

**Arrangement and Maintenance of Batteries.**

The quantity of electricity which exists in the form of a current upon a given length, size, and quality of wire, is proportional to the number of cells in the battery; for, while the quantity of electricity produced by a battery is proportional to the amount of zinc decomposed in each cell, and is no greater in a battery of one hundred cells than in any one single element of that one hundred cells, the electro-motive force which is required to overcome the resistance of the conductors, or to force the quantity generated by a single cell through the wire, increases with every additional cell.

The quantity of electricity existing in the form of a current upon a telegraph wire from a given number of battery cells, is inversely proportional to the resistance of the wire, relays, and battery. To summarize: The electro-motive force being constant, the quantity of electricity which flows through any circuit is inversely proportional to the resistance.

The resistance being constant, the quantity of electricity which flows through any circuit is directly proportional to the electro-motive force.

It is evident from the above considerations that the number of cells employed in a battery for working a telegraph wire should be strictly proportional to the resistance of the wire and relays. If a battery of a certain number of cells is employed to work several wires, the resistances of all the circuits should be approximately the same; for if a wire one hundred miles long is attached to a battery which supplies another wire of twice the length, the shorter wire will have twice the quantity of current that the longer wire receives. If, therefore, the electro-motive force of the battery is sufficient to work the longer wire, it is twice as great as the shorter wire requires, and the surplus strength is wasted. In estimating the length of a wire, of course the resistances of the relays must be included, and the size and condition of the wire, or its conductivity, properly considered.

Applying the foregoing principles, the strength of current upon each of the following wires when supplied from separate batteries of 50 cells each, will be found as stated in the eighth column. When all the wires are supplied from one battery of 50 cells the strength of current upon each will be as stated in the ninth column.

Number of Line.	Resistance of Line.	Resistance of Relays.	Resistance of Line and Relays.	Resistance of Line and Relays increased by 50=Battery.	Conductivity of Wires.	Conductivity of Wires, each, increased by 50.	Strength of Current when supplied by separate batteries of 50 cells each.	Strength of Current when supplied from one battery of 50 cells.
1	3000	7000	10000	10650	.0009433	.0009939	4,694	4,108
2	3000	6800	9800	10500	.0010204	.0010152	5,076	4,443
3	3000	5800	8800	8850	.0011363	.0011299	5,917	4,948
4	3000	4800	7800	7850	.0012590	.0012764	6,732	5,582
5	3000	3800	6800	6850	.0015151	.0015337	7,518	6,597
6	1700	2900	4500	4550	.0022222	.0021978	10,989	9,677
7	3400	1400	4800	4850	.0020893	.0020618	10,309	9,072
8	2000	3600	4600	4650	.0021739	.0021505	10,752	9,466
9	2000	1000	3000	3050	.0033333	.0032736	16,293	14,515
10	2200	1600	3800	3850	.0030461	.0030773	18,867	16,748
11	3000	400	3400	3450	.0039411	.0039265	14,432	12,807
12	1000	400	1400	1450	.0071428	.0070895	21,384	21,104

The problem of working the twelve wires from one battery is a case of branch circuits, and the question is, What is the joint or combined resistance of the twelve branches? This will readily be found to be  $R=337,384$ . If now we add to this the common resistance of the battery  $R=50$ , the total resistance of the circuit will be  $R+R=337,384$ , and the strength of current flowing through the battery, or generated by it, will be  $S=\frac{50,000}{337,384}=129,0709$ . Now, this strength of current divides itself among the twelve branches in proportion to their several conductivities, as exhibited in the sixth column (conductivity is reciprocal of resistance, thus  $\frac{1}{337,384}=.0009433$ ).

If the resistance of the battery were less than 50, the strengths of current in the last column would approach more nearly to those in the eighth column; but, on the contrary, were the resistance of the battery more than 50, the strengths of current upon the wires supplied from a common battery would depart more widely from those supplied by separate batteries of the same electro-motive force.—George B. Prescott in the Journal of the Telegraph.

**Use for Blast Furnace Slags.**

We have published several articles on this subject, giving an account of the manufacture of chemical salts, cements, pavements, and the like, from what has always been a waste material, and now hear of the proposition to cast the cinder from the furnaces into slabs, garden rollers, posts, pillars, and so forth. In certain metallurgical operations these articles can be made to resemble porphyry. In some parts of Germany the slag is cast in molds, and is at first used by the workmen for cooking and heating purposes, and afterwards for building houses and walls. The prospect is fair of furnace slags becoming valuable for many purposes.

