.

This work from the pen of Prof. Busquet has for its aim the placing at the disposal of all engineers, and others interested in the use of water power, of the principles to be followed in the construction of hydraulic power plants. M. Busquet first states the primordial laws of hydraulics which must be followed in plants of this character, and he then follows this with a discussion of the flow of liquids through pipes and in open canals. The latter part of the work describes various forms of turbines and waterwheels, and there is a closing chapter on the "Creation of a Water Power." The book, while more or less technical in character, does not go into mathematics beyond the solution of ordinary arithmetical problems, and the employment of the first principles of geometry.

SUGAR AND SUGAR CANE. By Noël Deerr. Manchester, England: Norman Rodger, 1905. 8vo.; pp. 396. Price, \$3.

The present work is an elementary treatise on the agriculture of sugar cane and on the manufacture of cane sugar. As there is no recent work in English covering the cane-sugar industry, the author hopes that this compilation may be of use to the English-speaking community connected with the industry. The book is a most comprehensive one, and will certainly be of the greatest possible value to growers, crushers, and refiners. It is a book which we can recommend.

LES FOURS ELECTRIQUES ET LEURS APPLICATIONS INDUSTRIELLES. By Jean Esnard. Preface by Henri Moissan. Paris: Vve. Ch. Dunod, Editeur, 1905. 8vo.; pp. 511. Price, \$4.50.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending January 23, 1906.

AND EACH BEARING THAT DATE [See note at end of list about copies of these patents.]

Abdominal supporter, N. Grose.....	810,407
Agricultural implement, J. U. Cornelison...	810,622
Air brake pipes, safety coupling section for, W. J. Hefstatter.....	810,862
Air treating apparatus, F. White.....	810,451
Anchor, guy, L. D. Pitcher.....	810,807
Animal trap, F. Ballentine.....	810,518
Antikicking attachment, F. J. Brady.....	810,520
Automatic carrier and self-dumping device, Systad & Rude.....	810,586
Automobile, L. B. Gaylor.....	810,636
Axle holster and guard, J. G. Busch.....	810,614
Axle and wheel structure, combined car, L. P. Fertig.....	810,525
Bale tying machine, C. M. Cagle.....	810,521
Barrette fastener, G. W. Dover.....	810,475
Balloting box, W. W. McCollum.....	810,790
Beach making device, G. C. Dwight.....	810,630
Bed and similar furniture, collapsible, F. C. Schofield.....	810,573
Beds, crib attachment for, W. E. Clark.....	810,718
Bedstead end piece, metallic, W. F. Bernstein.....	810,699
Beer, Pasteurizing, H. Gronwald.....	810,745
Bell ringer, R. M. Crosby.....	810,725
Bicycle attachment, A. P. Santini.....	810,814