A NEW SYSTEM OF TELEPHONY.

BY A. E. DOLBEAR.

That rubbing a piece of amber will endow it with the property of attracting other bodies has been known from remote times, and it is probable that this phenomenon was the only electrical one known until comparatively recent times. Sulphur, wax, glass, and a few other substances were found to possess the same quality, and latterly it has been discovered that every substance whatever when subjected to friction from a different kind of substance than itself is capable of attracting light bodies in the same way as amber and as glass. The difference is one of degree only.

Another phenomenon due to the electrical excitement of bodies by friction is, they attract each other stronger than they attract other bodies, while each of the excited substances will repel a similar body excited in the same way.

But there are other ways of generating electricity that are familiar enough nowadays; for example, the galvanic battery; but this does not exhibit the attractive property of the piece of rubbed glass in a way that is appreciable by ordinary means. A well excited piece of glass will make a pith ball to move toward it from a distance of a foot or more. But let the pith ball be brought very near to any part of a battery or a wire attached to a battery, and no appreciable motion will take place. If, however, the wires connecting the terminals of the battery be wound into a helix that incloses a piece of iron, the latter will be made a magnet by the current of electricity in the wire, and this magnet will attract other bodies.

A very strong magnet will attract any body whatever, even a pith ball or a piece of hard rubber, but the strongest electro-magnet hitherto made will not attract such a substance to itself from a distance of half an inch. The attractive property manifested by the iron is called *magnetism*, and the corresponding property of the glass that has been subject to friction is called *electrical attraction*.

While it is true that a current of electricity in the wire conductor of a battery is capable of developing an attractive property in the iron, it is also true that the terminal wires of the battery, when they are not connected, manifest an *electrical* attraction, for if they be properly connected to a sensitive electrometer the latter will show them to be electrified, one positively, the other negatively; and in order to understand better what is subsequently stated, it will be best to dwell a little while upon this phenomenon.

It has been stated above that all substances may be rendered electrical by friction, but for conductors of electricity like the metals friction is not essential; it is only necessary to *touch* one metal to another or to a fluid, like water, when one will be found positive and the other negative. Thus if a piece of copper is touched to a piece of zinc, the copper will be found to be positively electrified and the zinc negatively; if the copper is touched to water the latter will be positive and the copper negative; while if the zinc be touched to the water the latter will still be positive, but the zinc will be more negative than the copper was. Now these differences of electrical condition are called differences of potential, and difference of potential is electromotive force, or the condition which results either in electrical attraction or in a current of electricity in a suitable conductor. A great number of facts lead one to the belief that whenever two different substances are placed in contact there an electromotive force is developed, electricity is generated; and the probable explanation of this is that the atomic and molecular motions of two differently constituted bodies cannot be exactly alike, that is, they cannot be taking place at the same rate in both bodies. The molecules of a dense body cannot be moving as fast as those of a less dense body, and when these differently moving molecules are placed in contact with each other there must be some rearrangement of their motions at the points of contact, and the readjustment is quickly distributed by reaction throughout the whole body if it be what is called a good conductor, and more slowly in a poor conductor, but after such distribution there is no further action, unless some means is provided for maintaining fresh surfaces of contact. In the galvanic battery this is effected by the gradual solution of the zinc, by which the surface molecules are removed, thus presenting a fresh surface for renewal of the original conditions. As the electrity thus generated tends to go from the element with the higher potential to the lower one there will be what is called a *current* through any conductor that connects them so long as the solution of the zinc goes on, but break the wire that connects the two metals and the current will stop, and the ends of the wires will be found to be electrified, one positively, the other negatively.

But electricity may be generated in other ways still, and the method discovered by Henry more than forty years ago is second to none in scientific interest as well as practical use. It is this: that whenever a current of electricity in a conductor is started or stopped, or in any way varied, another current will be generated in an adjacent conductor, but it will have a direction opposite to that of the originating current. This is the foundation of what is now called *inductive coils* or inductoriums. These consist of two coils of wire, one with only a few turns of larger insulated wire wound over a bundle of iron wires, the other coil being wound outside of the first or primary coil, and consisting of a great many turns of very fine wire. The primary coil may be connected to a battery, as in Fig. 5, first page, while the terminals of the secondary coil are generally made fast to some hard rubber mounting, as in Fig. 7. When a current of electricity is permitted to traverse the primary coil the induced electromotive force in the secondary coil raises one terminal to a higher potential than the other; that is to say, one terminal is positive, the other negative; and if a wire connects these terminals a current will flow through it from the positive to the negative terminal. If a galvanometer be connected to them the needle will be deflected by the current. Indeed it is not necessary to have the wire terminals quite touch each other, for if the electromotive force be great enough a spark will pass from one to the other, the spark being a part of a transient current, and consisting of some of the material of the terminal that has been torn off, and is transferred to the other terminal because it is electrified positively, and is, therefore, attracted by the other terminal, which is negatively electrified. That the terminals are electrified at such times may be proved by bringing a pith ball suspended by a thread near to one of them, or attaching one of the brass disks of an Epinus's condenser by a wire to the terminal, as E in Fig. 5. Each make and break of the battery current will make the pith ball move toward the disk. This principle of the attractive power of an electrified body for other bodies is the basis of the new speaking telephone about to be described.

