tect, and has developed a special device of his own of this kind, naturally argues strongly in favor of his own device.

THE CONVERSION OF HEAT INTO WORK. By William Anderson. London: Whittaker & Co. New York: D. Van Nostrand.

The simple and direct but extremely interesting way in which an ordinarily complicated subject is here presented will doubtless render this book of exceptional value to young mechanics who know little of the theoretical side of their business, and to other students who have to "dig out" their education from books, without the aid of teachers. Although now published as a practical handbook on heat engines, it contains but little matter in addition to that which appeared in the original form in which it was published, as lectures before the Society of Arts and Manufactures, London, which were printed in six successive numbers of the SCIENTIFIC AMERICAN SUPPLEMENT in the latter part of 1885.

A HISTORY OF SALT LAKE CITY AND ITS FOUNDERS. Salt Lake City, Utah: Edward W. Tullidge.

This is a handsome octavo volume of nearly 1,100 pages, profusely illustrated with fine steel engravings of the principal Mormon notables from 1840 to the present time, with biographical sketches. It is in fact a history of Mormonism and its growth and development in Utah, written by "authority of the Council and under supervision of its Committee on Revision," and therefore giving a picture of Mormonism in the most favorable light in which it is possible to present the institution to the public. There are too many outside evidences of material prosperity and thrift everywhere to be seen in the resourceful valley where the Mormon emigrants from Illinois and Missouri began to make their home in July, 1847, and the vitality of the community has been too plainly manifested on many occasions, for any one easily to escape the conclusion that the "Mormon question," as it is called, is still one of no insignificant importance. It is no part of our purpose to discuss the matter, but just why and how it has become of such material significance is probably more fully explained in this volume than in any other one work published.

The British Guiana Directory for 1887, published by C. K. Jardine, Demerara, cannot fail to be a valuable aid to such of our merchants and manufacturers as are seeking to extend trade in that exceedingly fertile and resourceful tract of 600,000 square miles lying just under the equator, on the northeast coast of South America. The book gives full details of all departments of the little government, with classified directory for the principal trades in different cities, the prominent country estates, etc.

* * Any of the above books may be purchased through this office. Send for new catalogue just published. Address Munn & Co., 361 Broadway, N. Y.

Notes & 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.

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.

(1) W. M. L. writes: 1. In building an eight light dynamo as illustrated in SCIENTIFIC AMERICAN, April 23 and 30, can I substitute brass instead of bronze for making sleeve A, flange B, and cylinder E, Fig. 6 (SCIENTIFIC AMERICAN, April 30), also for yoke-holding shaft, or only make cylinder E of bronze and the rest of brass. A. Brass may be used, but bronze is preferred on account of its hardness and durability. 2. Does it make any difference in the winding of the field magnet whether I wind both posts right or left handed, or should they be wound different? A. Wind so that if placed endways the direction would be uniform. Both must be wound either right or left handed. 3. How can I attach machine to wooden base? A. Drill and tap the polar extremities, and insert tap bolts through the wooden base. 4. What is the best wood to use for the armature core? A. Well seasoned mahogany or maple. 5. What are the wedges made of that are use for dividing the coils on the armature? A. Hard rubber, vulcanized fiber, hard wood, or bone.

(2) R. T. asks: In regard to pumping cold water into a boiler when the water is low and the flues heated, is it not the gas that is generated in coming in contact with the hot iron that causes an explosion? A. It is dangerous to pump cold or hot water into a boiler with the line of water below the top flues; at such times the flues out of water may become red hot, as also the sides of the boiler above the water. Pumping up the boiler at such times largely increases the generation of steam, possibly carrying the pressure up to the point of rupture. The theory that explosions are thus caused by gas formation is in no way sustained.

