Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

NEW BOOKS AND PUBLICATIONS.

BETRIEBS-EINRICHTUNGEN AUF AMERIKANISCHEN EISENBAHNEN. Von H. Bartels. Berlin: Ernst & Korn.

Contains a clear and concise description, illustrated, of the stations, freight depots, cattle yards, oil docks, water powers, coal yards, switches, turntables, signals and signal service of the American railways. The author traveled on the Pennsylvania and Western roads in 1876 and '77. The subject of which the book treats was not well known in Germany, as can be seen from the fact that this book was published upon order from the Secretary for Commerce and Manufacture. We are indebted to the Smithsonian Institution, Washington, for a copy of the work.

TABLES OF THE PRINCIPAL SPEEDS OCCURRING IN MECHANICAL ENGINEERING. By P. Keerayeff. London and New York: E. & F. N. Spon.

This little pamphlet must prove of great use to mechanical engineers and users of machinery, especially as the subject is meagerly treated in pocket engineering books.

THE NEW ENGLAND BUSINESS DIRECTORY for 1879. Boston; Sampson, Davenport & Co. 8vo. pp. 1,576. Price $6.00.

This, the ninth issue of the New England Business Directory, will be of practical value and assistance to every man having business interests in, or connection with, those States. Its classification is such that one can find in a moment the names and post office address of every man or firm, in any business, in any town in New England. The book is well made, and contains a good map of the Eastern States.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) A. McC. asks: 1. What length and sizes of wire for primary and secondary coils would be required for an induction coil to give a ¼ inch spark for the electric pen described in No. 8 of present volume for February 22, 1879, p. 121? A. Wind over a well insulated core of No. 18 annealed wires, ½ inch in diameter and 3½ inches long, two layers of No. 16 silk covered wire for the primary. For the secondary wind over the primary about 15 layers of No. 36 silk covered wire, insulating the separate layers as well as the primary from the secondary with two thicknesses of shellacked writing paper. You will need a condenser. 2. In "Notes and Queries," No. 32, March 22, 1879, you answer a like question from A. L. S., by saying "a coil giving an 8 inch spark will do." This is evidently a misprint; an 8 inch spark is a very powerful one. Do you mean a ⅛ inch spark or an 8 inch coil? A. It was a misprint; it should read—a ⅛ (one eighth) inch spark will do. 3. I have a small coil made for a medico-electric apparatus. It is 2 inches diameter by 5½ inches long and gives powerful shocks, but, though I have made for it a condenser with 350 square inches tin foil (700 in counting both surfaces) it will not give a spark more than one twentieth inch long, when used with the zinc and copper, sulphate of copper battery jar belonging to it. I have used it with a more powerful battery, before attaching the condenser, but could see no spark. The circuit braker is a thin spring about one-fiftieth inch thick, nine-thirty-seconds inch wide, 1¼ inch long. Does it need more wire, a better, *i. e.* lighter spring, or more battery power? A. It is probable that the coil is not made with sufficient care to give a spark of any considerable length. The insulation must be very perfect.

(2) L. writes: 1. In making brass cocks that are used to control the flow of water in hydraulic cotton presses, can they be made solid by using a core in the mould? A. Yes. 2. If a core can be used, what should it be made of? Made of common sand they all come out full of small holes just under the scale. A. River sand 2 parts, loam 1 part, and a very small quantity of wheat flour. Mix well together and moisten preparatory to moulding, with stale beer or with water to which a little molasses has been added.

(3) F. C. J., referring to query (20), page 283, current volume, writes: It seems to me the answer should be four feet instead of three. A. Test the question practically by weighing any uniform bar of iron on two scales, or spring balances. If it was placed at 4 feet the two men would carry two thirds and a part of the other third. See answer to W. P. P. on this page.

