(10205) H. B. asks: Would you please tell me if the ½-inch Ruhmkorff coil used with the set of wireless telegraph mentioned in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 1363, page 21849, of February 15, 1902, could be made to work the receiving apparatus explained in the same issue to a distance of 1-3 of a mile over land? If not, how large a coil will it require? A. We suppose the ½-inch coil *could* be made to work a wireless receiver at a distance of 1-3 mile over land, else Mr. Hopkins would not have said it could; but we should use a 2-inch coil, or larger, if we were going to put in a set of instruments to have them available under all conditions, or a coil giving even a larger spark than that. A large coil will give a fat, short spark. Any coil near its limit of spark length must give only a thin, blue spark.

(10206) G. B. asks: We have tried different ways in cutting round glass rods of ½ inch to ⅞ inch without good results. Will you kindly advise best way of doing same? A. A glass rod is usually broken by making a cut on one side with a file or diamond and giving a quick bend at the point opposite to the cut. An improvement upon this method, although requiring more work, would be to make a cut entirely around the rod, and apply heat at the place where the cut is made. A red-hot piece of iron ⅜ inch in diameter will be the best for applying the heat to the rod. This may be fitted into a handle and used as a soldering tool is used in the hand.

(10207) W. J. T. writes: I learn through a manufacturer of great numbers of automobile Ruhmkorff coils that by placing the inside terminal of the secondary winding nearest the vibrator a somewhat longer spark may be obtained than when the outside terminal is placed nearest to it. Judging from some coils which I have personally examined (and made by other manufacturers), small Ruhmkorff coils are in general constructed like those of the above manufacturer. Has any reason ever been given as to why the placing of the inner terminal of the secondary nearest the vibrator increases the spark length of the coil? I have found by personal experiments on several small coils that a much longer spark may be picked from the outside than from the inside terminal of the secondary when the knuckle or a conductor is presented thereto. Can you enlighten me on this phenomenon? A. We should consider that more careful experiments would be required than you describe before a generalization could be made that a longer spark can be obtained from one end of a coil of wire than from the other end. It may be so, but data as to voltage, amperes, and mode of producing the spark should be taken. We have no theory to advance, nor do we question in any way the facts as stated.

(10208) J. P. A. asks: Comparing the chemical equivalents (atomic weights) given in Century Dictionary with those stated in text books on this subject, I find considerable difference in the figures. In some cases, the amounts are one-half for those of text books as against the amounts of Century Dictionary, while in other cases the differences of amounts are without definite proportion. If the determination of equivalents of elementary bodies has passed beyond the presumptive state, will you kindly advise me where the truth of this matter may be found? A. We should no more think of going to the Century Dictionary for the chemical equivalents, or atomic weights of elements, than we should think of going to an almanac seventeen years old. The Century Dictionary is most valuable in its field; but surely its field is not to give data which have been made far more correct since its publication seventeen years ago. The American Chemical Society has a committee upon atomic weights, and its figures reported from time to time are received as authority. Probably the most weighty name in connection with this work is that of Prof. F. W. Clarke, the chief chemist for many years of the United States Geological Survey. The determination of atomic weights has passed beyond the "presumptive stage," and the results may be found in any recent chemistry, such as Remsen's "College Chemistry."

(10209) J. E. A. asks: The article describing the dry generation of acetylene in SUPPLEMENT No. 1607. I would like a little information if you can give it to me. The article in question says: "Mix carbide with soda." I have been trying to generate acetylene as described, but with indifferent success. If you can tell me what kind of soda was used, you will oblige me very much. A. It is probable that carbonate of soda is intended in the article upon the dry generation of acetylene, although there would seem to be no objection to using sulphate of soda for the purpose other than that carbonate is cheaper than the sulphate of soda. The smaller sizes of carbide should be used and the sodium carbonate should be crushed so as to render contact between the two more easy. The carbonate of soda has ten parts of water of crystallization, so that in 286 pounds of carbonate of soda crystals there are 180 pounds of water. This water it is which produces the acetylene just as in the ordinary methods of generating acetylene and when the action is over the carbonate of soda is present in the receiver deprived of its water. There will be dry calcium oxide and dry carbonate of soda. From a chemical point of view there seems to be no advantage in using the soda instead of water, since soda costs much more than water. Nor is it apparent that the acetylene generated in this way would be different from that generated by water.