(3) C. H. D. & Co. ask the ingredients of a solution in which to steep burlap or jute bags in order to make them more durable when used for transporting acid fertilizers, such as dissolved phosphate rock. A. Plunge the bagging into a solution, at 142° Fah., and leave for an hour, the solution consisting of sulphate of alumina 2¼ pounds, water 5½ gallons, and borate of lime 2¼ pounds. The borate of lime is added after the sulphate of alumina has dissolved, and the whole decanted when settled. After taking out of this bath, the textiles are put into a second bath, composed of 2¼ pounds resinous soap and 2¼ pounds Marseilles soap dissolved in 5½ gallons water and carried to the boiling point. At the end of ten minutes the bags are allowed to drip, are next dried, and then rewashed and dried. Bagging made in this way, it is claimed, will resist the action of acids or chemicals.

(4) E. T. H. asks how to make a mahogany stain for wood, and a varnish to coat it to represent a polish. A. The following is a dark stain: Boil ½ pound of madder and 2 ounces logwood chips in a gallon of water, and brush over while hot; when dry, go over the whole with a pearl ash solution, 2 drachms to the quart. Or put 2 ounces dragon's blood, bruised, into a quart of oil of turpentine, let the bottle stand in a warm place, shake frequently, and when dissolved, steep the work in the mixture. To polish, take a piece of pumice stone and water, and pass repeatedly over the work until the rising of the grain is cut down. Then take powdered tripoli and boiled linseed oil, and polish the work to a bright surface.

(5) H. W. F. asks: 1. What cement, either liquidor otherwise, can I use to mend china so as to hold hot substances, and the cement to be transparent or white? A. See article on cements in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158, for this information. 2. How is oak finished as "antique oak"? Is it possible to do over oak furniture so that it will be antique? A. By intensifying the stain, the oak can be made to resemble the antique article. New furniture restained has that appearance. 3. What is the cause of the "gapes" in chickens, etc., and what can be used to prevent and cure it? A. Camphor pills, it is said, will cure this disease. Sulphur is also used. 4. How do you multiply hyacinth bulbs? A. They multiply from the small bulbs which form at the base of the large ones.

(6) H. A. L. and others.—Your question has been many times answered. Try and look a little more closely into the exact terms of the problem. No part of the periphery of a wheel of a wagon moving along a road travels faster around its axis than another part. The axis moves along the road with the mean speed of the top and bottom of the wheel. The top of the wheel moves twice as fast as the wagon. *Per contra*, the periphery of the wheel is during one half of its revolution gaining, and during the other half losing speed, as compared with the forward motion of wagon and axle, so that the bottom of the wheel, or part in contact with the ground, does not move in a measurement of this onward movement.—A snake climbs a tree that is small enough to allow of its peculiar manipulation, by a spiral movement around the trunk or a return bending of its coils nearly half way around, by which the snake obtains a grip. Their favorite trees are the kind that have low limbs, which give them a natural rest.—For the manufacture of steel see back numbers of SCIENTIFIC AMERICAN SUPPLEMENT.

(7) W. J. B. writes: Referring to article in SCIENTIFIC AMERICAN, April 23, 1887, upon eight light dynamo, will you please inform us through your paper: 1. What size of wire and how many layers to wind upon field magnet to make a plain series machine of it, using but one strand for conductor? A. Use eight layers of No. 12 (Am. W. G.) wire on each leg of the magnet. 2. What changes will be required to make it operate 12 standard 16 candle power lamps instead of 8? A. Put coarser wire on the armature, say No. 18, and increase the speed, and increase all of the dimensions of the machine about 20 per cent.

(8) P. S. asks: How many gallons of water per hour will a 3 inch pipe line 7,000 feet long deliver into a tank, the point of delivery being 38 feet above ground and the head of water being 13 feet higher than point of delivery? A. 1,400 gallons per hour.

(9) R. F. asks how large to make a balloon and of what material, to lift 5 pounds. A. You will require a globular balloon of 7½ feet diameter when filled with the carbureted hydrogen of your gas works to lift 5 pounds and the weight of the balloon of say 2 pounds. For material use strong tissue paper or Chinese silk well varnished with rubber varnish. See Balloon Making, SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 249, 413.

(10) G. K G. asks: What will remove bicycle oil from corduroy without leaving a stain? A. Use ether or a mixture of ether and ammonia. Apply in a circle all around the stain, and sponge off the spot last of all.

