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the filth that passes through ordinary water faucets. You would be alarmed and disgusted. These germs are the cause of most diseases. Pure water would prevent them and perfectly pure water can be produced only by using the widely celebrated  
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which is constructed on the most scientific and hygienic principle. Easy to clean and care for. Rapid filtration. One gallon of pure water in 4 minutes.  
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has a capacity of 50 gallons 125 feet and 100 gallons 67 feet. Equals 30 men pumping water. All complete ready to attach to pump. Uses gasoline in proportion to water pumped. Weight 500 lbs. Engine speed 375 revolutions. Can be used for other power purposes. Simple, safe and economical. Outside dimensions, 9 ft. long, 3 ft. wide, 5 ft. high. Capacity, 25 gallons per minute 250 feet.  
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## 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 This is for our information and not for publication.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.

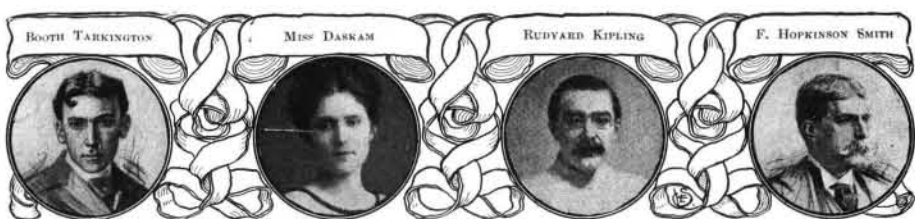
(8454) J. W. McD. asks: Where can I obtain the best works on building up-to-date, modern electric generators and motors of small sizes, of from 45 to 110 volts? Twenty to fifty 16-C.P. lamps. A. The most recent work giving plans of dynamos is a book called "Electrical Designs," price \$2 by mail. This does not contain large machines. The plans for these can hardly be found outside of the shops of the companies engaged in manufacturing them, for the reason that they cannot be built economically by amateurs. It would not pay to publish such a work because each company has its own designs, made by its own engineers.

(8455) I. S. W. asks: 1. At what temperature does frost form? A. At 32 deg. Fahr. 2. In magnetizing a piece of iron or steel with a permanent magnet, does the permanent magnet lose any of its magnetism? A. No. On the contrary it tends to strengthen the magnet. 3. What horse power engine is required to run the 8-lamp dynamo of SUPPLEMENT No. 600? A. Three-fourths horse power. Also what horse power to run the 110-volt dynamo of SUPPLEMENT No. 865? A. About one horse power. 4. How is the horse power of a windmill calculated? A. Approximately by multiplying the area of the slats in the plane of revolution by the cube of the velocity of the wind in feet per second, and divide the product by 4,000,000.

(8456) G. L. M. asks: 1. Please give me the difference between Eastern, Central and Western standard time and where it is changed. A. Eastern time has the 75th meridian west of Greenwich as its central line and is 5 hours behind Greenwich time. Central time has the 90th, Mountain time the 105th, and Pacific time the 120th meridian as its center. Theoretically the meridians half way between those above named are the lines where the change of time is made, and each is one hour earlier than the next to the east. Practically the convenience of the railroads controls the matter in the United States. Thus, the change of time is made at Buffalo on roads starting from that place, east or west. It is made at Pittsburg for roads having that as a center. This is better than changing the running time an hour at some small way station. The line north and south along which the time changes is not a straight line. 2. Also the difference between Eastern, Central and Western sun time and where it is changed. A. Sun time is the time at the particular place. It is noon by the sun when the sun is exactly south of one, and clocks which are set to sun time are said to keep local time. This is not called eastern or western. It is the time of that meridian only. It is the same local time upon a line due north or south over the earth. For a change of one degree of longitude the local time changes four minutes, being four minutes earlier for each degree to the west, and later by the same amount for each degree to the east of any place. This is the time that was kept everywhere in the world before standard time was introduced. Now nearly the whole civilized world has standard time based upon the meridian of Greenwich.

