M. CLAUDE BERNARD.

M. Claude Bernard, whose portrait we present herewith, is justly entitled to the credit of having raised physiology to the dignity of a separate science. He it was who proved that the infinite variety of functional phenomena, with relation to the endless diversity of organic forms, is based on fundamental truths, which collect on common ground all living things, without distinction of classes or orders, whether vegetable or animal. The liver, he showed, made sugar the same as does the fruit; beer yeast is subject, the same as man, to anæsthesia when submitted to etherized vapor. For the physiology of animal mechanism he showed that anatomical deductions are insufficient and often erroneous; and that experiment only can conduct to certainty. The rules of such experimenting, he demonstrated, are the same in the sciences of life as in those relating to inanimate bodies, and that there are not "two contradictory natures, giving place to two orders of opposite sciences." He pointed out that the experimental physiologist not only analyzes and demonstrates, but dominates and directs, and that he may be a "conqueror of nature" as well as the chemist or the physicist. M. Bernard died in February last at the age of 65 years.

THE CANADIAN TROPHY AT THE PARIS EXHIBITION.

This beautiful structure is erected under the northwest dome of the Exhibition Building in Paris. On entering the principal doorway from the left bank of the Seine, one finds one's self in a magnificent transept, over 800 feet long and about 80 feet wide, divided in the center by a tower 80 feet square, and at each end are towers covered by domes 111 feet square. The ceilings and walls of this immense transept and its domes are profusely and gorgeously decorated with mouldings, gilding, and carvings. It is probably one of the largest and richest galleries ever erected. Here the trophy is being put together. It is in the form of a tower, with a high pitched roof. The base occupies a space 30 feet square, from the center of which rises the main framework to a height of about 100 feet. This height is divided into four stages. From the angles of the framework, on the ground level, handsome glass cases radiate, designed for the exhibition of manufactured goods. The remaining three stages have projecting galleries, supported by ornamental brackets. These galleries will contain the productions of the mines and forests. Access to them is obtained by means of a circular wooden staircase of novel construction in the center of the trophy. The roof is divided in the center of its height by a band, on which the word "Canada" is cut out in fretwork. The roof is covered in part with slates and in part with shingles and bark. The exhibits will be so arranged that the framing timbers, which are of red pine, will be left exposed to view. The woodwork will be finished in oil, to bring out the natural grain of the wood, so that visitors may examine specimens of the different timber grown in Canada. We are indebted to the London *Illustrated News* for our engraving.

Dry Plate Developer.

When a dry plate is coated with a preservative principally or entirely consisting of gallic acid, it can be rapidly developed by the following solution: Distilled water, 100 c. c.; crystallized silver nitrate, 4 grammes; acetic acid, 4 grammes. Place the plate, film downwards, in a trough of rain water, so as to moisten the whole of the film without unequally removing the preservative, then pour all over it the above solution; the picture will quickly appear, and will generally be completely developed. It must be carefully watched, and washed as soon as it seems to be sufficiently intense.

