

sible. To get at the full scope, the book itself should be consulted, and we recommend it to all photographers upon its merits.

POOR'S MANUAL OF RAILROADS, 1887. Twentieth annual number. New York: H. V. & H. W. Poor. Pp. xliii., 1053. \$6.

To any one interested to understand the details of the railroad business of the United States, the financial position of the different companies and the various properties, this book is simply invaluable. During the twenty years since the first edition was published, each successive volume has represented a larger and larger mass of more carefully compiled statistics, much being from the sworn statements of railway officials, giving the work a high standing as an authoritative record in a field in which it has no competitors. From the summary statement in the introduction, it appears that there are now employed by all the railroads 26,415 locomotives, 19,252 passenger cars, 6,325 baggage and mail cars, and 845,914 freight cars, and that of a total of 168,047 miles of track, 105,723 miles are now laid with steel rails. The net earnings on all the capital invested is placed at not quite 3/4 per cent for the last year.

POOR'S DIRECTORY OF RAILWAY OFFICIALS. New York: H. V. & H. W. Poor. Pp. xliii., 372. \$2.

This is properly a supplement to the Manual, bringing within convenient compass the names of all officials desirable to know, for business purposes, to the number of some 30,000, including the names of officers of street and lumber railways as well as steam railways, express and sleeping car companies, and manufacturers of railway supplies.

The *Curio* is the title of a new illustrated magazine, commenced by R. W. Wright, of No. 6 Astor Place, New York. It is in quarto form, handsomely printed, and intended to satisfy the tastes and set forth the possessions of collectors of the rare and curious in the departments of genealogy and biography, heraldry and book plates, coins and autographs, rare books and works of art, old furniture and plate, and other colonial relics. The first number is handsomely embellished with valuable illustrations.

The *Machinery of Small Boats for Ships of War*, etc., a paper read before the Institution of British Naval Architects, by A. Spyer, presented on application by Fred. M. Wheeler, 95 Liberty Street, 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 This is for our information, and not for publication.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) **A. F. M.** desires a recipe for making a good thin shellac varnish. A. Break the gum into small pieces and macerate in a stoppered bottle with ether. After swelling up sufficiently, the excess of ether is poured off, when the shellac will dissolve quite readily in alcohol.

(2) **H. S. W.** desires a receipt for the cure of warts, one that will remove them permanently. Also please give me the cause of warts. A. Their cause is uncertain; they are said to be caused by uncleanliness. Their removal is easiest effected by means of caustics, such as silver nitrate, nitric acid, or salicylic vinegar.

(3) **A. F. S.** asks (1) a good receipt for making hektograph ink, both purple, blue, and black. A. Take 1 part aniline of desired color, dissolve in about 7 parts water and add 1 part glycerine. 2. The cause of the glass plates cracking in the Wimshurst electric machine? A. The trouble may be in the clamping—the flanges may not fit, or may not be properly packed. For electrical supplies, address any of the makers of or dealers in such goods advertising in our columns.

(4) **G. F. D.** writes: I have been troubled of late with what is generally termed sour stomach, and have been taking a third of a teaspoon of saleratus or thereabout, to overcome the acidity. Is that a proper corrective? A. You had better take a cup of clear warm water an hour before meals, and occasionally a bottle of citrate of magnesia to clear the stomach, with good habits and plenty of exercise. See most interesting lectures on dyspepsia, its treatment and cure, in *SCIENTIFIC AMERICAN SUPPLEMENT*, Nos. 323, 129, 215.

(5) **H. G.** asks a recipe for a good paint or stain for patterns for castings. A. Shellac varnish alone or with lampblack or vermilion is in ordinary use for varnishing patterns. Methylic or wood alcohol is the best solvent of shellac for making the varnish. Shellac varnish may also be purchased through the paint trade.

(6) **J. McD.** asks: 1. Is there really a fourth state of matter, known as radiant matter? A. The question is yet undecided. It is safest to conclude that there is probably no fourth state of matter. 2. Does all ice maintain a fixed temperature or degree of cold? In other words, would ice frozen at or near north pole and brought to North Carolina be of same

temperature as ice formed in North Carolina? A. Ice can be of all degrees of temperature below 32° Fah. The fixed point of temperature is its melting point. This is always 32° Fah.

(7) **P. H., Jr.** asks: 1. Will a siphon draw water through 2,400 feet of 1 1/4 inch pipe with a rise of 20 feet and a fall of 80 feet? A. Yes; but it requires care in filling or charging, to free every part from air, and an air chamber at the apex to prevent a break in the flow by accumulation of air which is liberated by the partial vacuum. Lower end should be immersed or turned up to prevent air drawing into the end, if the slope is steep. 2. A receipt for roof paint for corrugated iron roofing. A. Use pulverized oxides of iron, as yellow and red iron ochers, or brown hematite iron ores finely ground, and simply mixed with linseed oil and a drier.

