1. Cost of electricity for cooking as above,	7.3 cents
2. Cost of heating water, for purposes as given above, and the same amount, in boiler of fifty per cent efficiency, with coal at same price as mentioned above, allowing for loss through radiation for day of twelve hours,	1.2 cents
Total cost,	8.5 cents

It will thus be seen that there is practically no difference between electricity and the ordinary cooking stove, so far as cost is concerned, and it is almost needless to point out the advantages of the electric oven over the cooking stove.

In the first place, we have absolutely no dirt, the electrical oven being lined with porcelain enamel, which can be cleaned with the greatest ease. In the second, we have practically no heat outside the oven to heat the room in summer. Then we have absolute regulation of the temperature. If the oven is cold, and we require a temperature of, say, 100 degrees C. to cook something, the automatic regulator is set to 100, and in less than a minute the temperature has risen, and remains exactly at that temperature. Again, if it is desired to only cook for a certain time, say two hours, the cut-out is set for two hours, and at the end of that time the current is either stopped entirely, or is lowered so as to give any reduced temperature that may be desired.

In conclusion, we may say that the electric oven is bound to come, if only on the score of convenience and accuracy. If cheapness were the only consideration, we should still be burning tallow candles or gas, but people, and especially the American people, will always decide in favor of what is most convenient, so long as the difference in expense is not so great as to form a serious burden, and the above data will, it is thought, show that, used in a proper manner, the expense of electrical cooking need not be seriously taken into account.

It will be seen that of every 100 tons of coal used in a cooking stove, ninety-six tons are wasted. It is difficult of course, to get exact figures, but it is probable that the waste in the city of New York alone is not far from 1,000,000 tons per annum.

With the electric stove, though the cost does not greatly differ, yet by far the larger proportion of the expense is due to the labor, interest on plant, and canalization, so that (taking the efficiency of the boiler, engine and dynamo as ten per cent) the electrical oven, for the same amount of useful calories, uses only one-fourth as much coal as the cooking stove, and from a social-economical point of view, is much to be preferred, for the more we can live on the world's interest, which is labor, and the less we draw from the world's capital of fuel, the better. R. A. F.

MOUSE TRAPPING.

BY FRANK BOLLES, CHOCORUA, N. H.

Late in August the mice of our White Mountain woods, fields, and meadows, begin to show an increasing interest in corn, sweet apples, and other kinds of bait usually used in effecting their capture. In the early summer trapping them is slow work, but the chill of autumn seems to stir them to fresh activity in the gathering of food, and then pursuit of them becomes really interesting. This year I am taking them alive in order to learn more about their habits during the winter. Where, in previous years, I have set the deadly little "cyclone" traps, I am now setting the common woven-wire trap with a revolving wheel attached. For the ordinary white-footed, or deer mouse (*Sitomys americanus*), I have only to bait the trap with kernels of corn or a bit of sweet apple, and place it at sunset near my wood pile or under the lumber heap back of my barn, and the sound of the whirling wheel is soon heard. For the long-tailed, gray, white-footed mouse (*Sitomys americanus canadensis*), I go to pine stumps in the woods, or to the old logs on the shore of a pond far from houses, and feel confident of taking him wherever I have previously found traces of his presence.

It is also easy to capture the short-tailed, brown meadow mouse (*Arvicola pennsylvanicus*), who always seems to me as much like a diminutive bear as the white-footed mouse is like a tiny deer. His place of abode is readily detected, for he makes long runways in the grass leading to the holes in the ground through which he reaches his burrow. Sometimes I find him under a plank bridge which crosses a moist spot on the edge of the mowing land, but oftener I trap him in the long matted meadow grass where his paths lead here and there in search of food or water. As a rule I catch him in broad daylight when he is most active. *Evotmys rutilus* has a keen eye for protective colors. I find him most frequently in dark, damp woods, remote from houses, domiciled in hemlock stumps. His chestnut fur matches the color of a decaying stump so closely that he seems like an animated portion of the red wood. He does not, however, confine himself to the forest, for I have caught at least one of his family, close to my barn. Neither does he limit his range to low land, for I have secured specimens a thousand feet above his favorite swamps.

By far the most beautiful of the New England wild mice is the jumping mouse of the woods (*Zapus insignis*). For him I walk back a mile from my house through lonely pastures and birch woods to a mountain stream which comes splashing over a rocky bed in a dark ravine. It is not on the first, or even the second day, that he condescends, or dares, to enter the trap, although that dangerous engine is carefully covered and disguised with leaves, ferns and bits of growing moss, until it looks like a piece of the wild wood itself. At first he eats the kernels of corn or the pieces of apple which are placed farthest from the trap. Then, night by night, he comes nearer, until at last, having eaten all the corn and apple outside of danger limits, he ventures too far and is caught. Probably *Zapus hudsonius*, the common jumping mouse, is to be found in this vicinity, but thus far I have not secured him, although his cousin with the white-tipped tail might almost be called abundant. A seventh species, too well known in his customary resorts, is *Mus musculus*, the old world pest of the pantry.

Trapping mice in "cyclones" often results in supplying moles and shrews with food which they seem greatly to enjoy. In fact, *Sitomys* himself is only too willing to devour the tender portions of his own kindred. By using the wheel trap and taking my mice alive, I am not annoyed by the flesh-eaters.

SUBMARINE PHOTOGRAPHY.

BY JOHN HUMPHREY, LONDON, ENGLAND.

Several of the difficulties experienced in endeavors to ascertain the natural relations of objects existing at considerable depths under water have been overcome by M. Louis Boutan, in a remarkably ingenious manner, and the contrivances he adopted are described in a recent communication to the Paris Academy of Sciences.