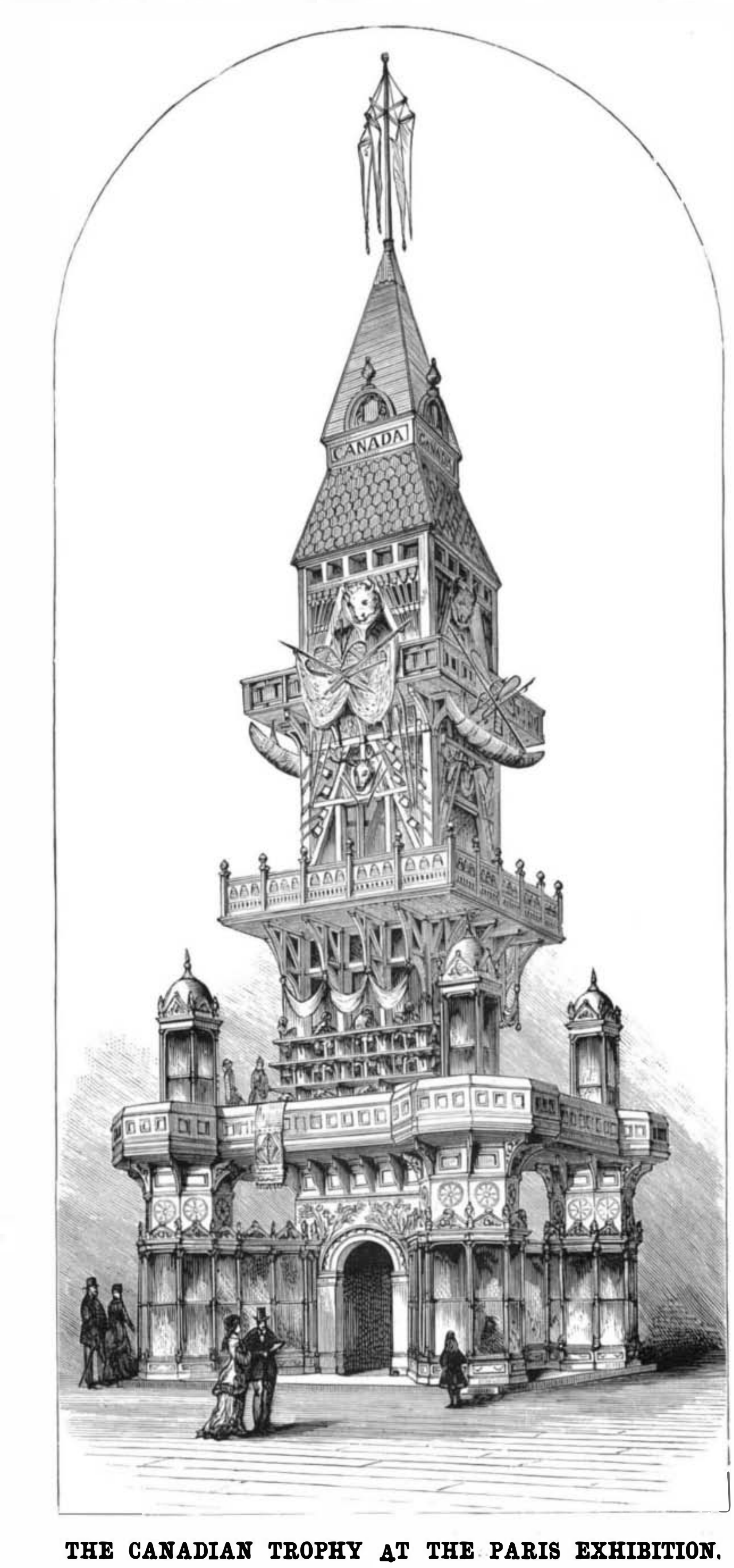
All photographers who are in the habit of developing dry plates have observed that when too much silver nitrate has been added to the developer, the intense blacks of the negatives were riddled with small holes. The formula which I have given above does not produce this result, even though the proportion of nitrate be much larger; the reason of this apparent paradox I am not in a position to explain.

I have only tried this developer with stereoscopic positives on albumen or albumenized collodion, and I am bound to add that I have obtained very unequal results. I therefore introduce it to public notice with some hesitation, though I believe that by washing off the preservative and by modifying the proportion of the ingredients, a very rapid and energetic development will be obtained.—*M. Queval, in Bulletin Belge.*

Swiss Double Postal Cards.

We are indebted to M. Adolphe Eggis, of Fribourg, Switzerland, for a specimen of the double postal cards which have been in use in that country for more than a year. The material is paper of the same quality, but a little lighter than that of the postal cards of the United States. The card is folded into two leaves, which may be separated at the crease, each of which is 5½ inches long by 3⅝ inches wide—a size considerably larger and more serviceable than that of our postal cards. The printing on both cards is the same, and each has a five centime stamp, that on the return half of the card of course remaining uncanceled until remailed.

M. CLAUDE BERNARD.



THE CANADIAN TROPHY AT THE PARIS EXHIBITION.

Bursting of Hose Pipe—A Remedy Wanted.

