of the carbon in the coal would be burned to carbon monoxide, and would, therefore, have but about 70 per cent of the heat value that this carbon had originally. The other 30 per cent of the heat of the carbon in the coal would either be lost by radiation or would go toward raising the temperature of the resulting producer gas. The object of blowing steam with the air through the bed of coals is to utilize this heat and make it available in combustion later. The steam on coming in contact with the incandescent coal is decomposed, abstracting heat from the fire and setting free hydrogen gas, which is available for combustion later, and is present in the resulting gas in addition to all the other component gases that would otherwise be there.

(9195) W. B. M. asks: 1. What size wire is used to wind magnets on relays of 150 ohms resistance? A. Different sizes of wire are used by different makers in winding relays. With the ordinary spools you probably can wind 150 ohms by using No. 32 B. & S. wire. About 1-6 pound will be required. 2. How is the resistance reckoned or measured? A. The resistance of a wire is measured in various ways. The best way is by the use of a Wheatstone's bridge. The details of the method are given in Thompson's "Elementary Lessons." You can most easily obtain a resistance by the use of a table, such as is given in most catalogues of materials. 3. What is the difference between the B. & S. wire gage and the English wire gage? A. There is no rule for expressing the difference between the B. & S. and the English wire gages. The sizes have no common difference by which they can be reduced from one to the other. Number by number the English gage has larger wires. Thus 32 B. & S. is 0.00795 inch in diameter; 32 English, or Stubs, as it is called, is 0.009 inch in diameter.

(9196) C. C. R. asks: Please make out a list of uses for a small hand power dynamo of about 10 or 12 volts. When I close the circuit on my dynamo and turn it, it works hard. How can I remedy it? A. For the uses to which a small dynamo can be put see "Experimental Science" under Hand Power Dynamo. It will do anything which a battery of 10 cells will do. When the circuit of the machine is open, no current is flowing and the machine is doing no work. It therefore turns without difficulty. When the circuit is closed, it is doing work and requires work to turn it. You can remedy the difficulty by opening the circuit.

(9197) G. R. McD. asks: 1. Please inform me whether the voltmeter described in SUPPLEMENT 1215 when calibrated will have equal divisions throughout scale? A. The voltmeter will not probably have equal divisions throughout the entire scale under any arrangement. The difference will be slight, however. 2. Will the substitution of a metal spool for the cardboard spool make the instrument dead-beat? A. If a cylinder of iron is inserted into the coil as in the D'Arsonval instrument, it will become practically dead-beat.

(9198) C. W. D. says: 1. Is a storage battery suitable for electric lighting in a house where only a few lights would be used at a time? The object being to have a light at a moment's notice and at times when it would be inconvenient to run a dynamo. A. A storage battery is the most convenient way to obtain a few electric lights at a time when the generator is not running. 2. Could a satisfactory battery be built by an amateur or would it best be bought? A. It is not to be advised that any one should attempt to make a commercial storage battery for himself. The work requires machinery and experience not usually found in the shop of an amateur. The best forms are covered by patents. 3. About what per cent would be lost by a storage battery of energy? A. The per cent of loss varies. A large battery loses less than a small one. Perhaps you might realize 90 per cent of the charging energy. 4. Would the eight-light dynamo described in SUPPLEMENT No. 600 be suitable for charging such a battery? A. The eight-light dynamo will charge storage batteries. 5. Are all the high-speed gasoline motors satisfactory, and are they very durable with good care? A. Gasoline engines are reliable with good care. 6. Are storage batteries expensive to run after they are installed? A. Storage batteries increase the cost of lighting, since they deteriorate with use as everything else does. It is cheaper to light without transforming the current than to pass it through a storage battery.

(9199) F. S. says: 1. Can any storm originating in the West Indies be properly called a cyclone and improperly a hurricane? 2. What is the difference between a cyclone and a hurricane? 3. I understand the theory of storms is that all wind in motion takes a rotary action opposite to the movement of the hands of a watch. If this is true, are not all storms large or small cyclones? 4. In reading several authorities on the subject of storms, I concluded that a cyclone is more of a theory covering the movement of all storms rather than a distinctive feature of any particular storm. Is this correct? 5. Have the typhoon or simoon any phenomena different from the hurricane other than the locality in which they exist? A. We referred your questions to the Department of Agriculture, at Washington, D. C. The following is a copy of their reply:

