telephone? A. The buzzing is due to earth currents if the line is isolated from other lines, but if it is in close proximity to telegraph, telephone, or electric light wires, the buzzing is due to induction. 2. Would the fact that branches of trees rest against the wires bave anything to do with it? A. If your line is charged by a battery, the grounding of the line against wet trees might create a buzzing. 3. What is the best book to give one a knowledge of the practical working of telephones, and what is its cost? A. Prescott's "Telephone, Electric Light, and other Novelties" and Du Moncel on the "Telephone" are probably the best works; they cost from $2.50 to $3 each.

(54) H. R.—Spelter in trade is zinc. The name has been used as a local term for a mixture of zinc and copper (granulated) used for brazing. Tubes are brazed by first turning and wiring the clean edges together. Then place pulverized borax and low melting brass granulated or in strips upon the inside, and turn the seam side down over a charcoal fire, commencing to melt at one end of the tube, and draw it slowly through the fire. Observe upon the inside of the tube the progress and condition of the brazing. The brazing material should always have more zinc in it than the tube that is to be brazed.

(55) J. J. H. asks: 1. How to keep windows from freezing? A. The most satisfactory method is by lowering the window from the top, thereby allowing ventilation and circulation of the air. The application of glycerine will prevent freezing. 2. A recipe for making cement for billiard cue tips. A. Try strong glue 50 parts, dissolved with a little turpentine in a sufficiency of water; to this mixture add a thick paste made with 100 parts of starch. It is applied cold. 3. And a cure for warts. A. A popular and useful remedy for warts consists of ivy leaves dried and ground to fine powder. The part having been moistened with strong vinegar, a pinch of the powder is sprinkled on it and then bound on with a strip of rag. A mixture of equal parts of savine and verdigris is also said to make an efficacious wart powder.

(56) J. E. R. desires a formula for silvering solution. A. Prepare a solution of 1 part potassium cyanide in 6 parts water; add it to a concentrated aqueous solution of nitrate of silver (free from acid), until the precipitate is redissolved. Mix this solution with fine chalk and apply after previous cleaning of the object.

(57) S. P. B. asks: 1. If the current in the field coils of a dynamo machine is an induced current? A. The current in the field magnet of a dynamo is either taken directly from the armature through the magnet coils, or the magnet is placed in a shunt circuit. 2. Are both field coils in the same circuit? A. Yes. 3. As the armature revolves, is there any reversal of the current? A. There are two classes of dynamo and magneto electric machines. One class delivers a direct current, the other alternating currents.

(58) H. H. E. asks: How the Edgerton system of making gas (as used in New Orleans) differs from the usual plan? A. The Edgerton system is the making of a permanent gas from crude petroleum by means of retorts. It is not new, except in some of the minor details, from other petroleum gas works.

(59) H. S. writes: I am experimenting with a new gas which I produce without fire. I employ copper vessels for the production of this gas. I have reason to think that a portion of the copper is taken up and becomes a part of the gas. If so, I wish to cleanse, or in other words, remove the copper from it. 1. Can you tell me how I can detect the presence of copper in the gas? A. The presence of copper may be detected by the green color with which the gas burns. By passing the gas through sulphureted hydrogen, a black precipitate will be obtained, or by running it through ammonia water a blue coloration will ensue, when copper is present. 2. And if present, how can I collect and remove it? I have thought that I could by pressure pass the gas through a chemical compound which has a strong affinity for copper, and so remove it. A. We should think that by passing the gas through sulphureted hydrogen and subsequent washing with water all copper would be removed.

(60) F. J. K. writes: You would oblige me by answering the following question, which is in dispute. Is the following size a 90 horse boiler or not: 70 tubes, 3 in.; 15½ ft. long, 60 in. diameter, with a water front supposed to be 2 horse, and a globe dome 24 x 24 of cast iron? There are many opinions on the capacity, and all agree except the maker of the boiler, who maintains 90; the others 63 to 65 at outside. Your opinion is very valuable to me in this. A. We calculate the horse power as follows: The area of one tube will be 1753·00, that is, 3·1416 × 3 = 9·4248; this multiplied by 12 gives us the 113·0976, which is the area of one foot. They are 15½ ft. in length, hence 113·0976 × 15½ = 1753·01, for 70 tubes = 122,710. This in sq. ft. is equivalent to 852·14. Hence for the tubes we have 852·14 sq. ft. The boiler shell is 5 ft. in diameter; 3·1416 × 5 = 15·7080 × 15½ = 243·25, divided by ½ = 121·63 ft., as the area of the shell. For the end we have as its diameter 5 ft. × 5 = 25 × 0·7854 (¼ of 3·1416) = 19·635 as the area of end ft. The sum of these is:

852·14
121·63
19·63
993·40

This divided by 12 or 14, according as you accept either number of square feet as being equivalent to the heating surface for each horse power, gives either 82·78 or 70·9 as the horse power of the boiler.

