which they live. The *sarracenia*, the large plant on the left of the page, the *nepenthes*, in the center, and the *cephalotus*, which is immediately below it, have lids which shut down upon their victims. The *darlingtonia*, shown on the right, curls it leaf around them; the *pinguicula*, in the right hand bottom corner, shuts itself up and curls its leaves; the *dionœa* on the left, below the *sarracenia*, also shuts itself upon its prey, and the *drosera*, in the left hand bottom corner, has an arrangement of fine lines ending with little knobs, which it throws over its prey, and thus secures it.

"To Mr. Ellis," says Dr. Hooker, "belongs the credit of divining the purpose of the capture of insects by the *dionœa*. But Rev. Dr. Curtis made out the details of the mechanism, by ascertaining the seat of the sensitiveness in the leaves; and he also pointed cut that the secretion was not a lure exuded before the capture, but a true digestive fluid, poured out, like our own gastric juice, after the ingestion of food.

"For another generation the history of this wonderful plant stood still; but 1868 an American botanist, Mr. Canby, who is happily still engaged in botanical researches, while staying in the *dionœa* districts, studied the habits of the plant pretty carefully, especially the points which Dr. Curtis had made out. His first idea was that 'the leaf had the power of dissolving animal matter, which was then allowed to flow along the somewhat trough-like petiole to the root, thus furnishing the plant with highly nitrogenous food.' By feeding the leaves with small pieces of beef, he found, however, that these were completely dissolved and absorbed; the leaf opening again with a dry surface, and ready for another meal, though with an appetite somewhat jaded. He found that cheese disagreed horribly with the leaves, turning them black and finally killing them. Finally, he details the useless struggles of a curculio to escape, as thoroughly establishing the fact that the fluid already mentioned is actually se creted, and is not the result of the decomposition of the substance which the leaf has seized. This curculio, being of a resolute nature, attempted to eat his way out. 'When discovered he was still alive, and had made a small hole through the side of the leaf, but was evidently becoming very weak. On opening the leaf, the fluid was found in considerable quantity around him, and was without doubt gradually overcoming him. The leaf being again allowed to close upon him, he soon died.'"

The foregoing description and illustration appeared in a special edition of the SCIENTIFIC AMERICAN, issued in December, 1874, and will be read with interest by all students of natural history and lovers of the marvelous in Science.

Sir John Lubbock has recently turned his attention to botany with special reference to the same thing, and has recently published "British Wild Flowers Considered in Relation to Insects," which will undoubtedly throw a great deal of light upon it. Meanwhile in this country no pains have been spared by those competent to investigate; and within the last year or two one lady in particular, Mrs. Mary Treat, of Vineland, N. J., herself both a practical botanist and a charming writer, encouraged in her pursuits by Professor Gray, of Cambridge, Massachusetts, has made diligent search for plants possessing these characteristics, and has patiently watched them through months of experimenting, keeping a diary and giving the information thus gained to the public. Mrs. Treat's latest experience is with bladderwort, which she carefully observed, and found ample proof that the little sacks are traps for water insects which are unsuspectingly drawn in and then consumed. She found that not only small insects were caught, but "innumerable moths, and butterflies two inches across, are held captive until they die—the bright flowers and brilliant, glistening dew luring them on to sure death." Some of these plants she took to the house, "away from atmospheric agitation," and began her experiments, pinning living flies "within a quarter of an inch of the most vigorous leaves; in less than an hour the flies' legs are entangled in the glands. I now take the long-leaved sun dew, which is more common and a more wonderful flytrap than either of the other species, place a struggling fly on a vigorous, healthy leaf; in less than three hours the leaf is folded completely around its victim. I take a bit of raw beef, placing it as nearly as possible on the center of the leaf; in twelve hours it is so enfolded in the leaf as to be completely hidden from view." Mineral substances, bits of chalk, etc., were not at all affected. Next she tried the round-leaved sun dew, whose leaves clasped a piece of raw beef in less time.

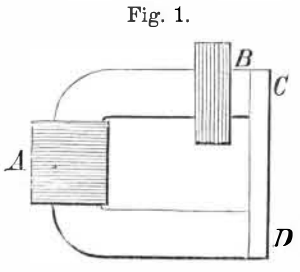
Killing Gophers.