(11) H. K. asks (1) the most practical method for making brass signs. A. Use nitric acid to eat into the metal. 2. How to permanently blacken the letters and scroll work? A. Mix asphaltum, brown japan, and lampblack into a putty-like mass, and then fill in the spaces, finally cleaning the edges with turpentine.

(12) S. O. N. writes: We have a driven well about 25 feet deep, with seven feet of water in it, but it does not pump easy. We think the point is in clay, and we cannot turn the pipe in ground Can you suggest a way to make the water flow more freely—like exploding a dynamite cartridge in it? A. The pipe should either be drawn up so as to allow the strainer to receive the surface water lying upon the clay, or be driven deeper, to reach the next sand stratum, which may give a better supply. It will be of no service to torpedo the well in the clay. Besides, your point should have a strainer which precludes the use of a torpedo without first withdrawing the tube. Better drive deeper and find what is below the clay.

(13) J. J. asks the best way to tin tempered steel (small pieces) with a smooth thin coating without injuring temper or getting too hard. I have first cleaned the pieces in a hot solution of potash, then put them in diluted muriatic acid and then in zinc acid, before going into the tin, but cannot get them smooth and even. A. Your manuipulation appears to be right, only that the surfaces should have a half polish or be quite smooth. Also the tin bath should have a clean surface, which can be made by sprinkling a little powdered sal ammoniac upon the surface and skimming. Have the tin pretty hot and draw the pieces slowly out of the tin.

(14) E. P. asks: How are photographs on boxwood obtained? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 428, page 6830, also No. 584, page 9320.

(15) C. E. E. asks how to make an enamel on steel, one that will dry quick and black. A. Use japan varnish and bake in an oven at 250° temperature.

(16) J. M. L. asks what to put in common coal tar to make it adhere to iron better than it does when simply boiled, and then applied. A. Mix with pulverized plumbago or lampblack. Thin with benzine if necessary. If color is no object, use Prince's metallic paint.

(17) H. S. sends a plant to be named, and asks whether it has any medicinal properties. A. The plant is a species of elder, *Sambucus glauca*. Its medicinal properties, if it has any, are probably the same as those of the eastern species, the flowers of which have been reported diaphoretic and discutient, the berries aperient and sudorific, the bark purgative, and, in small doses, diobstruent.

(18) W. S. asks: What is the greatest height at which a siphon will work, and the largest pipe that can be used therefor? A. There is no limit to the capacity of a pipe for a siphon. The greatest height depends upon the pressure of the air. It may be 33 feet, practically 28 to 30 feet.

(19) G. S. D. asks how hair clippers are ground or sharpened, whether on flat surface or between the teeth, and what is used to sharpen them with. A. Never sharpen the clippers on the flat side. Always on the bevel side. Use Washita or Arkansas stone and oil. You can buy the stone in long sticks, ½ inch diameter, through the hardware trade.

(20) P. & S. ask as to the feasibility of running an upright shaft direct from engine, through a six story building and connecting with it shafts on each floor by gearing. A. Vertical driving shafts in mills are only to be tolerated as a necessity, or as turbine shafts. The step of a long vertical shaft is a source of constant trouble, which added to the noise has about driven the system from present mechanical practice.

(21) H. M. D.—Six inch copper pipe may be bent to a radius of 3 or 4 feet by filling, after annealing, with resin. Allow the resin to cool, and bend slightly over a curved block of wood hollowed out, so that the pipe will bear half way round to keep it from flattening. Bend a little, then melt the resin out and anneal again. You may have to do this two or three times.

(22) F. E. writes: I wish to make a wire rheostat with resistance of 3,000 ohms, divided into 10 divisions or more—or 15. What size wire will I have to use to put 200 ohms resistance in each coil, and how much to each coil? Also give same with 300 ohms resistance to each coil. A. Of No. 35 German silver wire, one pound gives about 8,136 ohms resistance. Therefore one twenty-seventh pound will give you about 300 ohms, and one fortieth pound will give about 200 ohms. The exact resistance of each coil has to be determined experimentally. One pound of No. 40 wire gives about 41,248 ohms, so much less of this, about one-fifth the above amounts, would answer.