**Professor Huxley's Address Before the British Association.**

Our readers will find in another column a portion of Professor Huxley's inaugural address before the British Association for the Advancement of Science. As a discussion of the origin of life and the various hypotheses in regard to this interesting subject, and as a clear expression of the views of one of the greatest biologists of the age, it will be found worthy of the most careful perusal. We shall conclude the address in our next issue.

**STEEL TYPES FOR TYPOGRAPHICAL USE.**—By an ingenious mechanical contrivance, not unlike that in use for making nails, previously softened steel wire is converted into types which are afterwards hardened. With a single machine and a one-horse power steam engine it is said in an English journal 35,000 types can be made in twelve hours, while the types thus made are of a superior finish, and cheaper, also, on account of the less expense of the steel as compared with the ordinary type metal (usually an alloy of antimony and lead, in the proportion of one part of antimony to four of lead, with a very small quantity of copper, the latter being usually present in sufficient quantity in what is termed hard lead).

**ARITHMETICAL.**—Any number of figures you may wish to multiply by 5 will give the same result if divided by 2—a much quicker operation; but you must remember to annex a cipher to the answer when there is no remainder, and when there is a remainder, whatever it may be, annex a 5 to the answer. Multiply 464 by 5, and the answer will be 2,320; divide the same by 2, and you have 232, and as there is no remainder, you add a cipher. Now take 359—multiply by 5, the answer is 1,795; on dividing this by 2 there is 179 and a remainder; you therefore place a 5 at the end of the line, and the result is again 1,795.

It is stated that an average Egyptian can see nothing distinctly at a distance of more than 500 yards, and has no acuteness in detecting an object within as many feet. A recent traveler says that when the railway was constructed the utmost difficulty was found in procuring men capable of seeing or recognizing the difference between signals only a hundred yards off. Many candidates came, but few passed the test. One man was nearly passed, but the engineer was not quite satisfied that the fellow had not been "making good shots" at the colors. So he held up his hat at 150 yards, and the hapless signalman pronounced it to be "the red flag."

**THE HOOSAC TUNNEL,** during last month, advanced 150 feet at the east end, and 112 at the west. The central shaft reached the grade of the tunnel August 13, and a force was employed during the remainder of the month in trimming pouches of rock and putting in new timbers and machinery.

We are indebted to James R. Smedburg, C. E., of the San Francisco (Cal.) Gas Works, for a copy of the Engineers' Index to the London Journal of Gas Lighting, covering the first seventeen volumes of that valuable publication. This Index will be of great value to all who are interested in the science and laws of gas engineering.

Two thousand of Krupp's workmen are said to have enlisted in the German army. Krupp's guns are also in the same army, and are giving good reports.

**NEW BOOKS AND PUBLICATIONS.**

**A PRACTICAL TREATISE ON SOLUBLE OR WATER GLASS, Silicates of Soda, and Potash for Silicifying Stones, Mortar, Concrete, and Hydraulic Lime, Rendering Wood and Timber Fire and Dry Rot Proof, etc., with Hundreds of Recipes for Soap, Cements, Paints, and Whitewashes, Railroad Sleepers, Wooden Pavements, Shingles, etc.** By Dr. Lewis Feuchtwanger, Chemist, and Mineralogist. Concluded with various Essays on the Origin and Functions of Carbonic Acid, Limestones, Alkalies, and Silica; and a Complete Guide for Manufacturing Plain and Colored Glass. With several Woodcuts. New York: Published by L. and J. W. Feuchtwanger, 55 Cedar street.

It will be seen by this title that a great variety of practical subjects are discussed by the author, who is well known as a man thoroughly posted in these and cognate matters, and also as the author of a valuable treatise on gems. The author was the first to introduce the use of soluble glass to the American public, and has devoted much time in experiments with it. Whoever reads the book will not be disappointed in finding much information on points not generally well understood in this country. An extract from the work will be found in another column.