THE RECEIVER.

This consists, in its simplest form, of two metallic disks about two inches in diameter, so mounted as not to be in metallic contact, and this is effected by turning a flange in a hard rubber case so they may be kept apart by it (see Fig. 4). A cap is screwed down upon each plate, one of them having a small hole in the middle of it to listen at; the other is a larger one, having a knob turned upon it for conveniently holding it in the hand. Through the middle of the knob a screw is sunk which touches the back plate and serves to adjust it to the best position relative to the front or vibrating plate. The back plate is thus fastened at both edge and middle, which prevents it from vibrating, while the front plate is only fast at its edge, leaving the middle free to vibrate. Each of these plates, A B, Fig. 3, is in metallic connection with the induction coil so as to be its terminals. When thus connected and one makes and breaks connection in the primary circuit a click may be heard by one holding the receiver near to the ear. If a Helmholtz interrupter be employed to make and break the primary circuit the pitch of the fork can easily be heard, and with a *Reiss transmitter* or other suitable one in the same place any kind of a sound will be reproduced.

The explanation of this is easily understood from the foregoing description of the conditions present. The electromotive force generated by induction in the coil changes the two terminals in the receiver, one positively, the other negatively; they therefore attract each other.

One of them is free to move, while the other is rigid. The middle of the freer plate consequently moves slightly toward the other whenever they are electrified, and *in so doing spends the energy of the electricity*, while its elasticity brings it back to its place. It is not essential, however, that both of these terminal plates should be connected to the induction coil, for if only one is connected the recurring charges will cause the free plate to vibrate, for a charged body will attract any other body, so if the connection be to the back plate it will attract the front one and make it move, and if the connection be to the front plate it will attract the back plate and approach it. The effect will be increased by putting the finger upon the terminal that is free; not because it *makes a ground*, as it is termed in electrical science, or completes an electrical circuit, for if the individual listening be as perfectly insulated as glass or hard rubber can make him, the sound is as loud as if he stood on the ground; but the individual becomes electrified by induction, it is the same as enlarging the terminal would be. Consequently receivers are made having only one wire terminal (see Fig. 9), the other plate being connected by a conductor to a metallic ring upon the knob, and this receiver is as efficient as the other.

Electricians will recognize in this structure what is technically known as the *air condenser*, and the mutual attraction of the two plates has been employed as a means of measuring electric potential. In this case one of the plates is suspended from one arm of a balance, while the other is fixed underneath it at a short distance. The attraction of the plates when they are electrified requires an extra weight to keep them apart, and the weight needed is the measure of the attractive force. But the plates will attract each other when glass or mica or any other non-conducting substance is placed between them in the place of the air; and one might expect that if such an air condenser would give sonorous results, other forms of condensers would do so likewise, and this is so. Indeed, whoever has charged a Leyden jar has probably noticed the sounds coming from it when it is nearly saturated. In 1863 Sir Wm. Thomson had his attention directed to the sounds produced by discharge in an air condenser.*

When the two plates of Epinus's condenser are in metallic contact no sounds whatever can be produced by it, but if they are separated by a thin film of air they will reproduce speech (see Fig. 6, at E). In the first case the electricity passes from one plate to the other without doing work or changing its form; while in the latter, its form is changed and work is done, and between the best conductors, such as silver and copper and the perfect non-conductor air, there are all degrees of conductibility, and whenever electricity spends its energy upon an imperfect conductor it results in heating it; that is, in molecular and atomic vibrations. Consequently an undulatory current from an ordinary transmitter, when sent through an imperfect conductor, will set up sound vibrations in it which may be appreciated by the ear. Let, then, any poor conductor, like a disk of carbon, a sheet of paper or of gelatine, or such chemical substances as ammonium chloride, be placed between the terminal plates, and an undulatory current sent through them will result in sound, and speech may be reproduced.