(4) W. P. P. writes: On page 283, current volume, query (20), relating to the carrying of a 12 foot shaft by three men, two carrying it by means of a lever and the other by taking one end, you state that to distribute the weight of the shaft equally between the three men, the lever should be placed three feet from the end. Is this right? I think it should be placed 4 feet from the end, because the 4 feet one side of the lever would balance 4 feet on the other side of the lever, leaving 4 feet for the man at the other end. Am I right? A. True, 4 feet on one side of the lever balances 4 feet on the other—but this does not leave 4 feet for the other man to carry, but one end of four feet. See answer to F. C. J. on this page.

(5) H. J. P. asks if the Corliss engine which was at the Centennial was the largest ever built? A. We believe it was the largest Corliss engine which had been built up to that time.

(6) A. D. R. asks if the mercurous sulphate battery gives off poisonous fumes, or fumes that would destroy metallic apparatus. A. If pure sulphate were used the amount of anything given off would be inappreciable under ordinary circumstances. These batteries should not, however, be kept in a warm place.

(7) J. H. G. asks: How can I make an emery wheel out of a cast iron one? A. Cement to the periphery of the wheel a strip of leather, allowing the ends to overlap each other. Coat the leather with rather thick glue, and roll the wheel in emery heated to about 200° Fah.

(8) F. L. R. asks: What causes halos around the sun and moon, and what do they indicate, if anything? A. They are formed by reflection of light from minute crystals of ice floating in the atmosphere or from watery vapor. They generally indicate a change of weather.

(9) C. M. R. writes: 1. I have constructed an induction coil, 1¾ inches by 1½, Nos. 26 and 36 silk covered wire used in its construction, and each layer is insulated with paraffined paper. Also a condenser containing 324 square inches of surface mica insulated. Have proved the insulation with galvanometer. The coil without condenser will yield a spark ⅛ of an inch, but with condenser in primary circuit, as per drawings and description in SCIENTIFIC AMERICAN SUPPLEMENT, No. 160, Fig. 4, the spark will not pass even at half that distance, though the shock which one may receive by completing the circuit with the hand is greatly increased. Are these results such as might be expected, or should the coil yield a spark at greater distance with the condenser in, and if so, where is the fault? A. Your primary wire is too small, and your condenser must be in some way defective. See that the two parts are everywhere well insulated from each other. Possibly less condenser surface would be better; the coil should certainly yield a longer spark with than without a condenser. See reply to A. McC. on this page. 2. How is the Trouve battery constructed? A. See SCIENTIFIC AMERICAN SUPPLEMENT No. 159.

(10) J. W. W. writes: I am making a dynamo-electric machine according to drawings in SUPPLEMENT No. 161, only three times the size instead of twice. What would be a suitable number of wire to wind the magnets and armature? The machine is intended for general experimental purposes, with reference more particularly to the production of a small electric light. A. You would probably obtain good results by winding the magnets with No. 14 wire and filling the armature with No. 16.

(11) C. B. B. asks: How can I polish fancy woods? A. Apply with a woolen rubber a mixture of alcoholic shellac varnish 3 parts, boiled linseed oil 1 part. Rub the work briskly until the shellac is hard.

(12) J. A. D. writes: In No. 162 of the SCIENTIFIC AMERICAN SUPPLEMENT you describe a simple electric light. 1. How many Bunsen cells would be required and how long would the light last? A. It would require about 8 or 10 cells. 2. Would a piece of carbon from a lead pencil answer for the thin carbon rod? A. No. 3. In No. 160 SCIENTIFIC AMERICAN SUPPLEMENT is a description of an induction coil. Is there a simpler way of making a commutator. If so, please describe it, and if possible by diagram. A. See answer to W. G. S. on this page. 4. How long a piece of tin foil is needed for 40 square feet of surface if it is one foot wide? A. 40 feet.