(8457) W. B. M. asks: 1. What is the nature of the conductivity of selenium in carrying a current of electricity, as affected or influenced by light? A. We do not know the nature of electrical conductivity in any substance. 2. Does the exposure or influence of light act on selenium gradually or instantaneously? A. All action of light is practically instantaneous. 3. Is selenium a non-conductor in the dark, i. e., absence of light? A. Selenium is to be classed among non-conductors. 4. Do any particular colors or rays of light affect it more quickly than others? A. We have no data at hand on this point. The best method of learning all about selenium is to go to some first-class library and go through the reports of learned societies. You will then have it all. We can send you articles in our SUPPLEMENT Nos. 462, 484, 492 and 1348 for ten cents each.

(8458) E. H. H. writes: I wish to break an electrical circuit a certain number of times in a second by means of a spring and electro-magnet, something like the electric tuning fork.  
(Continued on page 354)



# McClure's Magazine

## FOR 1902

1902 promises to be a year of interesting and important human achievement. This will make McClure's Magazine rich, for it is McClure's special purpose to describe the newest things in science, invention, and discovery while they are interesting. Because the achievements of 1902 are not yet accomplished, the prospectus of a magazine that keeps in touch with life cannot be complete.

### A NEW NOVEL BY BOOTH TARKINGTON

Author of "The Gentleman from Indiana" and "Monsieur Beaucaire" will shortly begin publication in McClure's Magazine. It is a beautiful and romantic love story, of love thwarted but triumphant, of gallant men and beautiful women. The scene is laid in Indiana at the time of the Mexican War.

### TRUE STORY OF STANDARD OIL

By IDA M. TARBELL

Author of Life of Napoleon, Life of Lincoln and Civil War Papers which have been immensely popular, because she looks at history and writes history in an intensely human way. In this spirit she tells of the struggles, the tremendous fights, the moves and countermoves that caused this company to rise to supremacy and keep it the greatest of the trusts. She goes back to original sources for material as she did for her other works. This immense corporation, perhaps the richest company that has ever carried on business in any land, has wonderfully modified conditions of life to-day. No history of the present generation can be complete or even intelligible without an account of the developments and progress of the Standard Oil Company. Its history of forty years is an extraordinary record of business sagacity and daring push, of striking and dramatic episodes. It is a stirring, wonderful story filled with all kinds of human interest. Miss Tarbell will treat it as history in her delightful sympathetic and vivid manner. She will give us, not an economic treatise, but a true story, interesting in the highest degree and vastly significant.

### TWO AMERICAN NOVELETTES

#### The Forest Runner

By Stewart Edward White, begins this month. The tale of a race and maneuver for a forest claim in the woods of Michigan—a fresh, clear-cut American story, absorbing, even thrilling in its succession of incidents.

#### A Battle of Millionaires

By Edwin Lefevre. The story of the most remarkable fight that ever occurred in Wall Street.

### "MR. DOOLEY" ON HIS TRAVELS

Mr. Finley P. Dunne has been taking his friend Mr. Dooley around among the cities, showing him the inhabitants of New York, Boston, Philadelphia, Washington and Chicago. Now Mr. Dooley, in spite of the comical way he says it, is a fair-minded person, sane, shrewd and kind. Though he may make us laugh at him, he has a way of turning the joke back upon ourselves, and leaves us with something to think seriously about; it is the man behind the laugh that exerts a far-reaching influence and gives the humor permanent value.

### Reminiscences of a Famous Journalist

For thirty years George Washington Smalley was the chief American newspaper correspondent in Europe, received everywhere, enjoying the confidence of statesmen, the companionship of generals in the field, the friendship of writers and actors. Mr. Smalley writes a series of articles on the people he knew—the late Queen Victoria and Lord Salisbury, George Wyndham, Asquith, Lord Rosebery, Sarah Bernhardt and Sir Henry Irving, Mrs. Kendall, Browning, and Bismarck, and Gambetta, treating them in group-statements, literary and stage folk.