(10210) D. C. D. asks: In order to settle a friendly dispute, will you answer in "Notes and Queries" the following question: Does the moon revolve on its axis? A. The moon rotates on its axis once while it revolves around the earth once. For this reason it presents always the same face to the earth. The face of the moon shows always the same physical markings. If it is not apparent to any one that the moon must rotate upon its axis in order to keep the same face toward the earth, let him take anything round, for example an apple or a ball, and make a plain mark on one side of it. Place a lamp in the middle of a room and hold the ball representing the moon with the mark toward the lamp. Notice which wall of the room the marked side of the ball faces. Now walk a quarter of the way around the lamp, having the lamp on the left hand as you go, and keeping the mark on the ball directed toward the lamp. To do this you will find that you must turn the ball around one-quarter of a turn toward the left, or in the opposite direction to that of the motion of the hands of a clock. Continue this till you have gone quite around the lamp. You will have turned the ball through an entire rotation on its axis, thus imitating the actual rotation of the moon on its axis as it revolves around the earth. You will find this matter fully explained in Todd's "New Astronomy," page 242. We can send you this book for $1.50.

(10211) M. H. asks: A friend of mine makes carbonic acid gas for his aerated waters from bicarbonate of soda and sulphuric acid and the residue left in the gas generator is thrown away daily. I should feel obliged if you would kindly inform me to what profitable use this residue can be put. A. The reaction of sulphuric acid and bicarbonate of soda gives carbon dioxide (carbonic acid) and sulphate of soda, when the ingredients are in proper quantities. The sulphate of soda has little value. We should not advise the use of bicarbonate of soda for this purpose. It is too expensive. Pieces of marble and hydrochloric acid, or sulphuric acid ether, will give the carbon dioxide just as well. The marble chips will cost little or nothing. If sulphuric acid is used calcium sulphate is formed, which is not soluble in water and settles to the bottom. If hydrochloric acid is used calcium chloride is formed, which is soluble in water and leaves little or no sediment.

(10212) H. E. says: Will you please inform me if ice formed from sea water becomes pure or nearly so, how about the ice in the Arctic Ocean? It is all salt. A thin layer of snow on the top of the ice becomes salt. If we want snow to melt to relieve our thirst we must take it off the top of a drift a little above the surface of the ice. A. In saying that ice from sea water is fresh, it is not intended to say that no salt will be on the outside of such ice. Ice frozen from sea water is also very likely to have salt in the mass of the ice in very cold regions where the ice forms rapidly. We quote from Whetham's "Recent Developments of Science," page 80: "If we cool a solution of common salt the ice which freezes out is the solid form of pure water. If the ice be frozen rapidly, some trace of salt may be deposited also; but experiment has shown that it does not enter into the composition of the crystals, and is entangled merely mechanically in their interstices." If a dilute solution of a colored material such as potassium permanganate be taken, and partly frozen, the ice will be clear, and the remaining liquid will be more strongly colored. We are sure every farmer knows that if a barrel of cider freezes the ice forms on the outside of the barrel and is water ice, but the liquid left in the middle of the barrel is very much stronger than the cider was at first. Of course ice in sea water gets salt on its surface very quickly, and so does snow over sea ice.

(10213) A. M. asks: Please let me know what I would need to cause the sound of a clock to be transmitted a distance of, say, 150 feet by electricity. A. A simple device would consist of a telephone transmitter in front of the clock and a receiver at the point at which you would hear the ticking.

(10214) B. F. V. writes: Will it affect the quantity of gas consumed in a building whether the gas is turned on full at the meter and partly turned off at the burners, or partly turned off at the meter and fully turned on at the burners? Assuming the same number of jets burning and the same illuminating power in both cases. A. There is a very slight difference in the volume of gas due to the pressure at the meter and the proper pressure at the burner jet, which indicates a saving of gas by the meter measurement at the higher pressure or by regulating the pressure at the burners instead of at the meter.

