

work any better than the jet. We use the city water works for cleaning out the pipe when it gets dirty. There are no elbows in the pipe except where it turns down in the well; all other turns were made by bending the pipe. Do you know of any way that we can convey power to the river, such as compressed air or some other way, by which we can force the water up to factory without too much outlay? A. The obstruction in the pipe that prevents the jet pump from working satisfactorily, would also interfere with the action of a pump. If the pipe is of wrought iron, not galvanized, it is liable to rust and form nodules on the inner surface throughout its length, which decreases the area and increases the friction. By raising the pipe at the river end and connecting with the water works pipe at the factory end, giving the full pressure on the pipe would show by the stream at the river end whether the pipe is permanently obstructed. If found to be obstructed, the pipe should be taken up and cleaned by pushing a smaller pipe through with a sharpened coupling on the end, a little smaller than the bore of the 1½ inch pipe. If there should be a full, strong flow from the pipe, the next possibility will be air leaks. To ascertain the fact, arrange the steam jet so as to discharge from an open pipe and start the jet. If there is air in the pipe or airleaks, the discharge will sputter, or become intermittent, possibly stop altogether. This is supposing that the start is made with the pipe fully charged with water. There is also a possibility that the separation of the air from the water by the partial vacuum in the siphon suction pipe may cause some trouble by accumulating at the apex and separating the water in the pipe. By your statement, your siphon has a probable lift of 26 feet or nearly its limit, and it may be that this is the source of your trouble. You can transmit power to drive a pipe pump by a wire rope system from a pulley in the factory to a pulley at the river with a couple of supporting pulleys at proper distances to keep the wire rope from vibrating.

(4519) G. J. asks : 1. Is there in existence a perfectly working long-distance pneumatic tubesystem? A. No; probably a mile or less. 2. What is the longest electric railway in existence? A. 5 or 6 miles. 3. What are the prospects of a near adoption of electricity on the steam railroads? A. The prospect is very distant. The system of wiring would be too intricate for the immense traffic and yard switching of our great railways.

(4520) Reader writes: Some years ago I saw at this place an exhibition wherein apparitions were made to appear on the stage by what was said to be the manipulation of mirrors under the stage of the theater. A form of a woman would appear, first in a transparent mist, and then would assume a perfectly lifelike appearance. A. The illusion to which you refer is produced by a plate glass mirror erected upon the stage at such an angle as to reflect the image of the figure below the front of the stage, a strong light being thrown upon the figure. This illusion is known as "Pepper's Ghost."

(4521) W. G. S. asks: For bathing purposes is artesian well water healthful or unhealthy? A. Artesian well water is healthy for bathing as much so as for household purposes. The wells that furnish hard water do not afford the satisfaction to bathers as the soft water wells. A little ammonia in the hard water makes a satisfactory and healthy bath. The mineral constituents of the hard water from artesian wells are principally lime and magnesia, with their various combinations. Some wells furnish water of decided sanitary properties.

(4522) E. G. A.—The following is a recipe for herb beer: Pour boiling water on 2½ ounces assafras; 1½ ounce wild cherry bark; 2½ ounces allspice; 2½ ounces wintergreen bark; ½ ounce hops; ½ ounce coriander seed; 2 gallons molasses. Let the mixture stand 1 day. Strain, add 1 pint yeast, enough water to make 15 gallons. This beer may be bottled the following day.

(4523) C. C. asks how to harden a chisel for chipping casehardened iron. A. Heat the chisel after sharpening to a low cherry red and then plunge it in a saturated solution of chloride of zinc. The chisel must be rebarded whenever it is sharpened.

(4524) F. S. B. writes: 1. It is said that if balls of wax and lead are dropped from the top of a building, they will fall together. Do you think this is wrong? A. There would be a difference, but it would be almost imperceptible. In a vacuum, both bodies would fall in the same time. 2. How do scientists explain that capillary attraction is not a case of work being done without an apparent loss of energy? A. In rising in a moistened tube water obeys the force of cohesion exercised over space, which represents the expenditure of energy. To extract the water from the tube, an exact equivalent of work would have to be done. Potential energy is represented by the separation of the water in mass from the water wetting the walls of the tube, or by the separation of the water in mass from the dry walls of the tube, if we assume a dry tube to be used, and adhesion to be one of the actuating forces.