The gopher is one of the most troublesome pests that the Western farmer has to contend with, and as difficult of extermination as any. Several inquiries have been made of us says *The Inter-Ocean*, as to the most effective means of disposing of them; and with a view of finding the most approved, we have consulted several farmers who have had extensive and painful experience with them. The plans for removal have been as various as the persons consulted, and have included poisoning, drowning, shooting, trapping, and other methods. But to our minds by far the best plan is that adopted and highly recommended by Dr. W. A. Pratt, of Elgin, Ill., and seems the most simple, least expensive, and most effective of any. He takes a light steel jaw trap, such as is used for catching rats, and crooks the catch (that passes over one of the jaws to the pan) a little, so as to allow the jaws to come nearer together then they do when set for ordinary purposes. He then sets the trap so that it will go off easily, and plants it bottom upwards over the gopher's hole, bringing the dirt a little around the edges so that the only apparent passage is through the jaws of the trap. The gopher, who generally comes out with some haste, rushes up, hits his head or paws against the pan of the trap, which unfastens it, and he is caught securely in the jaws. Dr. Pratt says that a few days of persistent trapping in this way will completely clean out every vestige of the gophers from a large farm

A NEW MAGNETO-ELECTRIC ENGINE.

In order to investigate the induced currents produced by the application of armatures to horseshoe magnets, Professor W. R. Morse recently constructed the simple apparatus represented in Fig. 1. This consisted of cylindrical horse shoe electromagnets, the wires of which were wound about iron cores at the bend of the iron, so as to form practically straight electromagnets with cores horseshoe in form. A is the coil of the electromagnet, and B the induction coil. Upon exciting the electromagnet, induction currents arose in the coil of fine wire, B, both at making and breaking the circuit. These currents were measured by a reflecting galvanometer placed in the circuit of the coil, B, and were compared with those obtained from the same electromagnet by placing a straight armature, C D, upon its poles, and then exciting the electromagnet.

Fig. 1.

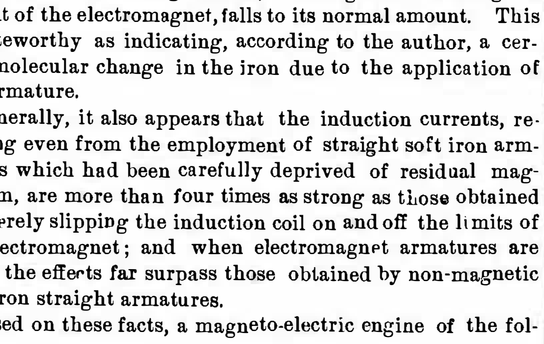


The results of experimenting show that a marked increase, amounting to nearly 25 per cent in the strength of the induction currents, is due to the application of the armature to the poles of the electromagnet. The first induced current after the removal of the armature, which results from again making the current in the electromagnet, shows the same increased effect, but the following current, resulting from breaking the circuit of the electromagnet, falls to its normal amount. This is noteworthy as indicating, according to the author, a certain molecular change in the iron due to the application of the armature.

Generally, it also appears that the induction currents, resulting even from the employment of straight soft iron armatures which had been carefully deprived of residual magnetism, are more than four times as strong as those obtained by merely slipping the induction coil on and off the limits of the electromagnet; and when electromagnet armatures are used, the effects far surpass those obtained by non-magnetic soft iron straight armatures.

Based on these facts, a magneto-electric engine of the following construction is suggested by Professor Trowbridge:

Fig. 2



The horseshoe armature is made to revolve around the line, X X, Fig. 2, as an axis. It has been found by experiment that, when a north and south pole are opposed, the induction currents through B and A' are in the same direction, and those through B' and A are also in one direction. By a suitable commutator, the currents circulating through the coils on the stationary magnet can be sent through those on the armature, and *vice versâ*. The residual magnetism in soft iron is sufficient to start the induced currents. Experiments, says the *American Journal of Science and Art*, are now being made upon the engine.

A Word to Young Mechanics.

"When Tubal Cain began to invent utensils and started to make a din in his forge, I suppose the first idea that struck him—for he must have been very observing in his youth—was that some materials are soft and easily manipulated, while others are of a more obdurate and ungovernable nature, and consequently require different treatment at the hand of him who would attempt to work them into new forms, so as to mold the shapeless mass to his uses, or engraft order and design upon chaos. With the lesson to be learned from the example of this pioneer of our order in view, I desire to say a word to young mechanics that would have been valuable to me while in the maze of study in the days in which I was learning a trade.