### Clara Morris

Will continue her vivacious and charming papers, taking for subjects Salvini, Henry Bergh, Sarah Bernhardt, Rachel, etc.

### William Allen White

Will write of such men of the day as Quay, Platt and others, without the partisan bias of the day. That he can do this he has shown in his portraits of Bryan, Croker, Hanna, and Roosevelt. Mr. White is clear-eyed, honest, fearless and genial. He strikes for the real man who stands misunderstood between the admiration of his friends and the prejudice of his enemies, saving him for the future; and he does it in a form that will last.

### BORDER FIGHTS AND FIGHTERS

#### Cyrus Townsend Brady

Will furnish articles on Daniel Boone, David Crockett, Sam Houston, Kit Carson, George Rogers Clark, John Sevier—the men who built the foundations of the present United States and carried the frontier farther and farther west.

### NEWEST SCIENCE and EXPLORATION

#### Marconi's Latest Discoveries in Wireless Telegraphy

As told by himself, will disclose some matters never before revealed to the public, the result of two years spent in perfecting his invention.

#### Edison's New Storage Battery

Will be the subject of an article by Ray Stannard Baker, which will tell at first hand of an invention which is almost revolutionary in its character.

### The Wonders of Modern Surgery

By Samuel Hopkins Adams, will set forth the latest developments in a science which has been making wonderful progress in prolonging human life.

### Transportation in the Great Cities

Wm. Barclay Parsons, chief engineer of the new underground railway system in New York, will compare the various ways London, Paris, Berlin, Boston, Chicago and New York are solving the problem and will tell of the thousand and one difficulties of every imaginable nature which beset those who plan and execute these great undertakings.

### With Baldwin to the Pole

With the most completely organized expedition ever sent out E. B. Baldwin hopes to reach the Pole during the year. McClure's Magazine will publish the account of his success, as well as any other important tidings he may send back in the meantime. Nansen says he cannot fail.

### A New Race of Forest Dwarfs

(not merely a new tribe) has been discovered in Central Africa. Sir Harry H. Johnston, the discoverer, will describe these strange men, and his own photographs and drawings will be reproduced.

### Many of the Best Features

Cannot be described in advance, as they will be secured as great issues arise.

### THE GREATEST of the OLD MASTERS

By JOHN LA FARGE

This modern master will write with the authority and understanding of a painter, the clearness and charm of a literary artist, on the great painters, Michael Angelo, Raphael, Rembrandt, Velasquez, etc. The first article of the series is in this number of the magazine. He personally oversees the illustrations, which will be reproductions in tint and black of

THE WORLD'S GREATEST PAINTINGS.

### OTHER FICTION

#### Rudyard Kipling

New Stories in the old virile manner.

#### George Ade

Humorous Stories with also deep meaning.

#### F. Hopkinson Smith

Tales of a typical American Sea Captain.

#### Joel Chandler Harris

Tales of Southern Life and Character.

#### Hamlin Garland

Indian Stories, picturesque and realistic.

#### Octave Thanet

Western Stories that stir with Western spirit.

#### Jack London

Adventures in the wild Northwest.

#### W. D. Hulbert

Animal Stories (The Lynx, The Trout, etc.).

#### Norman Duncan

Tales of Fishermen and the Sea.

#### Josephine Dodge Daskam

More stories about boys and girls.

#### George Madden Martin

Emmy Lou Stories.

Among the other short-story writers of the year will be Anthony Hope, Henry Van Dyke, Sara Orne Jewett, Mary E. Wilkins, Robert Barr, Mary Fulton Cutting, Booth Tarkington.