The bursting of hose pipe at fires is about as common an occurrence as a fire itself, and even more so, for not unfrequently it occurs several times at one fire, thereby causing a much greater destruction of property than would otherwise have happened. This was especially the case at the late fires in New York and Philadelphia, where the loss of hundreds of thousands of dollars' worth of property was wholly attributable to the bursting of the hose. And the great loss from that source has led the people of these cities, through their representatives, to call for a most thorough and rigid investigation into the quality of hose used, expecting thus to find a remedy. Undoubtedly some progress may be made in that direction by using a very superior article of hose, but as it will be impossible to ascertain what pressure it required to burst them, very little information of a satisfactory character will be attained.

This is a subject that has long engaged the attention of both firemen and mechanics, and various remedies have been suggested and various devices used, many of which were probably in the right direction. As yet, however, they have failed to accomplish the desired result. Among the most important of these improvements has been the introduction of a relief valve at the engine pump, to relieve the working pressure when it should exceed that required. This improvement has undoubtedly saved thousands of feet of hose and many thousands of dollars' worth of property. But still the bursting of hose goes on, and still the invisible foe remains, and is no respecter of persons or of hose. Whenever or wherever his forces are concentrated, a rent is made, the pipe is burst, the fires burn on unchecked, until another pipe is laid to take its place, when, far too soon, it shares, perhaps, no better fate.

Thus far, then, the problem remains practically unsolved, even by those who heed it most and understand it best. Several years ago the writer was called upon to aid in the perfection of a relief valve for fire engines, to prevent the bursting of hose pipe, when he discovered that it was only "locking the stable door after the horse had been stolen," for before the valve would be called upon to act, the mischief would be done—the pipe would be burst. It was not the static pressure consequent upon the working of the pump that burst the hose, for it will require usually more than double the pressure necessarily used in the pipes to cause them to burst. From these facts we are led to the conclusion that the static pressure is not the force that bursts the hose. Consequently, as that is not the real cause, a relief valve at the pump cannot be a certain remedy, though it may be useful and important as a relief from an over pressure, and to that extent valuable. If, then, as shown, it is not the static pressure that bursts the pipes or hose, what, then, is it, for the pipes are burst? It is the accumulated energy of the rapidly moving water within the pipe, backed by the static working pressure of the engine pump, and unless relief can be had at or near the point where this force is concentrated, the pipes, although abundantly strong enough for practical use, will not stand such concentrated force, and must necessarily yield to it. This force, under certain circumstances, becomes immense, and as water is a non-elastic substance, its whole energy is thrown upon some particular point of the pipe. The real wonder is not that the pipes frequently yield to its immense power, but that they stand it so well.

To illustrate more fully this power, let us take, for example, a pump working under a pressure of one hundred pounds per square inch of area, and forcing water through a pipe one hundred feet in length, with a moving velocity in the pipe of, say, thirty feet per second. The accumulated power of this water equals its weight multiplied by its velocity per second, and backed up by the static pressure of the pump. As the pump pressure equals one hundred pounds per square inch, the accumulated force of a body of water one hundred feet long, one inch square, equals 44·4 lbs. × 30 = 1,332 lbs. + 100 lbs. of pump pressure, = 1,432 lbs., the force that would be concentrated on the pipe. Should the pipe be straight and the flow of water instantly impeded, under such circumstances what pipe would stand the pressure? But as this, even, may not be the limit of this power, it must be apparent to every one familiar with this subject that pipes ever so well made must continue to burst unless relief can be had at or near the point where the flow of water is stopped, for the whole momentum of the water will be spent on the pipe before a relief valve at the engine would come into action. But a relief valve in each hose coupling would afford a relief once in every twenty-five feet, at least, and with relief valves thus arranged the bursting of pipe of reasonable strength would be nearly if not entirely prevented. This would afford such a practical solution of the whole question as would save and make serviceable large quantities of pipe that are now useless, and would add to the efficiency of fire departments and materially lessen the cost of their operation.—*T. T. Prosser, in Western Manufacturer.*

Roll while the Ingot is Hot.