**THE CANADIAN ILLUSTRATED NEWS.**

This excellent weekly periodical, which is about the size of the SCIENTIFIC AMERICAN and other current illustrated papers, now comes to us greatly improved in its style of illustrations. Our Canadian contemporary has from the first exhibited a commendable spirit of enterprise in the production of all its engravings by the photographic process, and now, by the recent introduction of improved steam presses, it is enabled to print its photographic pictures as quickly and in almost as good style, as the ordinary hand-cut wood engravings. We have seen some admirable specimens of printed photographs from nature done by the same method as that employed for the illustrations of the Canadian News, namely, Leggo's process, of Montreal. The publisher of the Canadian Illustrated News is Mr. George E. Desbarats, a practical printer of much experience, ability, and enterprise. The credit of establishing a weekly newspaper, profusely and regularly illustrated by photographic plates, belongs to Canada. There is no other paper like it in the world, that we know of. The Leggo process above alluded to, was some time ago fully described in the SCIENTIFIC AMERICAN.

**Inventions Patented in England by Americans.**

(Compiled from the "Journal of the Commissioners of Patents.")

**PROVISIONAL PROTECTION FOR SIX MONTHS.**

- 1,431.—LOOMS AND SHUTTLES.—H. E. Towle, New York city. May, 18, 1870.
- 2,051.—TOILET AND OTHER MIRRORS.—G. H. Chinnock and E. P. Williams, New York city. July 20, 1870.
- 2,324.—PRINTING PRESSES.—W. Braidwood, New York city. August 24, 1870.
- 2,330.—PRINTING MACHINERY.—R. M. Hoe, New York city. August 24, 1870.
- 2,338.—LIQUID METERS.—J. F. De Navarro, New York city. August 25, 1870.
- 2,340.—TRAMWAYS AND ROAD SURFACES.—S. D. Tillman, Jersey City, N.J. August 25, 1870.
- 2,353.—TUNNELING.—W. Sykes, Toronto, Canada. August 27, 1870.
- 2,358.—SEWING MACHINE ATTACHMENT.—G. H. Collins, New York city. August 27, 1870.
- 2,359.—TACKS AND NAILS.—H. W. Wright, Taunton Mass. August 27, 1870.

**Business and Personal.**

The Charge for Insertion under this head is One Dollar a Line. If the Notice exceed Four Lines, One Dollar and a Half per Line will be charged.