(4525) W. E. P. asks: How should the 8-light dynamo be connected for the best results, when used for charging storage batteries, and how many will it *fill*; batteries to be connected in series, and using a 1-horse power Shipman engine for power? Dynamo is now connected as shown in Fig. 1 (large cut) in SUPPLEMENT 600. A. The 8-light dynamo should be connected in series for use in charging storage cells. You should connect your cells in series. The dynamo will charge from 10 to 20 cells. The rapidity of charging diminishes with the increase in the number.

(4526) J. M. writes : 1. Please give some antiseptics for a gelatine emulsion for dry plates ? A. SUPPLEMENT No. 541 contains full instructions for making emulsions. 2. Where may the wooden valves used in the air pump, *Experimental Science*, p. 92, be bought ? A. These valves are not on sale. They are easily made, and with very little effort you can make them yourself. 3. How could the motor on p. 498 of the same book, be best converted into a dynamo, and what would be the power of the same ? Also name books con-

taining instructions for making simple dynamos, without the need of lathes or special tools. A. Make the field magnets of cast iron, and wind the field magnet and armature with No. 20 or No. 22 wire. 4. I have a lantern which is identical with the one described on p. 594, but have not changed it in any way. It shows colored slides quite well, but will not show a good picture off a photo, slide. How could I change it? A. Modify the lantern in the manner described in Experimental Science, that is to say, replace the front lens of the objective with a meniscus of the same focus.

(4527) J. F. R. asks: Is it safe to fasten a lightning rod to a wooden house with staples, without insulator glasses? A. Yes.

(4528) W. C. Moore writes: I inclose, you will find, a leaf of a plant found in west North Carolina the natives call "gall of the earth" or "rattlesnake'sking," the milk white juice of which is said to be an immediate and sure cure for rattlesnake bites. I have made some notes on the subject. So please let me know if it is generally known to the scientific world, and what its analysis is, and I will be pleased to furnish you specimens and what information I can procure. Answer by Prof. C. V. Riley: The leaf accompanying Mr. Moore's letter is what is known as rattlesnake root, *Prenanthes altissima*, Hook. It is referred in the botanies to the genus *Nabalus*, and is popularly known as white lettuce, rattlesnake root, etc. There may be some foundation for the belief your correspondent refers to, and the common name of the plants of the genus would indicate such a property. I cannot find, however, any authorities which accord to it this power of curing rattlesnake bites. It is used as an astringent in dysentery, and an analysis of the plant which has been made indicates that it contains tannin and various inert properties.

(4529) G. C. H. writes: I send you by mail to-day, under a separate cover, two bullets which were picked out of the snow after a target shoot February 23. The projectiles were fired from the best breech-loading target rifles with heavy charges of powder, and, after flight of (200) two hundred yards, passed through a paper target backed by one thickness of cotton cloth (sheeting), then entered the snow, penetrating but a few inches, and were picked up with the points marked as you now see them. The feature to which I specially desire to call your attention is this peculiar marking upon the point. It is a reproduction of the surface of the cloth, in which you can trace every thread of the fabric. It is possible that the tremendous velocity of the bullet made the impact equivalent to the blow upon a stationary and immovable object, or that a small piece of the cloth may have been punched out, and, going forward with the bullet, was impressed between the bullet and the snow. The matter may be sufficiently interesting for you to express an opinion upon. A. Your first explanation appears reasonable.

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United States were Granted**

**August 30, 1892.**

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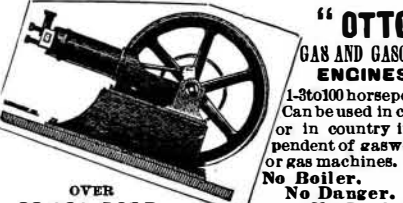
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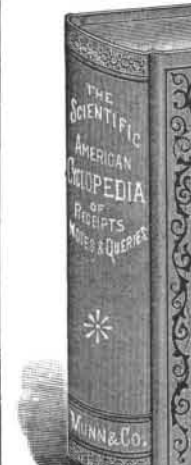
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