Now, the phenomena observed in Geissler's tubes and Crookes' tubes show that the residual gaseous molecules are violently impelled from the electrified terminals, not simply because they are electrified, but because they are heated, for the same phenomena are witnessed when the terminals are heated in other ways; so it is probable that between the plates of the air condenser there is an actual impulsion of the air particles from one to the other, and that the phenomenon of attraction is not isolated from molecular impact. Receivers have been made in which a vacuum could be produced between the plates, but no great difference could be observed in their performance; and when one reflects upon the immense number of molecules left in the best vacuum yet produced, it is not a matter for much surprise.

When a non-conductor, such as air, or vulcanite, or mica, separates the two plates, there is a complete transformation of the electricity at the limiting surfaces, and with small condensers the efficiency depends upon the electromotive force employed. For low electromotive forces, such as common batteries of a few cells can give, the effect is almost inappreciable, and for this reason such a receiver as this is quite free from the disturbance known as induction, and which is so troublesome in the magneto-telephone, such induced currents being generally of low electromotive force.

Among the earliest of my experiments, made while developing this method, was to attach one terminal wire from an induction coil to the outer coating of a Leyden jar, taking the other wire from the coil in one hand, and applying one ear to the knob of the jar. Every word spoken at the transmitter was distinctly heard, but the prickly sensation due to the electricity was too disagreeable. Another receiver, not less curious than the Leyden jar, was found in the pair of insulating handles made for the medical application of electricity (Fig. 8). When these were connected to the coil wires, and one held in each hand by the wooden part, while the metallic ends were placed at the ears, any kind of a sound at the transmitter was heard without any difficulty, but of course the same sensation was felt as with the jar. Many forms of condensers have been employed with capacities too small to measure up to two micro-farads, and these in all sorts of relations, charging the plates from batteries, from Holtz machines, charging the line as in cable works, etc., all of which give results that differ only in degree.

THE TRANSMITTER.

As with other systems in common use, there is a transmitter as well as a receiver. One form of the transmitter is shown in Fig. 10, it being attached to the door of a box containing battery and coil. This transmitter is substantially the same as the one invented by Reiss in 1861. His consisted of a cubical box (see Fig. 6) about five inches on a side, having an opening on one side to talk into, and another one on top, across which the diaphragm was fastened. A pin of platinum was glued to the middle of the membrane and connected by a wire to a binding screw. A V-shaped wire with platinum point touched upon the platinum of the membrane, and with its binding screw served to complete a galvanic circuit. This one (see Fig. 10) differs from this of Reiss only in making the chamber smaller, making the connecting wire on top I-shaped, and substituting carbon or other suitable substance for the platinum; but the platinum does very well. It is a matter of some surprise that the old transmitter is still spoken of as a *make and break* circuit, and that it can only transmit pitch, whereas, whether it breaks or not when a sound is made in it depends solely upon the intensity of that sound, just as with the Blake transmitter. If one talks gently to the original Reiss transmitter, it not only does not break, but it transmits speech with all its qualities.

Accompanying the transmitter an induction coil is shown at I, Fig. 6, and as the working of the receiver depends upon electromotive force and not upon current, it is necessary, if a coil be used to raise the electromotive force, to have one with many more turns than is needed with the magneto receiver, and the best results have been obtained with a coil having a resistance of four or five thousand ohms, but it is probable that this will be reduced.

On account of the high electromotive force a better insulation is needed than ordinary telegraph lines give when the induction coil is at the further end of the line, but if it is at the receiving end, and a low electromotive force is employed in the primary, then ordinary insulation will answer. Again, the electromotive force being high, inserted resistances do not so markedly decrease the efficiency of the instrument, as in the case with the magneto-telephone. For instance, the articulation is perfect and loud enough with a resistance of fifty thousand ohms, a resistance equal to five thousand miles of common telegraph wire, and it may be heard through a resistance of a million ohms, practically an infinite resistance.

If one of the terminals of a receiver be charged in any way, the reaction between the two plates will be stronger than it will be without. Let, then, one terminal be attached to a knob of a Holtz machine that is kept charged by rotation. The sounds will be heard much louder, and any other source of electricity with high potential will answer the same purpose. Hence a battery of a large number of cells may be substituted for the Holtz machine, and one of the terminals of the battery may go to the ground, though

* See papers on Electro Statics and Magnetism, page 236.