- Pattern Molding Letters to put on patterns of castings. Wholesale and retail, by H. W. Knight, Seneca Falls, N. Y.
- Propeller Engine Cylinders, 28 inches square, for sale cheap, by Daniel W. Richards & Co., 92 Manzan st., New York.
- Foundry Cranes, ten and fifteen tons capacity, wanted. Address Box 2,348, Postoffice.
- The Oil Cups and Lubricators manufactured by H. Moore, 41 Center st., are the most simple, durable, and perfect. Send for circular.
- Metallic Pattern Letters for putting on patterns for castings, etc.; also, engraved plates for numbering church pews, etc. Allen & Brim, Seneca Falls, N. Y.
- Parties West of Harrisburg, Pa., who can influence trade with Manufacturers, and are desirous of securing agencies for the celebrated "W. H. Tupper & Co. Furnace Grates," are requested to correspond immediately with the Western Controllers, W. C. Childs & Co., Pittsburgh Pa. Grates tested for seven years, and endorsed by the most prominent manufacturers throughout the country. See Circular. Delivered free of freight.
- A good Patent Salesman wanted to sell rights for the best Gas Machine invented. Full particulars by calling on or addressing C. F. Dundee, 90 Wall st., New York city.
- Stager's Automatic Boiler Feeder. The water is kept at just the right height by the filling and emptying of a tube. For Rights and Machines apply to J. B. Smith, 417 Broadway, Milwaukee, Wis.
- Foundry Cranes, thirty tons capacity, for sale cheap. Address Postoffice Box 2,348.
- Send to H. Moore, 41 Center st., for Circulars of the best self-closing and compression faucets, water-closet valves, etc.
- Send prices and pamphlets of all kinds of wood working machinery to A. J. Williams, Madison, Ga.
- Manufacturers as well as Owners of Buildings would do well, before purchasing their paints, to read the advertisement of the Averill Chemical Paint Co., in this number.
- Silver Medal Machinery Lathes, Presses, Engines, all kinds of light machines, dies, models, etc., by John Dane, Jr., Newark, N. J.
- Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.
- Millstohe Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.
- For foot power engine lathes address Bradner & Co., Newark, N. J.
- Peteler Portable R. R. Co., contractors, graders. See adv'tment.
- For Am. Twist Drill Co.'s Patent Grinders, and other fine tools, address J. W. Storrs & Co., 252 Broadway, New York.
- "507 Mechanical Movements."—No Mechanic or Inventor can afford to be without The Illustrated Book of 507 Mechanical Movements. They will find in it just what they require—what they can find nowhere else. Price \$1. By mail, \$1.12. Address Theo. Tusch, 37 Park Row, New York
- Pictures for the Drawing Room.—Prang's "Lake George," "West Point," "Joy of Autumn," "Prairie Flowers." Just issued. Sold in all Art Stores.
- Roofing Materials, House Sheathing, Roofing Felts, & Psints, full directions for applying. Mica Roofing Co., 73 Maiden Lane, New York.
- Edging or Profiling Machines, having a valuable improvement in device for cutting "formers;" superior shaping, die sinking, spindle and cutter grinding machines are made by the Pratt & Whitney Company, Hartford, Conn.
- Parties having patented or other machines which they desire to have manufactured, can have it done at very low rates, in wood or iron (facilities ample), by the Diamond Mill M'fg Co., Cincinnati, Ohio.
- The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, \$4.00 a year. Advertisements 17c. a line.
- A New Waltham Watch, made especially for Railroad Men and Engineers, is fully described in Howard & Co.'s Price List of Waltham Watches. Every one interested should send for a copy, which will be mailed to any address free. Address Howard & Co., 785 Broadway, N. Y.
- Building Felt (no tar) for inside & out. C. J. Fay, Camden, N. J. See advertisement of New Work on "Soluble Glass," published by L. & J. W. Feuchtwanger, 55 Cedar st., N. Y. Price \$3.20, mailed free.
- Pumping Water without Labor or Cost, for railroads, hotels, houses, cheese factories, stock fields, drainage, and irrigation by our self-regulating windmill. Strong and well tested. Con. Windmill Co., No. 5 College Place, New York.
- Steam Gages, thoroughly made, no rubber or other packing. Address E. H. Ashcroft, Boston, Mass.
- Self-testing Steam Gages. E. H. Ashcroft, Boston, Mass.
- Screw Wrenches.—The Best Monkey Wrenches are made by Collins & Co. All Hardware dealers have them. Ask for Collins Wrench.
- Profitable Canvassing.—"Universal Sharpener" for Table Cutlery and Scissors. A correctly beveled edge can be obtained. See Adv't.
- Blind Stile Mortising and Boring Machine, for Car or House Blinds, fixed or rolling slats. Martin Buck, Agent, Lebanon, N. H.
- Builders—See A. J. Bicknell's advertisement on outside page.
- The best selected assortment of Patent Rights in the United States for sale by E. L. Roberts & Co., 15 Wall st., New York. See advertisement headed Patentees. Sales made on Commission.
- Best Boilertube cleaner—A. H. & M. Morse, Franklin, Mass.
- For Sale or to Lease—A never-failing water-power at Ellenville, N. Y., 1/2 mile from depot of the Ellenville Branch N. Y. and O. Railroad R. R., and only 80 miles from New York city, by rail. For full particulars address Blackwell, Shults, Gross & Co., Kingston, N. Y.
- "Your \$50 Foot Lathes are worth \$75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.
- The Best Hand Shears and Punches for metal work, as well as the latest improved lathes, and other machinists tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office, 98 Liberty st., New York.
- One 60-Horse Locomotive Boiler, used 5 mos., \$1,200. Machinery from two 500-ton propellers, and two Martin boilers very low. Wm. B. Andrews & Bro., 414 Water st., New York.
- For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.
- Keuffel & Esser 116 Fulton st., N. Y., the best place to get 1st-class Drawing Materials, Swiss instruments, and rubber Triangles and Curves.
- For tinners' tools, presses, etc., apply to Mays & Bliss, Plymouth st., near Adams st., Brooklyn, N. Y.
- Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Frearicks, 367 Broadway, New York.
- Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.
- For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.
- It saves its Cost every sixty days—Mitchell's Combination Cooking Stove. Send for circular. E. B. Mitchell, Chicago, Ill.
- Incrustations prevented by Winans' Boiler Powder (11 Wall st., New York.) 15 years in use. Beware of frauds.
- To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms \$4.00 a year.