(13) W. G. S. asks: 1. Could the commutator described in connection with the induction coil (SCIENTIFIC AMERICAN SUPPLEMENT No. 166) be made like that of Professor Hughes' induction balance (page 244 in current volume of SCIENTIFIC AMERICAN), and if so describe connections and give details of making? A. You may make one on a similar principle by connecting with each binding post a button, and driving three round headed screws into the board, so that either the middle screw or one of the outer ones may be touched by one of the buttons, and the middle and the other outer screw may be touched by the other button. Connect the middle button with one terminal of the primary coil and the two outer buttons with the other terminal and you have it. 2. What would be the price of the induction coil? A. $35 to $40. 3. How can I make a pair of spools suitable for a telegraphic instrument or electric call bell? A. As you do not give the resistance of your proposed line we cannot give you a definite answer. If the bell and instrument are intended for experiment only, probably the following would do: Turn two very thin wooden spools, 1½ inch long, ¾ inch internal diameter. Wind them with about 8 layers of No. 20 cotton covered wire. 4. Could I make a Trouve battery of a number of zinc and copper plates in the same cell, and would it be of sufficient power to be felt? A. You can make a battery in the way you propose, but you will not be able to feel the current from it without using a great number of pairs or employing an induction coil.

(14) J. A. McC. asks: 1. Is not the office of the line wire in the acoustic telephone to transmit the vibrations of the diaphragm from the transmitting to the receiving instrument? A. Yes. 2. If this be correct, would it not be better to use as light a wire as possible? A. Yes. 3. If this also be correct, would it not be better to use hard drawn wire on account of strength and lightness, instead of soft? A. No, on account of its resonance. 4. What is the durability of the diaphragm in this instrument when made of thin iron, or has it been tested? A. We see no reason why it should ever fail. 5. Is there any more danger of damage from lightning on lines of one mile and less without ground connections than there would be from a badly put up lightning rod to a house or other building? A. More danger to the operator because the line extends over a greater area. You should use a lightning arrester. 6. Can you tell me if there is any foundation in fact for the idea generally prevalent among western hunters that a breech loading shot gun will not shoot as well as a muzzle loader, everything else being equal both as regards closeness and penetration? A. We think a well made breech loader the best.

(15) J. H. W. asks for the best way to keep steam boilers through the summer that are used for heating purposes in winter. A. Fill them entirely full of water and paint the outside well.

(16) D. B. B. asks can power be obtained by air pressure in the cylinder of an engine in the same manner as from steam. A. Yes. See Mr. Haupt's report published in Nos. 176 and 177 of the SCIENTIFIC AMERICAN SUPPLEMENT.

(17) J. L. G. asks: 1. What is meant by saying an engine cuts off at ½ or ¼ stroke? A. Cutting off the steam at the time when ¼ or ⅛ the stroke is made. 2. How is the valve set when it cuts off at ½ stroke and when it cuts off at ¼ stroke? A. We cannot explain to you the set of the valve, as it depends upon the kind of valve and valve motion. 3. Are the fire sheets of a large flue boiler the same as the other sheets? A. Yes. 4. What is the diagram often mentioned in connection with steam engines? A. By examining the back numbers of this journal you will find descriptions and cuts of engine diagrams.

(18) D. C. H. asks for a receipt for making paste to make paper adhere to tin. A. Soften 4 parts of glue in 15 of cold water, and then moderately heat until the solution becomes quite clear. Then add 65 parts of boiling water, and agitate. In another vessel stir up 30 parts of starch paste with water enough to form a milky liquid without lumps, and into this pour the boiling glue solution with constant stirring. Continue the boiling for a few minutes, and add, after cooling somewhat, a drop or two of carbolic acid to each gallon of paste. Keep the paste in closed vessels.

(19) P. A. L. asks if bismuth is extensively used. What is its value? A. Bismuth is chiefly used for certain alloys, as Newton's and Rosse's fusible alloys, etc. The basic nitrate and the carbonate are used in medicine. *Magisterium bismuthi* or *blanc de fard* is used as a cosmetic. Bismuth is worth about $2.25 per pound.

(20) J. C. asks: 1. Do you know of any locomotive in Wales or England that weighs 120 tons? A. No. 2. What is the weight of the heaviest American locomotive that you know of? A. About 60 tons without tender. 3. When is a locomotive heaviest on the rail, when it is running or when it is standing? A. When running up a concave grade.