He prefers to use a small camera in which several plates can be exposed consecutively, and encloses this in a rectangular, water-tight metal box, into the sides of which plates of glass are inserted to serve as windows. The camera can be so disposed that the lens may face all the windows in turn, if desired, and exposures are regu-

lated from outside the metal case. To avoid any ill effects that might be caused by differences in the internal and external pressure when the apparatus is sunk in deep water, a kind of balloon filled with air is connected with it. As the pressure increases, in descending, the balloon is compressed, extra air is thus forced into the box, and the pressure on its walls equalized. A stout foot to support the apparatus and weights to sink it complete it for practical purposes.

In water near the shore, not greatly exceeding one metre in depth, the apparatus can be conveniently fixed, without the operator needing to enter the water, and, by direct sunlight, good negatives can be obtained in ten minutes. When the water is deeper the operator must descend in diving costume to fix the case securely on its stand before commencing the actual work of photography. In calm, bright weather photographs can then be obtained by direct sunlight in from thirty to fifty minutes. Colored glasses, preferably blue, must be interposed between the objective and the water, in order to obtain sharp images.

By the use of artificial light to illuminate the surroundings, however, matters are still more simplified. To this end, M. Boutan has contrived a special magnesium lamp. A cask of two hundred litres capacity is filled with oxygen gas, and on its upper end is fixed a spirit lamp, which is covered by a bell glass. A vessel containing magnesium, in powder, is connected with this lamp in such a manner that the metal can be projected across the flame by the action of a rubber ball which serves as bellows. The oxygen gas, of course, is intended to assist combustion, and the lamp, having been lighted and covered by its protecting globe, the cask simply requires weighting to sink it.

Good instantaneous negatives have thus been obtained by M. Boutan during a violent storm, when no daylight could penetrate the depths. They are lacking, as regards background, but this he attributes to imperfections in the apparatus, particularly the objective. He also found it necessary to place before the lens a diaphragm of very small aperture to secure a sufficient degree of sharpness. If a formula were calculated for an objective, the front of which might be exposed to sea water, he thinks these drawbacks might be remedied.

As it is, he has proved that photographs can be taken in a brief time under water, in calm weather, by direct sunlight, at depths up to six or seven metres; whilst, by the use of his special lamp, they can be taken, instantaneously, at any depth that can be conveniently reached by a diver, and the state of the weather is of no importance.

THE SCIENTIFIC BASIS OF COMPOSITION.

BY DR. CHARLES H. J. DOUGLAS, BOYS' HIGH SCHOOL, BROOKLYN.

THE end of literary composition is effective communication. To this end there are necessary, first, something to communicate and, second, some means of communication. The only thing to be communicated is thought. The medium of communication is language. One cannot, then, expect to understand the philosophy of literary composition without investigating both the nature and the process of handling both thought and language.

Psychologists recognize three distinct kinds of thought, viz., the concept, the judgment and the argument. The concept, the simplest form of thought, may be defined as the act of mind by which we merely become aware of something. Objectively considered, the concept is indivisible and unrelated—a kind of intellectual atom. The simple judgment, a more complex form of thought than the concept, may be defined as the act of mind by which we apprehend an agreement or disagreement between two concepts. Objectively considered, the judgment is a complex unit, resolvable into its constituent parts—a kind of intellectual molecule.

The argument, the most complex form of thought, is commonly regarded as differing essentially from both the concept and the judgment. It is, however, in the last analysis, nothing else than a complex judgment. It may be defined as the act of mind by which we apprehend an agreement or a disagreement between two concepts, by apprehending an agreement or a disagreement between each of them and a third concept.

The relation of logic to composition is peculiar and quite likely to be misapprehended. The formation of judgments upon a subject must, of course, precede the communication of thought upon that subject. But the formation of judgments upon a subject is nothing else than the study of that subject; it is not composition. That process begins with the selection of judgments already formed; and it ends, so far as the handling of thought is concerned, with the arrangement of them according to a certain recognized principle.

At this point, then, the mind begins a new process. Ceasing, for the moment, to form judgments about the subject of the communication, it begins to form judgments about those judgments in order to the process of discourse. This may be defined as the selection and the arrangement of judgments with a view to the greatest mental effect in apprehending them.

Thus, while the formation of a set of judgments about the subject of the communication, and of another set of judgments about the first set, are both processes implied by the process of composition, neither of them is included in that process. Again, the mind, in the formation of judgments about its own judgments, in order to discourse, is subject to the laws of logic no less than it is in the formation of judgments about the subject of the communication. The relation of logic to composition is, therefore, seen to be both vital and complex.

But, while the mind in the formation of judgments about its own judgments, in order to discourse, is subject to the laws of logic, yet the principles according to which the selection and the arrangement of the judgments are made, are not principles of logic, but of dialectic. This may be defined as the science of effective thought, as logic is the science of correct thought.

So important are the selection and the arrangement of judgments in the effective handling of thought, that it has sometimes been said that what the judgment is to the concept, and what the argument is to the judgment, such is method to the argument; and that, consequently, a fourth division is necessary to complete the doctrine of logic. Both the premise and the conclusion of this statement are, however, untenable.

It is evident that method does not sustain the same relation to the argument that the argument does to the judgment and that the judgment does to the concept, first, because the argument does not sustain the same relation to the judgment that the judgment does to the concept; and, second, because method is of precisely as much importance in simple discourse, where there are no arguments at all, as it is in reasoning, where there is nothing except arguments.

The importance of method, instead of arising from some relation which it is supposed to sustain to the argument, depends entirely upon the principle of the economy of the recipient's attention. By selection, the waste of his energy in the formation of irrelevant or unimportant judgments is avoided. By arrangement, the greater susceptibility of his mind at certain points in the time-series of cognitions which he makes, and to certain sequences of judgments, is taken advantage of.