(61) W. H. W. says: I am greatly troubled with hornets, who have located in my top loft. They have built their nests in said loft, and multiplied frightfully this last season. Can you tell me the best and most effectual way of destroying these pests? They instantly charge any female who dares to enter said lofts. The intruders feel happy if they make good their retreat without being stung? A. There should be no trouble in getting rid of the hornets if attended to early in the season, when they commence to build their nests. Some pyrethrum powder and a good force pump (*e. g.*, Whitman's fountain pump), will do the work effectively. The powder to be stirred up in water (at the rate of ¼ pound to about 8 gallons of water), and the liquid to be sprayed on the nest. This should be done late in the evening or very early in the morning, when the hornets are all in the nest. Diluted kerosene emulsion may be substituted for the pyrethrum water. Later in the season, when the hornets are more numerous their destruction is of course more difficult.

(62) R. C.—The boiler you describe is in very common use and works well; large numbers have been used in steam launches and yachts, but for burning straw or wood as fuel it does not give sufficient furnace or firebox capacity, hence for this kind of fuel the locomotive boiler is better, as any desired capacity of furnace can be obtained. Either kind of boiler should have not less than 200 square feet heating surface, and if the return tubular is used 220 feet, would be better. We would not advise you to use a smaller cylinder than 8 inches diameter and 12 inches stroke. The engine will be more firm and steady if attached to the side of the boiler. There is no work published especially on portable engines, but Rigg on the Steam Engine (price about $15.00) will give you useful information. The automatic cut-off would not be worth while on such an engine. For an 8 inch cylinder by 12 inch stroke the steam ports should be 6 by ¾ inches, and exhaust ports 6 by 1½ inches.

(63) M. L. S. desires us to explain: 1. Upon what law of science, in Tufts' automatic fountains, a stream of water is made to rise from six to twelve inches above its own level? A. We believe the action of the automatic fountain is due to the elasticity of the air. The water flowing into the lower globe or reservoir expels the air, which is forced into the upper apartment; the air thus compressed acts upon the water and makes it jet out. By reference to any text book on physics, the full description will be found under the title of Hero's fountain. 2. Do you know of any reliable cure for catarrh? A. For the catarrh avoid the use of patent medicines, and consult a competent physician.

(64) J. W. H. asks a receipt for preparing water color white. A. It consists of zinc oxide mixed with water and a little glue or sizing of some sort. A beautiful and permanent white that can be used either in oil or water consists of powdered Roman alum 2 lb., honey 1 lb.; mix dry, powder, calcine in a shallow dish to whiteness, cool, wash, and dry. Then mix it with water and suitable sizing,

(65) S. T. H. asks the best method of dissolving odds and ends of sheet India rubber so as to utilize same. A. The best solvent for rubber is a mixture of methylated ether and petroleum spirit—the common benzolene used in sponge lamps. The general method, however, of using old India rubber is by heating it with steam, whereupon the sulphur discharges, the rubber melts, runs into hot water, and collects at the bottom of the pit, while the vapor prevents its burning.

(66) A. V. Co. ask: Can superheated steam be used in pipes or coils, to boil linseed oil in large iron kettles? What temperature can be secured by steam used in this way? Is any peculiar style of boiler required? A. Superheated steam can be used for boiling linseed oil, but is not considered economical, as the oil boils at 640°, which is a very high temperature for the economical use of steam. A kettle bricked up in a hot chamber, out of the direct contact with the fire, with a safety chimney, is much used.

(67) J. N. H.—1. Steam ports ⅞ x 7½ inches, exhaust 2 x 7½ inches. 2. Pipe not less than 2¾ inches diameter. 3. Your keys, if of ivory, should be bleached.

(68) W. H. P. says: I am tempering saws in lead, but find the cast iron kettle in which I hold it is so porous and burns away so quick that it makes it expensive. Can you tell me anything better than cast iron for that purpose? It would have to be large enough to hold about three tons of lead, which is brought to a bright red heat. A. If you have your lead pots cast *bottom down*, or in the same position that you use them, they will not be porous. Also make the bottom much thicker than the sides. Wrought iron is also used for lead pots. They are more expensive to make. Think that you will overcome much of your trouble by casting *right side up*.

(69) J. H. C. says: 1. I have two steel boilers 14 feet by 55 inches connected together on top of steam drums, with 4½ inch pipe; have the usual number of 3 inch flues. No connections at bottom; 4½ inch pipe to engine 30 feet off. Engine cylinder 16 x 42 inches, 50 revolutions per minute, eighty pounds steam. The water in the outside boiler continually ebbs up and down from 1 inch to 8 inches; what can be the cause, and what would remedy the trouble? A. The outside boiler evidently foams. It is doing more than its share of the work. There may be in the arrangement of the chimney connections a stronger draught upon the foaming boiler than upon the other one. The steam connections may also be unequal, or so as to favor the delivery of steam from the foaming boiler. Unequal firing will also produce the same effect. 2. How much water will flow through a pipe per minute, 1,400 feet long with a fall of 75 feet, first 100 feet of pipe 6 inches in diameter, next 400 feet 4 inches in diameter, the remainder 3 inches with ten elbows? A. You will obtain a flow of 18 to 20 cubic feet per minute. 3. How much pressure would be at lower end if shut up tight? A. A pressure due to its height, or 32½ lb. per square inch when closed. 4. Where can books and papers be had to gain a practical knowledge of the Brush and other electric lights? A. There are about 20 numbers of the SCIENTIFIC AMERICAN SUPPLEMENT that describe the various kinds of lights and systems. 5. Which is considered the best electric light now in the market for factories, mills, and cities? A. There are about as many different opinions as there are companies.