(8) **F. H. S.** asks: What is the best battery for running a small electric turntable for show windows? How is the battery made? A. Use a plunge battery of ten cells carbon and zinc plates in electro-pole fluid. Would this be suitable to run the above or a small electric lamp, or would it soon run out? A. For the above purposes a Bunsen battery is perhaps the best. For description of this and other forms, see our *SUPPLEMENT*, Nos. 157, 158, and 159. The plunge battery, however, is very serviceable.

(9) **G. A. M.**—Rule for surface of oblate spheroid: Square their diameters, and multiply square root of half their sum by 3/4146 and this product by the transverse diameter, or

$$\sqrt{\frac{d^2 + d'^2}{2}} \times 3.1416 \times d'$$

For prolate spheroid: As above by inserting conjugate diameter in place of transverse. The other formulae asked for involve conditions in mathematical astronomy too complicated for this column.

(10) **J. W. D. L.**—The expenditures of the German government last year, including cost of army and navy and ordinary expenses of the empire, were \$174,153,877. The general cost of the United States government was \$242,483,138. Any such comparison, however, would be greatly misleading without counting the expenses of the several States, which in Germany have to support their army contingents, which is not the case here. Prussia, for instance, has a total expenditure of \$324,868,000, Bavaria \$60,000,000, Baden \$41,000,000, etc. Our State governments are expensive, but paying for a large special army contingent each does not figure in such expense.

(11) **P. L.** asks: What is the proper composition of the metal in a safety plug for a boiler, and at what temperature does it melt? A. We have no record of the composition used by various parties advertising the sale of fusible plugs. The following alloys, with their corresponding melting points, together with the temperature of steam at various pressures, may be found useful:

Tin	Lead	381° F.	Steam pressure by gauge.	Temp.
5	1	378°		
4	1	365°	120 lb.	350° F.
3	1	356°	105 lb.	341°
2	1	340°	90 lb.	331°
1 1/2	1	334°	75 lb.	320°
4	4 Bismuth 1	330°	60 lb.	307°
3	3	310°	45 lb.	283°
2	2	292°	30 lb.	274°
1	1	254°	15 lb.	250°

So much depends, however, on the way in which an alloy is made, the purity of its original metals, and the changing conditions to which a fusible plug is subjected, that it is very doubtful whether they should ever be depended upon in critical places.

(12) **Jones** asks how to use glucose in making pop corn balls. A. We know of nothing better for making pop corn balls than molasses boiled until stringy and then rolling the corn in it. Glucose is decidedly inferior.

(13) **G. S.** asks the best way to mix the whitewash for outside work. A. Take a clean, water-tight barrel and put into it 1/2 bushel lime. Slake it by pouring boiling water over it and in sufficient quantity to cover it 5 inches deep, stirring it briskly till thoroughly slaked. When slaking has been effected, dissolve in water and add 2 pounds sulphate of zinc and one of common salt.

(14) **W. L. F.**—There are several receipts for making the black color on brass: 1. 5 drachms nitrate of iron, 1 pint water. 2. 5 drachms perchloride of iron, 1 pint of water. 3. A solution of chloride of platinum in water.

(15) **R. K. B.**—The curvature of the earth in such a straight line a mile in length would be 2 1/4 inches from the surface at either end. If the line were two miles long, either end would be 8 3/4 inches from the surface. The measures are found by determining the tangent of the circle of the earth's radius.

(16) **J. E. N.**—The cultivation of the tree that yields annatto would not prove profitable, as the demand for the product is too limited. It is used chiefly for coloring butter and cheese. Messrs. W. H. Schieffelin & Co., 170 William Street, New York, and all other large drug houses import it in quantities such as to suit the demands of their trade.—The address of our Consul-General in Brazil is H. C. Armstrong, Rio de Janeiro.

(17) **J. S.** asks if there is any simple and reliable method of testing a 12 horse power boiler at 100 pounds water pressure. The said boiler is situated in a part of India where no government test is procurable, and it cannot be sent to any boiler works. What apparatus is necessary for the purpose? A. We know of no safe way of testing the boiler except by improvising a pump, no matter how small. A common plumber's force pump is sufficient. Fill the boiler full of water by any convenient means, through the safety valve or otherwise. Use the pressure gauge attached to the boiler, if you think it is correct. Also set the safety valve weight at 100 pounds by its mark. Then pump water in by any means at hand. It takes but very

little water to run the gauge up to 100 pounds after the boiler has been filled. If you have a steam pump attached to the boiler, a lever may be arranged to work the pump a few strokes for the required pressure. The engine in the absence of all pumping appliances may be made to put pressure upon the boiler by pulling it backward and pouring water into the exhaust, but this should be managed cautiously. With proper precautions the following method may be used. Fill the boiler with water, leaving absolutely no air space. It must be solid water. Then by slowly firing, the pressure can be run up to any desired amount. The instant the pressure is reached, or an instant before, draw the fire. This should only be done by an experienced engineer.