(21) B. F. M. asks: 1. Will it materially weaken ¾ inch pipe to bend it cold into coil of 20 inches internal diameter? A. No, if of good iron. 2. Can a pump be made—and how—to work boiling water coming out of boiler at about 150 lbs. pressure? I wish to take the water out at one side and pump it in again at the other. A. Place your pump a distance below the boiler, so that the water will fill the pump by gravity.

(22) J. J. B. writes: A friend of mine has in constant use three return tubular boilers side by side, two of which are connected with one smoke stack, 60 feet high; the third is connected with another smoke stack, same dimensions and height as the one referred to. The smoke stacks are of brick, and stand about seven feet apart. The first smoke stack referred to has not quite sufficient draught for two boilers, the other has more than enough for one. Will connecting the two stacks be of any benefit in running the three boilers, if so, how near the surface of the ground should the connection be made? A. Yes, if properly done. The flues of all the boilers should be brought together and then divided to lead off to the two chimneys.

(23) T. P. H. asks: 1. Will not a keel do as well as a center board in the boat of which plans are given in No. 29 of SUPPLEMENT? A. You will not be able to carry so much sail with the ordinary keel unless the boat is ballasted. 2. If so, what depth and thickness should the keel be made? A. 2 inches thick and 4½ inches deep.

(24) J. H. C. asks: Can you tell me when and where cycloidal teeth were first used for gear wheels? Who is supposed to have invented them? A. Camus, a French mathematician, describes cycloidal gearing in a work published in 1752 and translated into English about 1806. 2. Are the profiles of "involute" teeth approximate involutes, or are they but one of the curves of cycloidal profiles? A. Approximate involutes. 3. Can you refer to any work containing the history of gearing? A. There is no such work that we know of.

(25) W. R. writes: 1. Suppose two side wheel steamers of unequal size run with equal speed in still water, should the larger boat be able to beat the smaller one against a current because the current has more effect on the smaller boat? A. The one having the greatest propelling power in proportion to its weight, should be the most efficient against the current. 2. Can a boat run in shallow water (not touching bottom) as well as in deeper water, other things being equal? A. No. 3. If two unequal but similar boats stop their engines when even and going at the same speed, which will stop first? A. Other things being equal, the lightest boat.

(26) H. B. asks: 1. Through what process is paper passed that it may resist the influence of water and fire? A. For processes of waterproofing paper, consult SCIENTIFIC AMERICAN SUPPLEMENT No. 96. A saturated aqueous solution of sodium tungstate may be used to render paper uninflammable. 2. What chemicals are used in the manufacture of lumber from paper? A Usually a concentrated aqueous solution (hot) of zinc chloride.

(27) J. T. G. asks how to remove the paper patterns from scroll work. A. Moisten it and scrape it off. It is better to trace the pattern than to paste it on the work. It is a good plan to paste the pattern on a piece of veneer and preserve the whole as a pattern after sawing.

(28) P. B. C. writes: 1. I have a well, 14 rods from house, at 26 feet rise from well to house. I have common force pump, 1¼ inch diameter by 4 inches stroke. Will the pump force water through a ½ inch pipe to the house? A. Do not use less than ¾ inch pipe. 2. Will an air chamber on the pipe help it any? A. Yes. 3. How large a windmill will it take to drive the pump? A. 8 feet.

(29) J. M. H. asks for dimensions for a pleasure skiff twenty feet long. A. 20 feet long, 3 feet 3 inches wide at bottom and 4 feet at top, and 18 inches deep, 7 inches shear forward and 4 inches aft: stern 2 feet 10 inches wide.

(30) G. L. W. asks: 1. What would be the power of an engine 8 inches by 10 inches stroke, with 100 lbs. steam pressure, making 100 revolutions per minute? A. See page 267(4), current volume of the SCIENTIFIC AMERICAN. 2. What is meant by mean effective pressure? A Average pressure on the steam side of the piston, greater than the retarding pressure on the exhaust side.