Mr. Bessemer lately said that he remembered one of the great failures he made in his earlier experiments arose from his not attending to the above. He took advice strongly given to him by Sheffield manufacturers, who were used to their own mode of producingsteel, and he learnt from them, as a fact, that a steel ingot must never have the hammer upon it while it was hot, and that it must never go to the rolls while it was hot, but that it must be left to cool, and the next day it was to be reheated. When one heard those things from practical men who had really made a mark in the world by their products, as the Sheffield manufacturers evidently had done in the olden time, one was apt to be led by it without going very much into reasoning. He thought it was necessary that cooling should take place, and that reheating should follow it. At one of his earlier experiments, made at one of the largest works in that part of the country (when their material was of an inferior kind to that, he was happy to say, all those around him were able to make today), they let one of their ingots get cool. It was rather a large one, and larger than any they had practiced upon at the time. It was reheated in one of the ordinary reheating furnaces—they were all waiting for the result, and the fire was teased most tremendously—they managed to get it gloriously hot on the outside, in fact it almost melted, while in the inside it was almost black. They attempted to put it through the cogging rolls in that condition. The result was a most singular one. The large mass went through the rolls, and about 1 inch to 1½ inch in thickness was stripped off from it, and an apparently black mass shot through the rolls, to the horror and consternation of all of them. After seeing that, he came to the conclusion that to let the ingot get cold was a mistake, if they were not obliged to do so from some circumstance or other. He came to the conclusion that he himself had worked out that an ingot, when cast, was hottest in the middle, and coldest outside, and the small interval that elapsed between the heating and rerolling would allow for cooling the inside and equalize it; but in all cases there would be a tendency for it to be softer inside than outside, instead of, as in the other mode of working, soft on the outside and hard in the center; and he was very glad to find that the conviction of the fact had prevailed and been attended to, and they were able now either to cog or to hammer down ingots in their original heated state from the casting. He thought that was an important addition which he was very glad to find Mr. Holland had so successfully carried out.

The Telephone and the Phonograph in Practical Medicine.

In a communication to the *Lancet*, a writer states his convictions that the telephone, combined with the phonograph, will become a necessity in clinical medicine, inasmuch as we have, in the phonograph, a means not only of registering sounds, but of reproducing them. "However much the telephone may be perfected for clinical purposes, it must always fail in transmitting sounds of the same quality as those received, consequently this defect will necessitate a special education of the ear to interpret the modified sounds. But with the phonograph sound vibrations can be made visible to the eye, registered on paper like pulse-tracing, and kept for future study and reference."

Dr. Stein has recently invented a method of photographing the beats of the pulse. It consists in photographing a beam of light which has been passed through a perforated vibrating disk. The perforated disk is attached to the artery like the sphygmograph. A strong light passing through the hole in the disk is made to reach a sensitive plate, on which the movements of the disk are recorded in the form of a wavy line. This invention might be made available for registering the sound vibrations of the telephone; for, by attaching a perforated disk at right angles to the receiving telephone drum, the vibrations of the latter could be recorded.

Medical Uses of the Microscope.

Dr. Cutter, of Boston, lately gave a list of Dr. J. H. Salisbury's scientific papers published since 1862 in illustration of original studies of the morbid alterations in blood.

Epithelial cells from the mouth and some from the liver were shown. These microphotographs were those of J. J. Woodward, Surgeon U. S. A., the father of modern microphotography. The nucleus and the bioplasm were pointed out. Attention was called to the fact that the form elements gave no idea of the work performed by the cells. The differentiation lies in the vital endowments of the bioplasm.

The cell that secretes bile or the tears has the same form elements as one that secretes milk. If separated they could not be distinguished apart. A dead bioplast could not secrete, though it may have been much longer in dying than the systemic body. Brunonian movements of the mucous corpuscles were alluded to as protoplasmic. These form good tests for objectives.

Microphotographs of vaccine virus were shown. This gives an excellent idea of Beale's view of a taint. The field is full of granules—germs—which are, he says, degraded bioplasm. A remarkable specimen of a protoplasmic plant that grew in the substance of a seaweed was exhibited. There is every probability that never before has it come under the eyes of man, as Professor Reusch, who prepared it, says it is entirely new. It has many lobes. Notice the buds shooting out. The weird, bizarre outlines remind one of the amœboid forms of the white blood corpuscle. It serves to illustrate vegetable bioplasm and also parasitism. It is probably innocuous.

