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References to former articles or answers should give date of paper and page or number of question.
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(8700) G. L. asks: I have an induction coil guaranteed to give a 1-inch spark. What amount of current will be required to make the 1-inch spark, and what number of 1900 dry cells or Bunsen's batteries will operate it? A. Two or three Bunsen, or twice as many dry cells will probably run the coil to its full efficiency. We should not advise the use of the Bunsen cells with nitric acid. The fumes in the house will corrode all metalwork. Better use chromic acid solution.

(8701) A. C. asks: A farmer in plowing around a square field, having plowed a strip ten rods wide, finds that he has one-fourth of his field plowed. How many acres in the field? A. The problem you send is not an arithmetical problem, but requires for its solution an equation of the second degree in algebra. The solution is as follows:

Let x = one side of the field, then will
$x - 20$ = the side of the square piece left after the strip is plowed around the outside.
x^2 = the area of the field, and
$x^2 - 40x + 400$ = the area of the square piece.

This area is three-quarters of the area of the entire field. Therefore,

$$\tfrac{3}{4}x^2 = x^2 - 40x + 400.$$

Solving this equation, we obtain for the side of the field, 149.2 rods; and for the area of the field, 139.3 acres.

(8702) J. H. B. writes: I notice in your columns of August 2 the statement that "an *aluminium* ball and a *lead* ball of the same size would fall, *in still air*, at the same speed." This appears to me to be an erroneous conclusion, from a faulty argument. According to the well-known physical law, the force between two bodies varies directly as the product of their masses. Then, the mass of the earth being *constant*, it follows that the force it exerts upon any (falling) body is directly proportional to the mass of that body. Suppose, then, that the masses of the aluminium and lead balls are m and m', respectively. The forces with which they are attracted downward are, then, *not equal* but *proportional* to m and m', so that, since m' is, by hypothesis, the *greater*, the *force* acting on the lead ball is the *greater*. But, the two balls being of the same *size*, they meet with the *same* resistance from the air. Therefore, since *unequal* forces are applied to *equal* resistances, it necessarily follows that the resulting velocities cannot be equal, but that the ball on which the greater force acts, i. e., the *lead* ball, will fall faster.

C. E. D. also writes: In a recent issue G. M. T asks (query 8650) concerning the falling of two spheres of same size but different weight, and you reply that they will fall in a vacuum with the same velocity, likewise the same in air. The latter part of the answer is manifestly incorrect, for it would indicate that falling bodies are not resisted by the air. The weight of the body is the power to overcome the resistance; and since the resistance is the same, since both are of the same size, the heavier body will fall faster. Any other conclusion would be assuming that different power will not produce added speed. A. We fear our answer to the query was not sufficiently explicit. Two bodies of the same size but of different weights will fall with different velocities in the air after they have fallen for a sufficient time. Aluminium is more than 2,000 times heavier than the air at normal pressure. At or near the beginning of its fall the air would resist an aluminium ball in the same degree as one pound would resist the motion of a ton. How slight that would be any one can see. It would be imperceptible under moderate velocities. How little the air resists heavy dense bodies can be seen by considering how swiftly a stone or bullet cuts the air. Lead is more than 8,700 times heavier than the air, and is in a higher degree able to overcome the resistance of the air. There is no question that the lead ball will acquire the greater velocity. The height from which the balls are dropped must be greater than is usually available for such experiments in order to make this difference appreciable. Our correspondent is quite right in his argument, and the result will be as he says if there is a sufficient distance for the fall. It will probably be necessary to drop the balls from a height of about 200 feet to make a perceptible difference in the time of fall.

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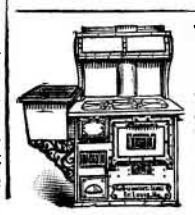

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