But we shall stick to the old way for the present. We do not think this method of treating disease is described in any scientific work.

(10411) J. W. asks: If you have a book that tells how the distance from the earth to the sun is ascertained, let me know. Could you give me the formula in trigonometry for finding the side distance or hours of the sun dial? A. The distance of the earth from the sun was ascertained first by astronomers by observations upon the transit of Venus. The solar parallax will give the result if it can be found with sufficient accuracy. The best method for finding it is by measuring the velocity of light, which multiplied by 499 gives the distance of the earth from the sun. You will find most of these processes given in text-books of astronomy. We can send Moulton's for $1.50, and Young's "General Astronomy" for $3. The formula for a sun dial which employs a horizontal surface upon which to cast the shadow of a style, or plate, is tang. angle with north and south line equals tang. 15 deg. times sin. lat. for 1 P. M. and 11 A. M. tang. angle for 2 hrs. 10 A. M. and 2 P. M. equals tang. 30 deg. times sin. lat. and so forth till the angle for the longest day in summer at your place is reached.

(10412) S. B. M. asks: Will you kindly settle the following arguments? Practically the same principle is involved in all three, and of course the velocity of the cannon ball in the first is absurdly small, but that is granted for the sake of argument. I. A train is running eastward at a speed of 100 miles an hour. Mounted on the front of this train is a cannon. From the cannon is fired a projectile with a velocity of one hundred miles an hour westward: i.e., in a direction opposite to the motion of the train: A holds: 1. That the projectile will move over the top of the train with a velocity of 100 miles an hour. 2. That its velocity with regard to the ground is nil; i.e., through space it has no velocity. 3. That a rifle ball will reach the ground in just as short a length of time when fired at a high velocity as if it were dropped from the muzzle of the gun with no lateral velocity, granted of course that the ground is level and the bore of the gun is parallel to the ground. B holds: 1. That the projectile will move over the top of the train at the rate of 200 miles an hour. 2. That with regard to the ground it has a velocity of 100 miles an hour westward. 3. That this is not true. A. In your various propositions regarding relative motion, the one whom you designate as A is right and B is wrong. Such problems are applications of Newton's Three Laws of Motion, or rather of the first and second laws. These laws are to be found in all school textbooks of physics. The cannon mounted upon the train which is running 100 miles an hour is carried eastward by the train with a velocity of 100 miles an hour, and sends its projectile westward with a velocity of 100 miles an hour. It should be plain that a ball which moves east and at the same time west with the same velocity will be at rest with reference to the earth below it. The train moves away under it. The ball would drop vertically upon the roof of the train, or upon the earth below from the muzzle of the gun, if the train could run from under it before it had time to fall upon the roof. The rifle ball shot horizontally will fall toward the ground as really and with the same velocity as if it were dropped vertically. See Newton's Second Law. Gravitation produces its effect, whether it acts at the same time with other forces or acts alone. This is the reason why a ball which is projected upward returns to the earth again. All objects not supported fall toward the center of the earth in exactly the same manner, since gravity produces its effect upon all alike. It matters not how they are moving under the action of other forces. II. An elevator falls down a shaft at the rate of 50 feet per minute; a man drops after it at the rate of 60 feet per minute. A holds that the man will strike the elevator with the same force as if the elevator were stationary and he were dropping 10 feet per minute. B holds that he will strike it with less force. A. A man who strikes an elevator which is moving 10 feet per minute slower than he moves will strike it with a velocity of 10 feet per minute, and give a blow proportional to his weight and his velocity. III. The same thing as II. (a) A train is moving at the rate of 30 miles an hour; on the same track a train is following at 40 miles an hour; (b) they are moving at the same speeds on parallel tracks. A holds that (a) the second train will strike the first with the same velocity or force as though the first were standing still and the second struck it going at the rate of 10 miles an hour; (b) that the second train will pass the first at the rate of 10 miles an hour—will take as long to pass it as though it were standing still and the second going at 10 miles an hour. B holds (a) that the second train will strike with less force and (b) that it will take longer to pass the first train. A. The swifter train will pass the slower train as if it were standing still and the swifter had a velocity equal to 10 miles per hour, the difference of the two velocities. All these answers are based upon the supposition that the resistance of the air is excluded from the problem, as is usually done in such cases. This is not necessary, however, in these answers, since it is stated in the questions that a certain definite velocity is attained, the resistance of the air being one of the elements in attaining the velocity.