(31) "Subscriber" writes: 1. We have a line of steam pipe, one hundred and twenty-one feet long, and have some difficulty in keeping our union joints tight. Would we gain anything by putting expansion joint in the line, and if so, would one be sufficient? A. Certainly, put in an expansion joint, or else suspend the pipe so that it can expand and contract freely. 2. Will asbestos cement rust steam pipe or a boiler? A. We think not.

(32) H. F. asks: Is there any astronomical reason known why the earth, one of the smaller planets, was selected by the Almighty to be the habitation of man? A. Neither known nor possible to be known. It does not fall within the province of astronomy to discover the motives of the Almighty in ordering things as they are. Science endeavors to discover the conditions of phenomena: it has no business with the infinite *why* of existence.

(33) C. P. M. writes: I have made a phonograph from drawings in SCIENTIFIC AMERICAN SUPPLEMENT No. 133 but fail to make it work. I have followed directions implicitly, and I thought perhaps you might give me some light as to some essential part that I had overlooked. The needle makes the groove all right, but does not seem to make any dots if I speak into it, nor does it reproduce sound when turned back. A. It may be that your diaphragm is too thick or too heavily damped, or it may be that your mouth piece is not tight. You should also bear in mind that it is necessary to speak quite loudly and clearly to the instrument.

(34) J. J. B. H. asks for the meaning of the term "angular aperture," as applied to microscopical objectives. A. The angular breadth of the cone of light which a microscope receives from an object, and transmits to the eye, is called its angular aperture.

(35) T. E. W. writes: If a hole were made through the earth, passing through the center, and a bullet dropped into the hole, would the bullet stop at the center, or pass through nearly to the other side, oscillating to and fro, losing a little distance each time, until it finally settled at the center? I hold that it would not pass the center; that at the center the weight would be nothing, the attraction nothing (or balanced), and the velocity nothing. My friend holds that it would reach the center with enormous velocity, and be carried through to the other side. Please say which is right. A. We think your friend is right. The bullet, upon arriving at the center of the earth, would have an amount of accumulated energy (so to speak) or momentum, that would be expended by passing beyond the center against the action of gravitation, then would return again under the action of gravitation.

(36) "Student" writes: 1. I have an engine, 8 inches diameter and 12 inches stroke. Purchased it for 15 horse power, but with 100 lbs. steam and 100 revolutions per minute, I calculate 24·50 by your rule, allowing 1-5 for friction. 1. Am I correct? A. Yes; but have you sufficient boiler? It is a badly proportioned engine to get that amount of power from. 2. Have I sufficient power to run a 56 inch circular saw in heavy pine timber and 3 wood turning lathes at the same time? A Not at proper speed. 3. Can I run a 24 inch burr corn mill and 70 saw cotton gin at once? A. We think not, to their full capacity. 4. What rate per minute must I run my saw and grist mill in order to obtain the best results? A. Consult a good millwright, as it depends upon the kind of work your mills are to do. 5. Is a 5 foot driving wheel too large for 12 inch stroke? A. No.

(37) A. B. B. writes: I have a mercurial barometer from which some of the mercury has been spilled. Will it indicate the changes in the weather correctly? A. No, it should be refilled. This you may do by inverting it, pouring in mercury, and jarring it to remove every particle of air.

(38) T. A. S. asks: 1. Would it not increase the power of an electro-magnet if, with a given battery power, I connected ground wires; connecting the — pole directly with the earth by one wire, and running the current from + pole to another ground wire after passing around the magnet? A. No. 2. Would a magnet made of ⅝ inch iron, the poles 3½ inches long, wound with Nos. 20 or 21 wire, and connected with two cells Calladu battery, attract with much force at ¾ inch from the poles? A. No; magnetic attraction is inversely as the square of the distance.

(39) F. A. S. asks: 1. Will several magnets in close proximity, if insulated, retain each their separate power? A. No. The magnets will mutually enfeeble each other. 2. Does pointing a magnet concentrate its power at the points? A. Yes, to some extent. 3. How near the neutral line on a magnet can the coil be placed, and still have its effect in the telephone? A. The coil of a telephone should be near the end of the magnet. We do not think the telephone would work at all with the coil near the mean line of the magnet; that is if the magnet were of any considerable length.