(18) **A. M. H.** asks directions for making paint to paint pipes and radiators for steam heating. A. A little clear japan varnish mixed with ordinary colors makes a very good cheap paint for radiators. The regular japan varnishes in colors are used for fine work. This requires to be baked in an oven at 250°, and makes a permanent color. Sometimes ordinary colors in oil are used. When dry, varnish with copal.

(19) **B. F. B.**—Hard solder is generally made of brass of a lower grade than the work to be brazed. For brazing the ordinary commercial brass, use the same kind of brass, melting in a crucible and adding 20 per cent of zinc. For brazing iron, use copper or ordinary brass. Flux with borax.

(20) **P. A.** asks: Which is the best—a piston or a rotary fire engine? A. Both are manufactured and in use. The piston engine and pump are preferred by the New York fire department.

(21) **J. H. L.**—Fulminate of gold explodes by slight increase in heat caused by compression, but is exceedingly uncertain and dangerous. Fulminate of platinum is next safer and explodes at a temperature of 400° Fah. Both the above are very violent, and explode with the slightest blow. Pure fulminate of mercury is very quickly and easily exploded. It is mixed with potassium nitrate or chlorate to moderate its violence, when used for charging gun caps.

(22) **J. M. C.** writes: In "Haswell," issue of 1884, on page 480, he says, the evaporative power of one pound of anthracite coal is 7 05 to 9 05 pounds of fresh water. Through how many degrees is this water supposed to be raised? A. The note referred to in "Haswell" is only an average or generalization of evaporative effect from mean temperature or 60°. The ultimate evaporative effect of the best coal, less the ash, is 14 9 pounds from water at temperature of 212° without pressure. When tests are made under pressure, the evaporative effect is reduced to and from 212° temperature without pressure. Thus the best forms of boilers doing low duty may run up to 12 pounds per pound of coal, and even higher than this is claimed with regenerative furnaces. The quality of coal varies greatly, as well as the condition of boilers. You will also find in "Haswell" interesting tables of the effective value of different kinds of coal. A large percentage of boilers in use are evaporating 5 pounds and under per pound of coal. Incrustation, dirty flues or tubes and overwork are the main features of small boiler duty.

(23) **R. B.** says: I am going to build a small steam engine 3 inches bore and 5 inches stroke, what is the rule in plain figures to get at the power? A. For small engines of uncertain cut off multiply the area of the cylinder by four-fifths the steam pressure and this product by the travel of the piston in feet per minute. Divide last product by 33,000 for the horse power. 2. What size boiler shall I need to get one-half horse power from this engine? A. Your boiler should contain for a half horse power 8 square feet of surface exposed to the fire. 3. What size boiler should I need to run it at its fullest capacity? A. Your engine is equal to 4 horse power at 200 revolutions per minute and 100 pounds steam pressure. For this you will need a 5 horse power boiler or one containing 70 square feet of fire surface. 4. What is the rule to get at the power of inclosed water wheels or turbine? A. Turbines give from 75 to 80 per cent of the value of the water flow. The value of the water flow is the volume falling 1 foot per minute multiplied by the weight of a cubic foot. For the horse power, divide the above product by 33,000.

(24) **M.** asks the best method of gluing emery on wheels and belts. A. Use the best emery and good tough glue made thick. Brush the glue on rather thick and follow the brush at once with the emery from the hand or a small piece of wire cloth soldered to the edge of a small shovel, so as to distribute the emery readily. Use the flat hand to press the emery close. A small flat piece of wood may also be used to advantage.

(25) **A. L. G.** asks: 1. What is the best for polishing bright iron work, such as cylinder heads and guides? A. Polish bright iron work with rottenstone and oil, if it is running machinery. Work not liable to have its running parts injured by emery, may be polished with emery cloth or flour emery and oil, as it is a quick way. You may polish the cylinder head with emery, but not the slides of an engine. Tripoli and oil makes a high finish after the emery. 2. What is best for polishing Russia iron? A. Russia iron should only be wiped clean with oil. The black surface will come off if polished with abrading material.

MINERALS, ETC.—Specimens have been received from the following correspondents, and have been examined with results stated.

A. D. G.—The material sent is sand containing iron ore, and is of value only in sufficient quantity and purity to smelt economically, which is very seldom the case.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequalled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address **MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.**

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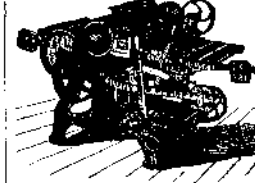
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