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this is not essential. This arrangement will keep the terminal plate charged to the potential due to the chemical relations and number of cells in the battery. If the battery be placed in the line wire it will keep both ends of the line charged. A Volta's pile may be substituted for the battery in either place, and so may a charged condenser of any capacity, the electrically charged terminals in this system acting in a way analogous to the permanent magnets in the magnetic system.

There are various other ways of employing condensers, and as one would infer from the preceding descriptions of the phenomena, these condensers will talk, that is, they will reproduce in sound the varying electrical conditions to which they may be subjected, as will also either a battery or a Volta's pile.

I have often heard them talk, and have made many experiments with such receivers.

Several other diagrams are also added, showing some of the various ways in which the system may be employed.

In perfecting this new telephone Professor Dolbear has given long and constant study to the scientific problems involved, while the mechanical construction has been prosecuted by Mr. H. C. Buck, aided by skilled machinists and competent assistants. The above concise description in the inventor's own words will give our readers a clear understanding of the principles that underlie his interesting invention, and it only remains for us to describe in brief the several figures in our front page engraving.

Fig. 1 shows the telephone in actual use, the transmitter being secured to the wall, the battery and induction coil being placed in a box on the floor, or in a convenient closet. Fig. 2 is a perspective view of the new receiver; Fig. 3 a face view of the same, with a portion of the casing broken away to show the connection of the two binding posts, A B, with the diaphragms, C D, and the adjusting screws by which the distance between the diaphragms is regulated are shown in the sectional view Fig. 4

Fig. 5 illustrates the principle of electrical attraction upon which the action of the new receiver is based; the electrostatic charge received by the plate, E, from the induction coil attracts the pith ball suspended in front of the plate.

Fig. 6 shows the two plates, E, of an Epinus condenser, placed near together and connected with the terminals of the secondary wire of the induction coil, I, and used as a telephone receiver.

Fig. 7 shows an induction coil with a separable primary for illustrating the principles of electrical induction.

Fig. 8 illustrates the manner of securing telephonic communication through ordinary medical electrodes.

Fig. 9 illustrates the essential features of the new telephonic system. I being the induction coil whose primary is in circuit with the battery, B, and transmitter, T, the receivers, R, are each connected with a single terminal of the secondary wire of the coil, I.

Figure 10 shows Professor Dolbear's experimental telephone transmitter. In this instrument the diaphragm, A, is horizontal, and carries a carbon electrode, upon which rests a movable carbon electrode connected by an arm with a delicately pivoted bar supported by the diaphragm cell. The local circuit is from the battery, B, through the carbon electrodes, and through the primary of the induction coil, I.

Fig. 11 shows the exhibit prepared for the Paris Electrical Exhibition, and intended to represent the perfected telephone system. It shows two similar instruments, which in practice are placed at opposite ends of the telephone line. T is the transmitter, B the battery, I the induction coil, R the receiver, and G the ground. *b* is a key for cutting out the receiver when it is desired to talk. *d e* are the primary wires, *f* the secondary wire leading to the key, *h* the line connection of the receiver, and *i* is the ground connection of the receiver.

MECHANICAL INVENTIONS.

Mr. Herman W. Vitt, of Union, Mo., has patented an improved device for communicating motion from the spindle to the stone, the construction being such as to allow the runner to run true, though the spindle may be out of tram or sprung.

Mr. Charles O. Dougherty, of Crisfield, Md., has patented an improved windlass for oyster dredges, by which, in case of accident or when it is desired to allow the dredge line to pay out rapidly, the machinery may be quickly thrown out of gear, and the spool on which the dredge line is wound be allowed to revolve freely on the shaft.

A new and improved machine for rolling axles, rivets, bolts, and other articles, has been patented by Mr. John H. Whitney, of New York city. The metal is fed into the machine through a suitable guide consisting of a loose flanged short tube held between two or more rollers or adjustable slides, the metal being held between the rollers by a pair of automatic tongs, which close as the work progresses.

An improvement in hoisting apparatus has been patented by Mr. John George Speidel, of Reading, Pa. The object of this invention is to provide for lifting variable loads, to insure safety, and to compass those objects by an apparatus of a portable nature. The invention consists in a block provided with differential gearing of novel arrangement, in safety-stop devices and automatic brake mechanism, acting by weight of load.