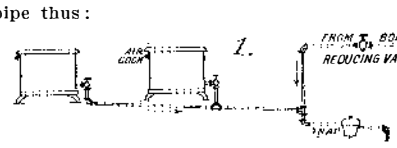
(10413) H. F. says: Concerning the earthquake reported, was the recent disturbance in Kingston predicted by reliable scientists, and can such disturbances be prognosticated to any degree of accuracy? A. Earthquakes have not been successfully predicted, nor does it seem probable that they ever can be predicted.

(10414) J. W. K. says: I hereby take the liberty of asking you to settle an argument. I claim pure distilled water is a nonconductor of electricity, B claims it is a good conductor. Which is the best insulator of the following—glass, pure water, oil, rubber, wood (dry), shellac, and in what order do they stand? What would the resistance of a column of pure water be if the column were 1-16 inch in diameter and 10 feet long, also the same column of silver? Please state the resistance in ohms. A. If the conductivity of annealed copper is taken as 100, the conductivity of annealed silver is 105, and of hard-drawn silver is 98.1. On the same scale the conductivity of pure water is less than one-millionth (0.000001) and that of glass less than one-billionth (0.000000001). Pure water is classed with insulators, but pure water does not exist in nature. The resistance of a silver wire, annealed, 0.001 inch in diameter and 1 foot long, at the freezing point of water, is 8.781 ohms; and that of the same wire hard drawn, under the same conditions, is 9.538 ohms. From these figures you can calculate the resistance of the wire you wish to use. The resistance of the column of pure water of same size and under the same conditions would be less than one-millionth as much. We leave the calculations to you. The order of the insulators about which you inquire as given by Foster in his "Pocket Book" is pure water, olive oil, paraffine oil, glass, gutta percha, shellac. We can send you the book for $5.

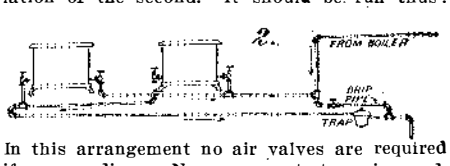
(10415) A. O. S. says: What is your idea, or the idea of scientific men of to-day, as to the condition of the ultra space as regards temperature? In other words, if a thermometer were placed far and away beyond the effects of gravitation and radiation of the entire stellar universe or ultra space, what would it register? Would it be what we call absolute zero, or in other words total absence of heat, and if so, why? A. It is the opinion of scientists that the temperature of space is absolute zero. The simple reason for this is that there is nothing there to intercept the waves of radiant energy and thus transform them into heat.

(10416) Several valued correspondents have written us, calling attention to the error of omission on the part of the types in an answer to Query 10342. Not all of the criticisms were kind, some were unjust, and some as erroneous at least as the original incomplete answer. In another note we have completed the answer as it should have appeared in the original issue, and have said all it seems necessary to say about it. We may now, however, point out the curious failure in argument by several in reasoning that whatever would be true of two balls of metal falling a short distance in air would also be true for any distance and for balls of any materials whatever. They argue even to the case of lead and hydrogen, in which of course a most absurd conclusion would result. Lead is not far from 9,000 times as heavy bulk for bulk as air, and aluminium is about 2,000 times as heavy as air. These in a fall of a moderate distance will fall equally fast. As we have before stated, the fall will not differ appreciably for distances up to 100 feet or more. We have not experimented on this matter, but take the statements of good authorities. Galileo experimented with 1-pound and 10-pound balls of lead and dropped them from the Leaning Tower of Pisa, height 179 feet, and found that they fell practically together. A lead ball weighs four times as much as an aluminium ball of same size. This difference is small as compared with the difference between these weights and that of the displaced air. For low velocities such as are acquired in a fall of 100 feet these two balls will be about equally able to overcome the resistance of the air, and will doubtless reach the ground very nearly together.

(10417) L. H. P. writes: Referring to the question asked by H. W. S., No. 10192, in your paper of November 10, 1906, page 351: Neither system of radiator connections will work at 80 pounds pressure. The diagram No. 1 would work at a reduced pressure, say 5 pounds, provided the pipe was of the proper size, and the trap connected with the down pipe thus:



Your diagram No. 2 will not work, as the return of the first radiator will stop the circulation of the second. It should be run thus:



In this arrangement no air valves are required if any ordinary Nason or pot trap is used. In both diagrams shown by you, the air valves are at the wrong end of the radiators. A. We thank you for calling our attention to another way of arranging the piping of the radiators. Both systems, as you describe them, would, we believe, work satisfactorily. Both systems shown in our sketches would work at 80 pounds pressure if the piping were of proper size and properly pitched. We understand, of course, that a much lower pressure, say 5 pounds, would be much preferable, but that was not the pressure which was specified in the letter we were answering. We therefore did not refer to it. The location of the air valve depends on the character of the radiator. On most of the common radiators the air valves are located as you indicate them.