Every one that ever learned a trade knows that many a time he has been without any clear idea of what he was doing, having merely acted as the machine of a master who was credited with being a No. 1 mechanic and all which that should imply, but who just lacked one thing, and that a very important one—he did not understand how to tell another how to do what he could do exceedingly well himself, and, as a general rule, got into a passion because his 'cub' didn't do it just to his mind. Now I could drop a word of advice here to journeymen; but you know, boys, as well as I do, that it is not our place to tell a 'jour.' anything, for fear his dignity might suffer, and ours too in consequence. But my advice to you is simply this: In starting out to learn a trade, make up your mind to learn and study both at the same time. This combination of occupations, it unfortunately happens, is rarely agreeable at fifteen or seventeen years of age, when one has just left school, and all study is looked at as something belonging to bygone days. I have been told by many a young man that work was his portion now, and that he didn't have time to study, and besides he was so tired at night that it was out of the question. My reply to those who speak in this way is:

'But you misunderstand me, my young friend. The lessons you need to study now are not taught in schools, colleges, or seminaries. You never see the books you need to apply your mind to now in libraries.'

I lay a piece of wood before the carpenter and say, 'my boy, that is one of your books.' I present a piece of iron to the blacksmith in the same manner, and on through all the branches of mechanism. The carpenter answers:

'Why, this is only a piece of pine, or of oak, and nothing more.' The smith will say: 'A bit of iron, and that's all. But here comes the question, 'what do you know of the nature of the wood, or of the iron, and why should you know its nature? True, you may be able to work them after a fashion, and your powers of imitation may enable you to be as good a mechanic as the man who taught you; but you will never thus, in the nature of things, excel, and excellence is what every young man should have in view in any pursuit, for without it you will be termed just what you so often hear of—only a mechanic.'

Every mechanic should have as thorough a knowledge of the material he works as has the best chemist in the land; and this cannot be arrived at without close study and attention to its every natural feature—strength, power of resistance, and tension; in short, everything connected with its working or transformation from one condition to another. This knowledge is what is meant when you hear a man spoken of as an experienced mechanic."—*Paper Trade Journal.*

Correspondence.

The Fireless Locomotive.

To the Editor of the Scientific American:

The fireless method of using steam is one of those simple affairs which need but little experiment to develop its best results.

Locomotives of this kind with large tanks will probably prove more economical than those with small tanks. If a tank, 3 feet diameter and 10 feet long, is capable, with one charge, of propelling a car with from 25 to 40 passengers a distance of 8 or 10 miles, a tank of twice this capacity would probably do considerably more than twice the amount of work, owing to the greater body of concentrated power and heat in proportion to the weight and surface of tank. The weight of these tanks may be reduced to a minimum by making them with hemispherical ends.

A tank of this form, 4 feet in diameter and 15 feet long, capable of sustaining a pressure of 360 lbs. per square inch safely, would weigh only about one third as much as an ordinary locomotive boiler. A tank of this size once charged with cold air only, to a pressure of 350 lbs. would propel an ordinary horse car load of passengers about five miles, if I figure correctly; if charged with water and steam at the same pressure, it would probably propel the same load some twenty miles. Notwithstanding this difference in expansive power of the two mediums, condensed air might prove the more economical and satisfactory of the two, especially in localities where ample water power could be obtained for condensing the air into reservoirs for charging the locomotive tanks.

A foreign periodical recently contained an illustrated description of a car propelled by a series of coiled steel springs arranged upon a single shaft beneath the car; but nothing very satisfactory seemed to be developed by this device. At present there seems to be nothing so likely to supersede horses on street railroads as the fireless locomotive or a system of condensed air engines. When the possibilities of both of these systems are fully developed, city transit will be conducted much more cheaply and satisfactorily than it now is.

Worcester, Mass. F. G. WOODWARD.

Fire Escapes Wanted.

To the Editor of the Scientific American:

The French church in which the Holyoke horror occurred was a large wooden building constructed of inflammable pine, with insufficient modes of exit in case of accident. Under such conditions, the best fire department in the world is helpless, and the only possible remedy is to rigidly require such buildings to be properly constructed. The only door by which escape could be made opened inwardly; and as was the case in the accident at a New York church several weeks ago, the frenzied crowd of men, women, and children pressed against it, barring their only way of escape, and became a prey to the raging flames.

There must be a remedy for all this. There must be responsibility somewhere for an arrangement that will crowd seven hundred strong men, timid women, and helpless children into a small church with no sufficient means of egress in case of an alarm. The church at South Holyoke is not the first that has been thus destroyed, and with it the lives of many human beings; yet that church, and many another like it, seems to have been constructed with a special view to occasioning a loss of life in the event of a stampede. This large and densely packed congregation were quietly seated in their church at a certain moment; and in twenty minutes thereafter, seventy-five of their number lay dead and dying, trampled under foot, crushed by fatal leaps, or blackened by the flames that rushed upon them. There was not a person in that church who could not, with an uninterrupted passage, have placed himself in security from danger in the space of one minute. If the means of egress had been sufficient to empty the church in five minutes, all would have been saved.

The estimates for the strength of gallery and floor are