"Referring to your inquiry regarding the definition of the terms 'cyclone,' 'hurricane,' etc., I beg to say that all storms in which the wind has a circulatory movement about a central area of low barometric pressure, may properly be termed cyclones. Tropical storms are known in the West Indies as hurricanes; in the Philippine Islands and on the southeastern coast of Asia, as typhoons; and in the Indian Ocean and Bay of Bengal, as cyclones. The general storms of the middle latitudes are usually referred to as simply storms, or areas of low barometric pressure. The 'simoon' is a desert wind, and is caused by the excessive heat of those regions. A tornado, or thunderstorm, is a secondary development that occurs within the areas of the general storms. In the northern hemisphere, the rotary motion of winds in storms is in a direction opposite to the movement of the hands of a watch, while in the southern hemisphere, the rotary movement is the same as that of the hands of a watch. This is true in the case of all storms, whether large or small.—H. E. Williams, Acting Chief U. S. Weather Bureau."

(9200) C. M. S. says: The article in your paper of recent date showing Lottie Brandon "looping the loop" has revived a discussion which we had a few months ago when she appeared in this city, and if it is not too "personal," I would be pleased to have it settled through your "queries" department. Professors and educated men claim that she can really obtain momentum as shown, while I say that the only momentum to start with is in the run of the wheels, and no matter how fast she pedals, her own weight and that of the bicycle frame have no momentum whatever to carry her around the loop, and it is doubtful to me whether she would be carried more than 4 or 5 feet on a level floor. She also makes two revolutions while men riding down the greatest incline can make but one. This again proves her "mechanical" loop. What are the laws governing the loop, and how could the diameter be determined, having given the velocity and weight of moving body, or *vice versa*? A. In reply to your inquiry regarding the principle governing the "loop," illustrated in the figure shown at the upper left-hand part of page 51 of our issue of July 18, we beg to offer you the following explanation: Before the rollers are lowered, allowing the wheels of the bicycle to come in contact with the loop, the *only* momentum is the momentum in the moving parts of the bicycle and the rider. The entire wheel, the chain or gears, the cranks and pedals, as well as the legs of the rider, have momentum, which is transformed into linear motion as soon as the wheels come in contact with the loop. The frame of the bicycle and the portions of the rider's body which do not move have no momentum as long as the machine stays on the rollers. The instant, however, that the bicycle and the rider commence to move around the loop, every part of the rider and the wheel has momentum proportional to its velocity. In compassing the first quarter of the loop, the rider, by vigorously pedaling, is able to very much add to the initial velocity which is given her by the rollers. During the upper part of the loop the pressure of the wheel against the track is so slight that it is doubtful if she is able to appreciably add to the store of energy which she and her wheel had at the quarter turn. It is the centrifugal force which holds the rider and her wheel against the track in opposition to the force of gravity. The centrifugal force is equal to $\frac{W v^2}{g r}$ where W is the weight of the moving body, g the acceleration due to gravity, v the velocity in feet per second, and r the radius in feet of the circle in which the center of gravity of the moving body turns. In order that the centrifugal force may be greater than the force of gravity, it is necessary that the velocity acquired divided by the radius r should be greater than 32.2. If the radius of the center of gravity of the rider and her wheel in this case is 8 feet, then the velocity at the top of the loop will have to be at least 16 feet per second. This corresponds to a velocity of about 11 miles per hour. In order that she may reach the top of the loop, however, and still have this velocity, it is necessary that she have a greater velocity at the quarter-turn point. Assuming that she is not able to do more than overcome the friction of the air and the friction of her machine, during the second quarter of the revolution, the necessary velocity at the first quarter point may be determined by the following rule:

$$v^2 = v_0^2 - 2g(h - h_0).$$

In this case $(h - h)$ equals 8 feet, the radius of the loop. The velocity v, therefore, equals 28 feet per second, which is equal to a velocity of approximately 19 miles an hour. If she has less velocity than this at the first quarter-turn, she will be unable to make an indefinite number of turns. The same would be true of a rider who acquired the initial velocity by riding down an incline. From the formula given above for the centrifugal force, you will see that the force tending to hold the wheel against the track is inversely proportional to the radius of the loop; hence you will see the advantage of having the loop small. The weight of the wheel and rider is absolutely immaterial, excepting so far as they influence the time that is needed to acquire the necessary initial velocity.

NEW BOOKS, ETC.