(10215) J. W. D. asks: 1. How long does it take to decompose one pound acidified water with a current of 100 volts? A. The time required to decompose a pound of water depends upon the amount of electricity used. If 13½ amperes are used at 100 volts it will require one hour. From this the time for any other current can be found, or the current for any other time. Water is decomposed with any voltage greater than 1.47 volts. You will see then that 100 volts is very much higher than is necessary. 2. How much does it cost to run a dynamo of 1,000 volts annually, including all expenses? A. That depends upon how many amperes the dynamo is to furnish. A dynamo giving 1,000 volts might be lighting a small village, or it might be lighting a large section of your city. The cost would not be the same in both cases.

(10216) G. G. S. asks: Please inform me as to the amount of current used by (1) ½-inch solid carbons, (2) ½-inch soft core carbons, (3) ⅝-inch solid carbons, (4) ⅝-inch soft core carbons, when used in a stereopticon on 110-volt alternating current circuit. A. Stereopticons are usually run with ½-inch carbons. We have never used one with a larger carbon. The ½-inch carbon will carry as high as 25 amperes, but 10 to 15 amperes is the usual current for such a lamp. A ⅝-inch carbon would carry 25-16ths as much current as a ½-inch carbon. The current would be proportional to the area of cross section of the carbon.

(10217) J. V. J. asks: 1. Why are open circuit telegraphs not used as often as closed circuits? A. The calling apparatus requires a closed circuit. 2. Can the duplex be worked on them? A. We do not know as to the possibility. Many things are possible which are not practicable. 3. Does an arc lamp when placed under water decompose? A. No. It heats the water. 4. Can a person get a shock from one carbon-zinc cell? A. Not from the battery alone. 5. Can an electric motor be driven both ways to advantage? A. Yes. Street car motors are reversed very often.

(10218) W. writes: A boiler which has a 2-inch feed pipe and 2-inch check valve reduced to 1½-inch discharge, the size the pump calls for. A 2-inch pipe extends from boiler 4 feet to check valve, and also 2-inch pipe continues from check about 4 feet, when it is reduced to 1½ inches. A claims that there is one-quarter greater resistance on the pump than should be or would be if there was 1½ inch check valve. B claims it has nothing to do with it, but that if even the check valve was larger it would not affect the pump. Who is right? A. B is correct. The larger size of the check valve makes no more work for the pump. If anything, it favors the work of the pump, causing less friction and resistance.

(10219) M. C. A. asks: Will you please inform me what size and how many feet of wire it will take to make an electric heater, 104 volts, say 5 to 7 amperes capacity? A. Seven amperes at 104 volts require 15 ohms of resistance. For a rise of 190 degrees F. the resistance rises 40 per cent. Hence about 5-7 as much wire will be needed if you wish to raise the temperature about to that of boiling water. No. 14 iron wire may be used. This has about 65 feet to an ohm. These are approximate numbers, and you can adjust the quantity to the temperature you wish to maintain.

(10220) J. M. C. asks: 1. Are there transformers made for direct currents? A. Yes. They are called rotary transformers, or converters. 2. Are 500-volt arc lamps made and operated successfully? A. No open arc light uses over 50 volts. It cannot. Inclosed arc lights use about 80 volts. Upon circuits of higher voltage as many arc lamps are put in series as will use up the voltage. On 500 volts ten arc lamps will burn in series. 3. Is there a chemical preparation or the like by which I may be able to clean fiber of oil? A. We do not know anything better than potash. 4. By cutting off a trolley pole, say, two feet, does it increase or decrease the pressure against the trolley wire? A. It will bear harder against the wire the shorter it is. 5. Has copper ever been hardened to any great extent? A. Not in modern times. It is considered one of the "lost arts" to temper copper. 6. Do you consider the best of lightning arresters a success? A. They are considered indispensable. We do not advertise any goods in this column. 7. If there is such, what do you consider a perfect, at all times waterproof insulation? A. India rubber. 8. Has electricity, as yet, been taken from the earth? A. No more than has been put into the earth. No one has drawn it from the earth for doing work.