(10418) J. G. T., Cincinnati, Ohio, is informed that if he sends his name his queries can be answered. See first notice in Query column each week.

(10419) M. W. P. writes: Our teacher has taken the position that a circle is a polygon. I would be pleased to have your opinion on the matter and also a demonstration in proof, for she will not receive any proof that I have been able to find. A. We are not able to tell from your letter whether you agree with your teacher that a circle is a polygon or not. If you do not agree with her we are sorry for you, since she is entirely right. Every mathematical student of any advancement knows that the circle is regarded by all mathematicians as a polygon of an infinite number of sides. The fact that a polygon may be inscribed in a circle and another may be circumscribed about the same circle which shall differ from the circle by less than any assignable quantity is proof of the point in question.

(10420) L. T. F. asks: As a reader of your paper for thirty-five years I would ask you to give the following information through your journal. This morning, about 5 A. M., we discovered smoke in our house. After investigating I found a bunch of rags on fire on a shelf. It was a glowing mass of fire about the size of a cocoanut, but no blaze. I found on further investigating that this rag had been saturated with furniture polish during the previous day, composed of linseed oil, turpentine, and varnish. I would like to know if it is possible for spontaneous combustion to take place on an open shelf in twelve hours' time? If so, there is a new danger for fire not thought of by the average housekeeper. A. A rag saturated with a mixture such as you describe is a very dangerous thing to leave lying around the house. The average housekeeper should not run such a risk of a fire. Many cases like this occur every year.

(10421) D. D. A. asks: 1. How can I make dry batteries? That is, what shall I fill them with? A. Dry cells are filled with a solution of ammonium chloride in water. Other materials are added to make a suitable paste. The carbons are packed with manganese dioxide and graphite. The process is given in our Supplements Nos. 1383 and 1387, price ten cents each, much more fully than can be given in a letter. 2. I have a small electric motor; the armature has three poles, the brushes are flat copper. Can I change it into a dynamo? Please give directions for doing so, if possible. A. Many small motors will not generate as dynamos, since they cannot build up a field of sufficient strength. You can find out about yours by trying it. Should you not succeed, you can then disconnect the field wires and use a battery in the field circuit to magnetize the field. It will then be separately excited, and will generate a current.

(10422) L. M. F. asks: I have a ground circuit telegraph line one-half mile long; two 20-ohm instruments on line. At one end have two 5 x 7 and one 6 x 8, at the other end one 5 x 7 and one 6 x 8 gravity batteries. Have glass insulators for line wire; do not know if line wire is steel or iron. Batteries will not work line, will work on short circuit. Have batteries connected, the positive pole to the negative pole of the other; also have them connected from one end of line to the other in like manner. I have worked line with an addition (to the present batteries) of twelve dry cells. I have a bell which one dry cell will ring, my gravity batteries will not. I have the copper covered with blue vitriol. The crowfeet are covered with a black substance. Batteries have been charged for two weeks. Are my batteries weak? Is my line the fault to a certain extent? How many gravity batteries will it take to run this line with 20-ohm instruments when line is in working order? A. Your trouble with the telegraph line may be due to one or more of several causes. The joints of the wires of the line may not be good. The ground connections may be bad. The battery may not be connected in series at the two ends, so that one part of the battery opposes the other part. The battery may not be powerful enough for a good line, and if there is any fault in the line the battery will of course not be powerful enough for a poor line. It is not possible for us to tell which of these causes is the source of your trouble. One dry cell may ring a bell when a far better gravity cell will not. The dry cell has 1.5 volts, and the gravity cell has only 1 volt at its best. But the gravity cell with its 1 volt will work right along for months on a telegraph line, while the dry cell will be run out in a short time. The black, or rather brown, dirt on the gravity zincs does not diminish to any extent the force of the cell. It is well enough to take the zincs out and scrape off once in a while. If you can find no other fault in your line, you would do well to put on more cells.

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