(40) J. M. S. writes: Suppose we place 3 wheels on the axle of a locomotive secure, and let the outside wheels be twice as large as the center one, and then we raise the track for the middle wheel so that they may all have an equal bearing on the tracks. Now in traveling a certain distance of course it does not take as many revolutions of the large wheels as of the small one, but as they are all fast to the same axle, one cannot make more revolutions than the other. How is the distance gained by the small wheel, and does it slip on the track? A. As you have two large wheels and but one small one, and the same weight supposed to be resting on each, the small one must slip.

(41) G. W. E. asks: If you take two cog wheels of the same diameter, the same number of cogs etc., place one of them stationary and revolve the one around the other, how many revolutions will the movable one make passing once around the other? A. Two.

(42) E. F. writes: I would like to know if there is anything made so as to filter the water before entering boiler, and is now in successful operation, and where it can be seen or had; or is there any composition or liquid, when mixed with the water, would precipitate the sediment to the bottom as in a tank. A. If you are troubled with a lime deposit, there are various feed water heaters that will relieve your trouble, as they are arranged so as to deposit most of the lime in the heater. Various materials are used to aid in the removal of deposits, but an analysis of the water should be made before proper advice could be given.

(43) C. C. S. asks (1) whether two lubricated hard substances will wear longer together than one hard and one soft. A. Yes. 2. Would the result be the same where there is no lubricator used? A. Yes, that is, the hard surfaces would wear the longest.

(44) J. O. H. asks: Can you give me a remedy for excitability, while reading or speaking before a school? A. Force of will and practice are the best remedies. It is said that a momentary inhalation of the vapor of ether will quiet the nerves and give a feeling of confidence, but we should greatly prefer the other remedies.

(45) T. S. V. asks: How hard or how soft will cast steel require to be before it is tempered? I claim that it is tempered when it is extremely hard, or when it is annealed very soft. Am I correct? A. Tempering is reducing the hardness of a piece of steel to any degree short of the softness produced by annealing by the application of heat. The operation of hardening does not properly include tempering.

(46) J. R. B. asks: Can you give me any receipt for bending white oak save the ordinary way by steaming? Is there any composition used? A. We do not know of any composition for this purpose. Boiling the wood in water is sometimes preferred to steaming.

(47) F. P. asks how much and what size wire he should use on electro-magnet, with core 7-16 inch diameter and 2¾ inches long, to be operated by one or two cells Grove's battery. A. You do not mention the purpose for which you intend using the magnet. Supposing you intend it merely for experiment, we suggest winding each core with 8 or 10 layers of No. 20 wire.

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

J. C. McL.—It is a fine sample of asbestos.

COMMUNICATIONS RECEIVED.

On a Solution of the Convict Labor Question. By D. D. S.

On Solar Circulation: Heat and Light. By E. F. D.

On Rotary Motion. By H. J. M. M.

[OFFICIAL.]

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Boot nailing machine, L. Goddu, Winchester, Mass.
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Clothes hanger, European and United States Patent Exchange, New York city.
Firearms, J. P. Lee, Ilion, N. Y.
Furnace for steam boilers, W. E. Kelly, New Brunswick, N. J.
Gun barrels, brazing, Colt's Patent Firearms Manufacturing Company, Hartford, Conn.
Lamps, W. B. Robins, Covington, Ky.
Lubricating machinery, C. Pershall, Detroit, Mich.
Ore separator, C. M. Buel, New York city.
Railway, H. Reese *et al.*, Baltimore, Md.
Railway switch, H. Greenway, Brooklyn, N. Y.
Refrigerating apparatus, J. G. Wolf, New York city.
Rotary engines, E. Hall, Boston, Mass.
Seed planter, J. Ellis, Oakland, Ga.
Sewer connections, W. Pickhardt, New York city.
Steam engine lubricator, W. P. Phillips, Boston, Mass
Water meters, W. B. Mounteney, Chicago, Ill.