Mr. Charles K. Hamilton, of Lebanon, Ohio, has patented an improved air pump so constructed that it can be readily changed from exhaust pumps to condensing pumps.

How to Detect Carbonic Oxide in the Smallest Quantities.

One of the important sanitary problems is to detect in the air of our dwellings very small admixtures of carbonic oxide. The following test, furnished by Vogel, has long been regarded as the most simple and unfailing: To a flask of water exposed to the air under examination add blood very much diluted. Carbonic acid is shown by the immediate reddening of the mixture. The addition of ammonia sulphide does not banish the absorption lines in the spectroscope as with ordinary diluted blood. This test will show the presence of a portion as small as 0·25 of 1 per cent. Experiments show, however, that the oxide may not all be absorbed in this manner.

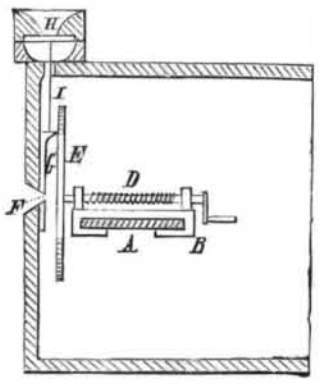
Dr. Walter Hempel uses the lungs of living mice to gather the gas from the room. The mouse experimented upon is then drowned, and blood from the region of the heart is tested with fresh, colorless ammonia sulphide. In this way 0·03 of 1 per cent can be easily detected, and strong symptoms of poisoning are shown with as little as 0·05 of 1 per cent of the gas. Since carbonic oxide is not, like carbonic acid, an unavoidable ingredient of the atmosphere, it becomes a matter of great importance to determine and prevent its presence.

PHOTOGRAPHING THE VIBRATIONS OF THE VOICE.

BY C. CUTTRISS.

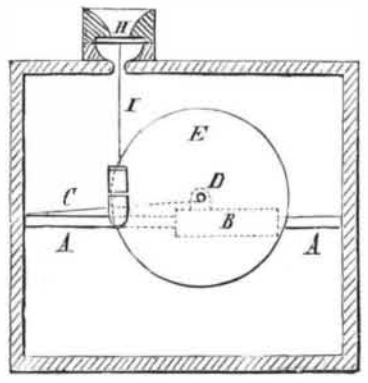
Reading of the experiments of Messrs. Bell and Tainter on the photophone, the idea struck me that the vibrations of the voice might be photographed. Not having the facilities to carry out the experiments, I communicated the idea, with a sketch, to my brother, Thomas Cuttriss, Leeds, who has carried it out as follows: A box, blacked inside, has a shelf, A, on which slides the saddle, B, which carries the

Fig. 1.



plate, E, and shaft, D, by which the plate is rotated. C is a silk thread fastened at one end to the shelf, the other being wrapped round the shaft, D, in that way, when the shaft is turned, traversing the plate in front of the slit, F, and the movable shutter, G. The shutter is connected to the diaphragm, H, by the wire, I, and is opened and closed

Fig. 2.



by the vibrations of the diaphragm. A powerful light is focused upon the slit (sunlight was used in our experiments), and the plate rotated as steadily as possible while speaking upon the diaphragm.

The plate, on being developed, showed a spiral, across which were dark lines showing on the outer circles the vibrations of the diaphragm very distinctly (see Fig. 3); but owing to the much slower speed of the plate, as it drew

Fig. 3.

nearer the center, the vibrations there merged into a dense fog, and were lost.

The vibrations are similar to the indents on the tinfoil of Edison's phonograph. We are now trying to reproduce the words by the action of light transmitted through the negative upon a gelatine film, using that in like manner to the tinfoil in the phonograph. The plate used was an ordinary wet negative.

SILK CULTURE IN AMERICA.

A prominent silk manufacturer remarked to the writer: "Were I to go into silk raising I would send my cocoons to France or Italy to be reeled."