CHEMISTRY OF DYE-STUFFS. By Dr. Georg von Georgievics. Translated by Charles Salter. London: Scott, Greenwood & Co. New York: D. Van Nostrand Company. 1903. 8vo. Pp. 402. Price $4.50.

The aim in view was to provide a text book presenting to the student in as lucid and condensed a form as possible the extremely wide domain of the modern chemistry of dye-stuffs. In order to present to the student an accurate picture of the modern aspect of this branch of chemistry an endeavor has been made to clearly define the true importance attaching to the several dye-stuffs whether theoretically, practically, or historically. The practical application of the dyes is relegated to a companion volume.

TELEPHONY. Vols. I. and II. By Arthur Vaughan Abbott, C.E. In six volumes. New York. 1903. Vol. I., The location of Central Offices. Pp. 170. 33 illustrations. Vol. II., The Construction of Underground Conduits. Pp. 190, 62 illustrations. Price $1.50 each.

The telephone engineer is now an important factor in the electrical field. The rules for the location of "central" are very precise, and upon this may depend vast sums. The treatment of conduits is just as thorough. The draft of contract is admirable and certainly leaves little loophole for misunderstanding. This feature is worth many times the value of the book. We shall look with interest for the successive volumes.

CONTINUOUS CURRENT DYNAMOS AND MOTORS AND THEIR CONTROL. By W. R. Kelsey, B.S. London: The Technical Publishing Company. New York: D. Van Nostrand Company. 1903. 12mo. Pp. 440. Price $2.50.

Perhaps the features which differentiate this volume from similar works is the rather fuller treatment of electrical traction, so far as tramway-motors and their gear are concerned, and in the discussion of the flux-speed-torque. The work is illustrated by 225 engravings and diagrams. Its treatment is lucid and we can commend it to young electricians who have some knowledge of mathematics.

A SYSTEM OF PHONOSCRIPT AND PHONOTYPY. By Charles Morrell. 4th edition. Chicago: Phonic Institute. 16mo. Pp. 108. Price 25 cents.

LAVORI MARITTIMI ED IMPIANTI PORTUALI. Per Bastiani Flavio. Manuali Hoepli. Milan: Ulrico Hoepli. 1903. 18mo. Pp. 424. Price $1.50.

An admirable work dealing with all kinds of harbor work, docks, lighthouses, warehouses, dry docks, etc. There are now 800 of the remarkable *Manualt Hoepli.*

ELECTRICAL PRACTICE IN COLLIERIES. By Daniel Burns, M.I.M.E. London: Charles Griffin & Co. Philadelphia: J. B. Lippincott Company. 1903. 12mo. Pp. 224. 142 illustrations.

It is interesting to know that so much interest is being exhibited in the use of electricity in collieries, and in mines generally. Electricity lends itself readily to mine work, both for light and power. The book is an excellent one, even though we notice that it may serve as a guide to students who may be preparing for a certificate as mine managers.

RURAL SCHOOL AGRICULTURE. Exercises in Agriculture and Housekeeping for Rural Schools. By Willet M. Hays. St. Paul, Minn. n. d. 16mo. Pp. 199. Price 60 cents.

This book is worthy of wide circulation, and is badly needed. There are 237 exercises, all of a useful nature. The first exercise deals with the size of strawberry boxes, sharpening pocket knives, temperature of well water, pruning soft maples, and a host of other useful things follow. It interests even the casual reader.

THE ALTERNATING CURRENT TRANSFORMER. By F. G. Baum. New York: McGraw Publishing Company. 1903. 12mo. Pp. 195. Price $1.50.

A very important subject which has been somewhat neglected, except by the electrical press. It is hoped that the present work will be of use to engineers and the general student of electrical literature. Some knowledge of elementary alternating currents is presupposed.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Issued for the Week Ending

September 22, 1903,

AND EACH BEARING THAT DATE.

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

Adjustable holder, W. A. Dickinson	739,482
Air brake mechanism, J. Shourek	739,793
Air brake mechanism, T. J. Quirk, reissue	12,158
Air compressing apparatus, F. E. Bachman	739,472
Air compressor, L. M. Sartain	739,792
Album, toilet box, and writing desk, combined photograph, R. Aisenman	739,571
Animal leg brace, N. P. Allen	739,634
Automobile speed indicator, J. W. Sutton	739,740
Ax handle protector, J. C. Dalrymple	739,652
Axle box for vehicle wheels, T. Hill	739,415

(Continued on page 255)