NEW BOOKS, ETC.

MARS AND ITS MYSTERY. By Edward S. Morse. Illustrated. Boston: Little, Brown & Co., 1906. 12mo.; pp. 192.

Although Mr. Morse's book hardly rises above the dignity of a compilation, and although it is manifestly based on Mr. Percival Lowell's deservedly well-known and popular work on Mars, it has the value of presenting in a clear and readily understood style the salient arguments for considering Mars an inhabited world—arguments which, to anyone who is at all familiar with Mr. Lowell's splendid studies at his Flagstaff Observatory, must seem irrefutable. The single original chapter of the book, that entitled "My Own Work," will probably be of most interest to the man who is used to handling a telescope. The observations there recorded were made largely without the assistance of any of the Flagstaff astronomers and serve to bring out most tellingly the extreme difficulty of seeing the much-discussed "canals" and "oases" without natural aptitude, long training, and favorable atmospheric conditions. Mr. Morse has drawn upon his knowledge of animal and plant life for many a happy and illuminating comparison. His work is valuable primarily because he has viewed Mars with a naturalist's eye, and endeavored to interpret its enigmatic phenomena accordingly, although his interpretations are decidedly colored by Mr. Lowell's own opinions. For a good, straightforward, and accurate account of what we know about Mars, the book is to be commended.

THE DIFFERENTIAL ARCH DAM "D. A. D." An Elementary Treatise on Masonry Dams for the Use of Parties Interested in Water Power Development, including a General History of the Subject. By George E. Ladshaw. Spartansburg: Carolina Spartan, 1906. 8vo.; pp. 77.

EXPERIMENTAL-UNTERSUCHUNG ÜBER DIE MÖGLICHKEIT EINER DOPPELTELEPHONIE MITTELS UNTERBROCHENER KLÄNGE. By J. W. Giltay. Amsterdam: Johannes Muller, 1906.

CARBON BRUSHES. By J. S. Speer. St. Mary's, Pa.: Speer Carbon Company, 1906. 16mo.; pp. 30.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending November 6, 1906,

AND EACH BEARING THAT DATE

[See note at end of list about copies of these patents.]