The president of the Silk Association of America, at one of their meetings, when a Mr. Lowery, of Huntsville, Ala., addressed them on the subject of silk raising, asking aid and information, said he understood the difficulty of silk raising in this country commenced with the reeling; or, in other words, commenced after it was raised. This is the whole subject in a nutshell. We can raise silk in any quantity, but reeling is manufacturing requiring machinery and skill. It is worth three dollars per pound to reel silk from the cocoon, even and fine as required for our best organzin for warps. Our manufacturers now get the benefit of the labor of foreign factories duty free by calling this "raw silk." Let it be ever so slightly twisted and it is called thrown, and must pay a duty of thirty-five per cent. Our throwster is protected from the foreign throwster by a duty of thirty-five per cent; or a silk worth six dollars, two dollars and ten cents is added, making it cost eight dollars and ten cents. He gets the reeled "raw silk," on which has been expended three dollars in labor, for five dollars, the whole work of throwing into organzin, "the most costly of all threads," costs only one dollar and twenty-five cents, making seven dollars and twenty-five cents, against eight dollars and ten cents, to import, so creating a monopoly, for this price covers every expense—factory, machinery, and labor.

It is plain to see that unless the reeling from the cocoon in this country receives like protection with the spinning it can never be done here, and that simply means and explains why one manufacturer says he would, if he raised cocoons, send them to France or Italy to be reeled, and what may be understood by the observation of the president of the Silk Association of America—"the difficulty of silk raising in this country commenced with the reeling." Now, if this is a difficulty in the way of the throwster, then the throwster is a difficulty in the way of the weaver, and the weaver in the way of the consumer. But the consumer says, for reasons of indirect benefit, "I consent to this tax," and the greatest benefit accrues from the largest amount of profitable employment and the greatest saving of outlay to the country. By raising our own silk we should save an immense amount in wealth and more than double the labor in the production and reeling the silk, independent of raising the cocoon. The money value of reeling is three dollars per pound, against the average work on all threads "after reeling" not to exceed one dollar.

I present these facts for consideration. We now permit the throwster to do three-fourths of his legitimate work in foreign factories, bring it here to the exclusion of the most artistic and valuable branch of the silk manufacture, and certainly what would be one of our most valuable and interesting products.

No one who understands doubts our ability to raise silk. Our silkworms' eggs are now exported to improve the stock of older countries, where we have been taught to look for excellence. Then why do we not reel it? The strength, luster, and evenness of American silk are excelled by none, and it is far superior to many brands now imported.

LEWIS LEIGH.

New Haven, Ct.

Insectivorous Plants in Florida.

To the Editor of the Scientific American:

In your issue of May 28, Mr. Peter Henderson has a short article entitled "Insectivorous Plants," in which he demonstrates by experiment that the "Carolina fly-trap" (*Dionea muscicipula*) and the "cruel plant" (*Physianthus albens*) are not truly insectivorous, *i. e.*, do not depend upon insectivorous food for their nourishment and growth.

Now, in Florida we have several so-called insectivorous plants, which, for the past three or four years, I have examined and watched very carefully, and have arrived at precisely the same conclusion in regard to them as Mr. Henderson and Professor Tait have in regard to the above, viz., "that the so-called feeding of the plants in no way conduced to their health or vigor, being identical in all respects with those that had not received insects."

Among those the largest and most important is the "spotted pitcher plant" (*Sarracenia variolaris*), found growing abundantly along the edges of our swamps.

From this plant I have taken at different times hundreds of insects, alive or in a more or less state of decay, among which were numerous species of ants, centipedes, bugs (*Hempitera*), beetles (*Coleoptera*), etc

The inside of this "natural insect trap" is covered with fine, bristle-like hairs, which seem to be sensitive to touch, and woe to the unlucky insect that enters therein; for these hairs entwining it with a "siren's" embrace, the insect, after a few ineffectual attempts to reach the opening at the top of the leaf and thus escape, becomes exhausted, and at last, overpowered by the fumes and gases of the decaying, putrefying mass below, dies, drops to the bottom, and in a few hours becomes part and parcel of the same, and possibly an accomplice for the destruction of some near relative.

Attracted by this putrefying mass a flesh-fly (*Sarcophaga sarracenioe*, Riley) drops an egg into it, and the larva which hatches therefrom takes up its abode, finding plenty to feast upon in the decaying insects.

When ready to pupate this larva invariably descends into the ground, either through the side of the leaf or the stem of the plant, changes into a *puparium*, and transforms within eight or ten days into the perfect fly.

Many of these plants do not contain this putrefying mass of dead insects, and I can see no difference between them and the others in growth or appearance, and I have since accepted many statements in regard to insectivorous plants, to use a Latin phrase, *cum grano salis*.

WM. H. ASHMEAD.

Jacksonville, Fla., May, 1881.

SHOOTING FINBACK WHALES.—Twenty finback whales were shot with bomb lances off Provincetown, Mass., May 14. The business of hunting these whales has lately become an important industry at that place.

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