(23) C. H. G. wishes further directions about making a kite without a tail, such as was described in SUPPLEMENT, No. 595. A. The directions for making the bow, which you do not seem to understand, read: "The bow . . . consists of two pieces of osier, each 5½ units in length, that form, through their union, a total length of 7 units." This simply means that the two ends of the osier that are to form the center of the bow should be lapped over each other to a sufficient extent to make the entire length of the bow when the two pieces are joined seven-tenths the length of the central stick.

(24) G. C. H. asks: 1. What is the best steel for making compass needles, and what temper will they require before magnetization, and what is the best shape to make them? A. Use cast steel, hardened and drawn to a purple. The straight bar form is probably the best. 2. Would a heavy coiled flat spring, say ¼ inch thick and 6 inches wide and 20 feet long, be eight times as strong as one one-sixteenth inch thick, 3 inches wide, and the same length as the first? A. It would be more than eight times as strong. 3. Will the lighter spring lift 150 pounds? A. You have left out the element of time and distance. It will lift 150 pounds if connected with the weight by suitable mechanism.

(25) D. M. G. writes: In the article "Inexpensive Arc Lamp," in the June 11, 1887, number, what kind of a battery can be used? Will a telegraph battery answer, and how many? Where can I get the carbons, in Cleveland? A. It will require from 25 to 50 Grove or Bunsen cells. The ordinary telegraph battery will not answer. You can get carbons from any house dealing in electrical materials.

(26) J. D. McC. asks: 1. In SCIENTIFIC AMERICAN SUPPLEMENT, No. 160, article on induction coils, what is the object gained by having the secondary coil in two sections, with insulating resin between them? A. The construction in sections is for the purpose of more effectually separating those layers of the coil having the greatest differences of potential, so as to prevent sparks jumping across and destroying the insulating material. 2. Is there any good reason for preferring naked wire to silk-covered wire, except its greater cheapness? A. Naked wire lies closer and is cheaper than covered wire; no other reason exists for its employment.

(27) O. R. asks: 1. What is a good glue to use in making camera bellows? Ordinary glue becomes hard and the rubber cloth breaks. A. Use rubber cement. See "Cements," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158. 2. A developing formula in which quinol is used in place of pyro? A. You probably refer to the hydroquinone developer. The formula is as follows: A. Water 80 cubic centimeters, hydroquinone 1 to 2 grammes. B. Saturated solution of carbonate of ammonia in water. To 8 parts of A add 1 part of B.

(28) W. D. B. S. asks: 1. Is there any difference in the lifting power of an elevator rope or ropes when the rope is passed through an eye, and the two ends attached to the drum, and when the rope is separated and attached in two places on the crosshead of the elevator, the ropes being all of one size? A. There is no difference. 2. What is the strain on a rope that two men are pulling on, one at each end, supposing one pulls 200 pounds one way, and the other pulls 200 the other way? A. The strain is 200 pounds.

(29) B. P. G. writes: About four years ago a young man in this place boiled a hen's egg and put it away. On breaking it open the other day, he found that everything in it had shrunk to a mass about one-twentieth the size of the egg, almost perfectly egg shaped. It looks like a piece of amber, being most beautifully translucent. A. The white of eggs contains about 85 per cent of water and 12 percent of albumen. By boiling, the albumen is coagulated, but without much if any loss of water. By lapse of time the water gradually evaporates, and the result spoken of was probably due to this evaporation.

(30) Subscriber asks: Has it been definitely ascertained yet what caused the sinking of the Oregon? A. It was caused by collision with a vessel believed to be a coal schooner.

(31) W. S. asks: Does the brake of a car wheel when set up so as to nearly but not quite cause the wheel to slide, stop a train quicker than when the wheel slides? A. Yes. If the wheel is kept from rotating, the part in contact with the rail becomes polished and slides easily. If allowed to slowly turn, a new surface is continually presented to the rail. The latter practice stops the car quicker.

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