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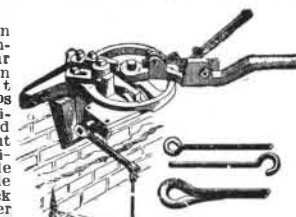
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Adopt modern methods and install one of our eye benders in your shop. It forms hooks, loops, eyes, etc., of various sizes and styles. Turns out perfect and uniform work. Made in 3 sizes suitable for bending stock 1 inch in diameter and under. Send for catalogue No. 8.



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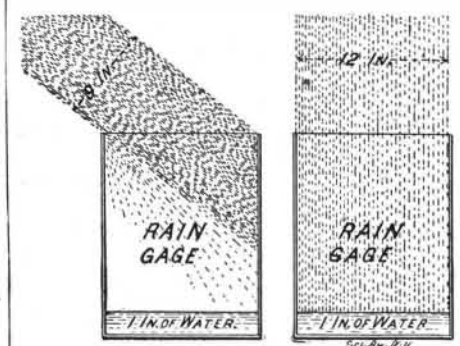
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REAL ESTATE TRUST BLDG PHILA. PA.  
SOLE MANUFACTURER  
**REGEALD ICE MACHINES**  
SEE FIRST PAGE SCIENTIFIC AMERICAN SEPT. 2, 1899

ing fork, but only using one leg of the fork. What number of vibrations (double vibrations) is it possible to attain? C of the treble clef has 517.3 double vibrations in a second. Would it be possible to attain four octaves above that = 8,276.8 double vibrations; that is, break the circuit that number of times? A. With that number of breaks per second the current would be apparently continuous. A dynamo making 1,800 turns per minute makes 30 turns per second, and if there are 24 coils on the armature, there are only 720 impulses of the E.M.F. per second. We call such a current continuous, and it has not a tenth of the impulses you name.

(8459) B. C. B. asks: Can you furnish me a book of instruction on the wiring of an electric light plant that explains fully the testing of lines for breaks, that explains the arc lamps, the incandescent lamps, the transformers and everything about an electric light plant? I have a book from your house, "The Practical Management of Dynamos and Motors," but it does not explain the wiring, lights and transformers. If you have such a book, what is the price? A. There is no single book which covers the range of topics upon which you desire information. We can furnish the following: Crocker's "Electric Lighting," Vol. 1, "The Generating Plant," price \$3; Vol. 2, "Distributing System and Lamps," \$3; Herriek's "Switchboards," \$3; Kilgour's "Electrical Distribution in Theory and Practice," \$4; Kapps' "Transformers," \$1.75.

(8460) B. A. T. asks: 1. How many ampere hours will a Fuller battery give? A. About 68 ampere hours. 2. Does a Fuller battery give the same voltage after it has been charged some time as it does when it is freshly charged? A. No. 3. Does a porous cup that is used in batteries wear out? A. No. Does battery carbon wear out? A. No.

(8461) J. R. T. writes: In your Notes and Queries, 8404, C. N. M., you say that a rain gage will register the same whether the rain is falling straight down or obliquely. I fail to understand why you say this. Let us suppose the rain gage is 12 inches in diameter and the rain was falling in a solid straight down, then 12 inches of rain would go in the gage; but supposing the gage was not level, but stopped at an angle of say 45 degrees, there could not be room for 12 inches of water to come perpendicularly into the gage. Reversing this, if the gage is bent and the rain is falling obliquely, or at an angle of 45 degrees from perpendicular, the result would be the same. If the gage is 12 inches wide, the body of rain, if a beating rain—or falls sloping—must not be over 11, 10 or 9 inches in diameter to go in, because the mouth of the 12-inch gage will not have a capacity of over 11, 10 or 9 inches, according to the slope of the rainfall. I have used common, every-day language to explain my position. See if I am right or wrong. Take a square or round box, any size in diameter, hold it in front of you and it will indicate say 12 inches. Now slowly turn it one side, still looking at it: the top or opening will look smaller and smaller until it will not look half as large. A. We regret that we cannot reach the same conclusion as our correspondent. We of course agree with him that all the rain gets into the gage when the rain falls straight down. We also think the same quantity gets into the gage when the rain falls slanting. When the rain falls at a slant the lines in which the rain falls are brought nearer together than when it falls straight. Suppose that the same quantity of rain falls in two showers on a field: in one it falls straight, and in the other at a slant. In the second the drops will be nearer together, and the same quantity will fall on one square foot. A diagram will make this plain.