(70) W. B. W. writes: In a recent number of the SCIENTIFIC AMERICAN SUPPLEMENT (No. 160), directions were given for construc ing an induction coil which by using two pounds of No. 36 wire would give a half inch spark. Sbould like to know how much No. 31 silk covered wire I should have to use to obtain the same result? A. The coil described in the SUPPLEMENT yields a 1½ inch spark. The amount of fine wire given for the coil referred to is somewhat in excess of the requirements, and it is probable that if you use the same amount and make your bobbin somewhat longer (say 1¼) you will secure the same results. You do not state whether the size given is by American or English wire gange. This would make some difference, as the English wire of this number is about the same as No. 32 American.

(71) W. K. R. asks for a good receipt for making blacking with bone black as a basis?

	1	2	3	4
A. Bone black	47·00	49·74	42·40	36·00
Molasses	23·50	37·29	21·20	30 40
Sulphuric acid	7·55	as So_3	10·64	1·53
Vinegar	7·00	9·32	...	...
Hydrochloric acid	....	...	5·32	2·00
Gum arabic	0·05	0·75	....	1·00
Olive oil	5·00	.	....	5·00
Sperm oil	....	0·55	....	....
Whale oil	....	....	3·00	....
Water	8·50	....	17·00	24·00
Copperas	0·70	....	...	....

The first is the analysis of English, the second and third of American, and the fourth of French blacking.

(72) S. L. H. says: I am in quest of some substance that will remove clinkers from fire brick furnaces. Would not a furnace lined with soap stone be anti-clinker? A. Soap stone is the proper material for preventing clinker in furnaces. The mines are in New Hampshire.

(73) S. S. B.—The encyclopedia referred to does say that "Pitch of a roof is the ratio between the height and the space covered," and no more. Other authorities say it is the *ratio of the angle of the rafters*. This harmonizes for both double and single roofs.

(74) J. N. R. asks us a series of questions abont the advisibility of adopting one or another system of water works for Lawrence, Kansas. We receive many such queries, which should properly be sent to an engineer, for they are of comparatively small public interest, almost always involve many questions not stated at the outset, and require an amount of personal attention and examination which we can hardly be asked to give gratuitously. To J. N. R. we would say that in order to decide what plan of water works are best suited for your city, we shall have to put ourselves in the place of a hydraulic engineer, and ask a great many questions, such as every particular in relation to the nature of the water in the Kansas River, and the eccentricities of the river. How much of the year it is clear? When not clear, is it loaded with sand or mud? In its muddy or high water stage is the water fit for household purposes? Is there any facility for low level reservoir of large capacity for supply during freshets? What is the average height of building—what, highest buildings? All of these points go to make up an opinion as to the best plan. The Holly system is the cheapest, but must have a supply uniform in quality which we fear in your case requires a settling reservoir. It will be unsafe to depend upon hydrants alone for fire purposes, 1,000 feet of hose is not admissible for fire purposes under this system. If with the combined system of Holly and high reservoir you are liable, without a low settling reservoir, to fill the whole system of pipe work with muddy water during flood season, this would have to be flushed out from the high reservoir to make the water fit for domestic use. Upon the whole, we think that the safest plan for a growing city as yours seems to be is to make plans in view of future wants, and start a plant for a uniform supply in quality of water from a low level reservoir large enough to supply clear water at all times, relying upon the Holly pressure system for all purposes, and in the near future build a storage reservoir that shall make a combined system perfect. You mention filtration. This is good to a limited extent, but has proved a failure for sudden demands. The system was built for the city of Newark, N. J. The supply being far short of the anticipation, the system was abandoned.

(75) W. L. S. asks: 1. How can I make a simple galvanometer? How can I find the focus of different forms of lenses? A. In SCIENTIFIC AMERICAN SUPPLEMENT No. 371 you will find a simple galvanometer described and illustrated. Find the focus of convex lenses by focalizing the image of the sun or any distant light upon a card or screen, and measnre the distance from the lens to the image. For a concave lens make a circle of twice the diameter of the lens upon a card or screen, and project the image of the sun or a distant light upon the screen at a distance that the shadow of the edge of the lens will correspond with the circle; this distance will be its focal length. 2. How can I make a very black drawing ink, to use in the blue process of copying tracings? Have tried India ink rubbed in a solntion of shellac and borax, but it is not satisfactory. A. We know of nothing blacker or better than India ink rubbed up with water only, as thick as it will flow.

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

S. S. Co.—The specimen is ferruginous clay or clay colored red by being mixed with iron oxide. Fine qualities of it are used for red pigments.

INDEX OF INVENTIONS

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July 15, 1884,

AND EACH BEARING THAT DATE.

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