Agricultural fork, J. Viall 834,951
Air-compressor, automatic, J. Rogers 835,291
Air strainer, F. Robinson 834,937
Amalgamator, D. McKelvey 835,457
Amalgamator, placer, W. H. Morgan 835,195
Amusement device, O. Henrichsen 835,424
Anchor, F. B. Langston 835,223
Apparel, wearing, W. J. Clayton 834,889
Auger bit, A. N. Webb 835,125
Automatic lighting burner, H. Lyon 835,138
Automatic lock, F. K. Heupel 835,426
Automobile motors, protective device for, A. Churchward 835,401
Bale band tie, E. L. Pence 835,465
Bailing press, W. A. Bright 835,054
Ball player's pad, base, E. Flick 835,219
Basket-making machine, H. Horton 835,135
Battery plate, secondary, J. H. Robertson 835,229
Bearing, shaft, R. H. Rice 835,324
Bearing, step, H. J. Flood 834,897
Bearings, apparatus for preparing rings for ball, S. Schneider 835,328
Bearings, end thrust resisting means for, J. A. Perkins 834,933
Bed bottom, spring, E. W. Burbridge 835,394
Bed, camp, F. D. Rannelee 835,469
Bed, couch, Sprague & Robbins 835,263
Bell, electric, H. W. Eden 835,183
Bell, electric, C. M. Procter 835,199
Bending tool, J. A. Staples 834,941
Billiard and pool table, T. H. Callahan 835,177
Binder, C. D. Rubel 835,257
Binder, loose leaf, W. M. Wheildon 835,340
Binder, temporary, J. Walker 835,171
Bit. See Auger bit.
Block signal system, alternating current, M. R. Hanna 835,419
Blotter, F. Raupach 835,323
Boiler furnace, J. R. Fortune 835,106
Bolster, body, W. D. Lowry 835,225
Bolt-trimming machine, R. J. Redd 835,255
Book, sales, A. F. Staples 835,041
Bootjack, H. Weber 835,147
Bottle, A. B. Adair 834,960
Bottle, P. T. Tkatzschenko 835,266
Bottle filler, siphon, W. J. Stapleton 835,001
Bottle, non-refillable, L. A. Robertson 835,081
Bottle, non-refillable, Rowe & Coy 835,115
Bottle, non-refillable, J. E. Lesueur 835,446
Bottle stopper, W. F. Purcell 835,360
Brace bar, extension, J. W. Kominek 835,359
Brake shoe, A. G. Olberding 835,463
Brick clamp, P. Stewart 835,376
Brick machine, D. P. Sanders 835,201
Bridle bit, F. J. Beard 835,092
Brush and holder, combined tooth, R. W. Morgan 835,365
Building block machine, M. L. & J. Dahn 835,405
Building block mold, J. Wengs 834,954
Building block molding machine, O. H. Olsen 835,140
Building tube, E. E. Van Wie 834,950
Butter separator, centrifugal, A. Fay 835,352
Butter treating apparatus, A. Fay 835,488
Cake trimmer, J. B. Winfree, Jr 835,341
Calipers, proportional, J. Prario 835,466
Camera, photographic, L. Borsum 835,127
Can closure, H. F. Maranville, reissue 12,551
Canceling and postmarking machine, stamp, F. Bjurstrom 835,094
Canopy for horses, G. H. Tayler 835,378
Capstan and horse power, Le Valley & Bird 835,073
Car, S. Otis 834,931
Car, E. W. Summers 835,167
Car bolster, F. Jerdone, Jr 835,436
Car brake, T. F. H. Zealand 835,270
Car brake, L. Allenbrand 835,295
Car draft rigging, railway, J. F. O'Connor 835,249
Car, dump, H. A. Reader 834,934
Car end sill, S. Otis, reissue 12,552
Car fender, Jeneskee & Melcher 835,435
Car, freight, W. I. Brock 835,392
Car, railway, W. T. Van Dorn 835,170
Car, railway, C. M. Funk 835,413
Car safety fender, street, G. D. Potter 834,996
Car standard, gondola, G. W. Du Bes 835,302
Car vestibule, railway, W. F. Richards 835,114
Car wheel, self oiling, H. Eggers 835,016
Carbon tetrachlorid, manufacture of, J. M. Matthews 835,307
Carriages, sled runner for baby, L. D. O'Rourke 835,287
Carrier, Fink & Carlson 834,896
Carton and display device, F. C. Ely 835,155
Cash register, T. H. Blair 835,348
Casting machine, line, F. C. L. D'Aix 834,971
Ceiling constructing apparatus, G. H. Sherwood 834,940
Chairs, drawer attachment for, H. H. Mallory 834,988
Check and tag, combined, J. P. Angell 835,385
Cheese cutter, J. H. Osborne 835,315
Cheese cutter, computing, J. H. Osborne 835,316
Churn, J. Wilson 835,126
Churn operating mechanism, M. Todd 835,335
Circuit breaking device, C. R. Bowler 835,411
Circuit closer, thermostatic, C. L. Walker 834,952
Circuit protective device, D. C. Jackson 835,025
Clamp. See Brick clamp.
Clamp, J. H. Winters 835,090
Clock, electric, A. F. Poole 834,995
Clod crusher and pulverizer, E. H. Smith 835,371
Clothes pin, Luster & Stewart 835,360
Clutch, friction, A. W. Robinson 834,936
Clutch, friction, H. R. Stacks 835,373
Coal dump, Ball & Higginbotham 835,386
Coal tar burner, T. Coughlan 835,403
Coal tipple, J. S. Pates, reissue 12,553
Coal washer and ore concentrator, A. C. Campbell 835,397
Coat rack, J. L. Gragg 835,417