(8462) A Reader asks whether or not 8-inch and 13-inch guns in the superimposed turrets on the battleship "Oregon" are constructed to permit of elevation and lowering in aiming and firing. A. There are no superimposed turrets on the "Oregon," each pair of 13-inch or 8-inch guns being in separate turrets; all of these guns are so mounted and the turrets so constructed that a considerable range of elevation and depression is possible.

(8463) H. E. G. asks: What will a voltmeter register when placed in series with a 110-volt, 1/2-ampere lamp (on 100-volt circuit)? A. A voltmeter in series with a lamp as above stated will register nearly the whole voltage, perhaps 106 volts. This is because the resistance of the voltmeter is very large as compared with that of the lamp. There

(Continued on page 355)

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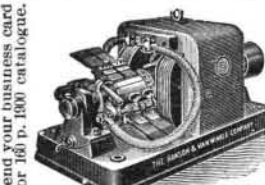
for riveting together articles of Hardware, Bicycle Chains, Mechanics' Tools, Agricultural Implements, Sewing Machine Attachments, etc. Six sizes 1-16 to 1/2 inch.

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Gasoline Lamp, Burning Hydro Carbon Gas by the Pressure Under-Generator Type. Perfect in mechanical construction. Absolutely Reliable and Safe.

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Unlike all other portable lights, the batteries of the "Light of Asia" Lamp do not deteriorate unless used. For a good light for short intervals, this lamp is unequalled. The "Light of Asia" Lamp is made with a view to beauty, and is mounted in an aluminum shell covered with the leather. Weight, 5 1/2 oz. 3/4 in. diameter. 8 inches long.

Larger sizes at \$3 & \$3.50.

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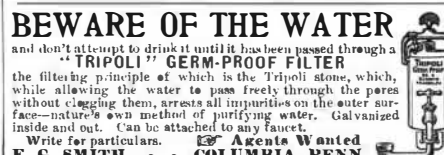
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the filtering principle of which is the Tripoli stone, which, while allowing the water to pass freely through the pores without clogging them, arrests all impurities on the outer surface—nature's own method of purifying water. Galvanized inside and out. Can be attached to any faucet.

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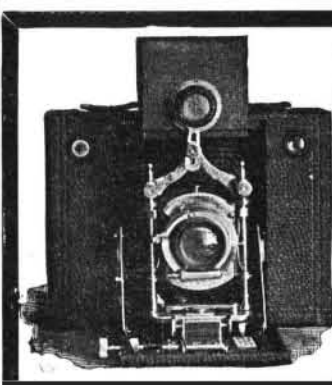
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are 110 volts between the terminals of the circuit. This drop takes place through a lamp and a voltmeter, in proportion to the resistance of each. The lamp has a few hundred ohms, and the voltmeter several thousand ohms, hence most of the drop is in the voltmeter. In a measurement we just made we had 115 volts; the lamp took 5 volts, the voltmeter took 110 volts. The voltmeter had 14,013 ohms. We did not measure the cold resistance of the lamp. The current shown by an ammeter was one-hundredth of an ampere, and of course little heat was produced in the lamp. Both instruments were Weston standard instruments and our results are correct. You can easily calculate the resistance of the lamp, of course. In issue of October 26, in replying to A. D., you stated that the voltage of a circuit was not affected by a rheostat. Now, is not the drop in volts equal to amperes  $\times$  ohms? So if a rheostat of 20 ohms R. carrying a current of one ampere were placed in a circuit, would not that reduce the voltage 20x1 or 20 volts? A. The voltmeter in this case is simply a very large rheostat. It therefore leaves very little drop for the lamp, not enough to light it at all. It does not affect the voltage of the circuit. That remains 110, under any and all arrangements for disposing of it. In the case you cite, if one ampere is to flow through a lamp on a circuit of 110 volts pressure, and the lamp has but 90 ohms of resistance, a rheostat of 20 ohms must be put into the circuit in series with the lamp. There will then be 110 ohms in the circuit, and 110 volts will force a current of 1 ampere through 110 ohms. Now a voltmeter across the terminals of the lamp will show a drop of 90 volts, and across the terminals of the rheostat a drop of 20 volts, making 110 volts across the whole circuit. The rheostat does not reduce the voltage of the circuit. It only takes a part of the drop into itself, so that there may not be too large a drop in the lamp. A voltmeter must be placed in shunt in order to get a reading of drop of voltage with it, not in series as you desired us to place it.

(8464) C. F. J. writes: In your Notes and Queries column of October 26, your correspondent A. A. D. discusses in Query No. 8403 the question whether iron in the direct rays of the sun on a hot day becomes hotter than the air, and quotes Dr. Wiley to the contrary. You reply, "Test the temperatures and find what they are." This may not be easy to do in the case of iron, but it is easy to do with mercury. Place a thermometer in the shade, and it indicates, for example, 98 deg. Move it only a few inches to direct sunlight, and it is very likely to go up to 120 deg. It will not be claimed that the air is so much warmer. The wind may be blowing several miles an hour, and the time of its passing from the first to the second position of the thermometer may be only a thousandth part of a second. It cannot be supposed that the air changes twenty or more degrees in temperature in that brief interval of time. Yet the mercury in a few minutes goes up to that extent. If the mercury becomes 20 degrees hotter in the sunlight than the air, why may not the iron do the same? Being black and dull it may naturally be supposed to absorb even more heat than the mercury. If Dr. Wiley or any one else can explain this any differently your readers would doubtless be glad to hear from him. A. The temperature of the air must be that indicated by a thermometer at the place of observation. If in the shade a thermometer indicates 98 deg. and when moved "only a few inches into direct sunlight" it indicates 120 deg., we see no escape from the conclusion that the temperature in the sun's direct rays was 120 deg. As we understand it, we base our knowledge of temperature upon the thermometer, and not upon our judgment of what we think the temperature ought to be. It has many times been pointed out that several objects at the same temperature do not feel equally hot, because our feelings are produced by the rapidity with which a body can communicate its heat to us. It is a matter of conduction only. Silver, iron, wood and air in the same oven will feel very differently. Silver will burn the skin at a little above 150 deg. Fahr. It will burn the tongue at 150 deg. Iron must be hotter than that to burn us. Wood can be handled at 200 deg. or above, while men have been into ovens at 600 deg without injury.

(8465) H. J. H. writes: 1. Kindly explain why, when you shock yourself with a five-bar generator, and put one finger on one binding-post and another finger on the other, the shock is more severe than having one finger on the two alone (binding-post). A. Because the path is longer and the nerves receive more shock than when the path is shorter through the body, from one binding-post to the other. 2. Why is a generator stronger when turning to the right than turning to the left? A. It may be that the earth's magnetism assists that of the field in one position and acts against it in the other position. There is no reason in the machine itself why it should generate more in one direction than in the other.

(8466) T. D. asks: Will you please tell me the resistance and safe capacity of copper wire No. 36 B. & S. gage? A. At 68 deg. Fahr. the resistance of No. 36 B. & S. copper wire is 2.414 feet per ohm. It will carry between two and three amperes in the open air without charring the insulation



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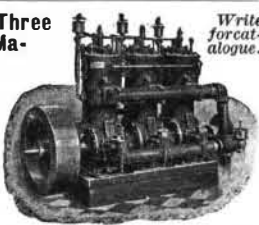
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