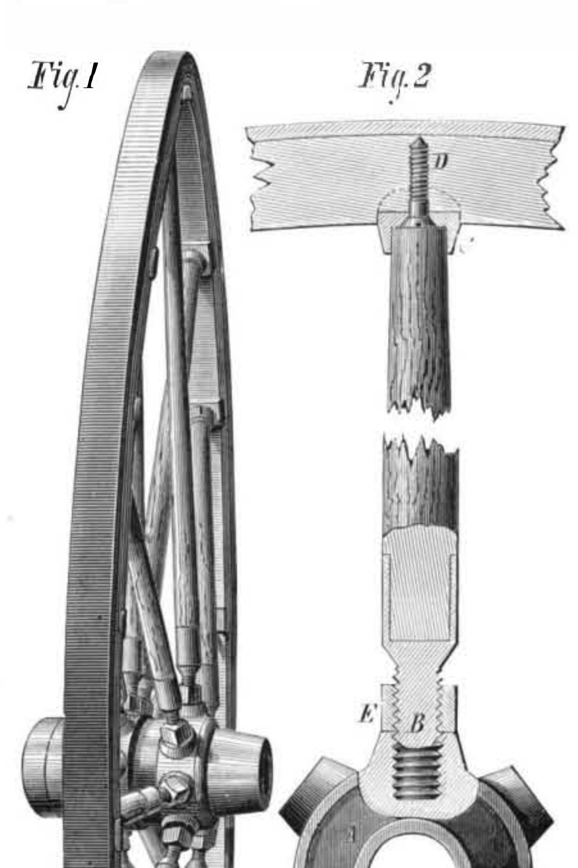
The healthy white corpuscle was clearly seen, and the importance of using microscopes that would show the white corpuscles as white was insisted on.

The white blood corpuscles of consumption and the nameless disease were displayed by means of microphotographs taken with the one seventy-fifth and one fiftieth inch objectives, and attention was particularly called to the physical changes going on inside.

Another illustration was a picture of consumptive cells, taken after three months of remedial treatment in which dietetics bore an important part. The white corpuscles were nearly all reduced to their normal size. The spaces were lessened in number, and the physical relations of the red corpuscles had improved. This was not an isolated evidence. With this reduction in size came a notable restoration to what was termed a healthy condition.

DETACHABLE SPOKE VEHICLE WHEEL.

We illustrate herewith a new vehicle wheel, the principal feature in which is that the spokes can be easily removed and new ones inserted in their stead without disturbing the tire or felly. They are placed in two rows upon the hub, from two to four inches apart, and each spoke is provided with a metal ferrule terminating in a screw. The felly has a metal socket to receive the outer end of the spokes.



DEADERICK'S IMPROVED VEHICLE WHEEL.

The construction will be understood from the sectional view, Fig. 2. It will be observed that there is a metal hub band, A, having suitable elevations, and that the spokes in one row, Fig. 1, stand opposite the spaces between those in the other. B is the spoke ferrule, terminating in a threaded end. C is the felly socket, fastened to the felly by the screw, D. This socket is let into the felly for a short distance, and braces it by semicircular ears. In order to remove a spoke the nut, E, is loosened and screwed up. The socket, C, is then grasped with a wrench, and the spoke, or rather the threaded ferrule end, B, is screwed downward into the hub until the outer end of the spoke is clear of the felly socket, C. It only remains to spring this end clear of the felly, and unscrew the ferrule end, B, from the hub. The spoke is inserted by reversing this process.

When, however, as in a heavy vehicle, the spoke is too stiff to be sprung, it must be of such a length as to reach exactly from hub to felly, and the felly socket must stand further out from the latter and must be detachably secured by bolts. In removing a spoke this socket is first unbolted and slid to one side before the spoke is unscrewed from the hub.

The hub bands, spoke, and felly sockets may be made of malleable cast iron, soft cast steel, or drop forged iron. The weight of the castings varies from two to four pounds per wheel. The felly socket may be a simple plate with ears, and a circular hole through which the tenoned end of the spoke passes into a shallow recess in the felly. No screw is needed to keep it in position, as it is held by the pressure of the spoke. Should the tire become loose, the inventor states that it may easily be tightened by screwing out the spokes against the felly. A loose spoke may also be tightened in similar manner; and by manipulating the spokes the wheel may be straightened, should it get out of plumb. In case the showing of the threads on the spoke ferrule piece is objectionable they may be screwed down close into the hub, and the wheel may be put together, or the felly and tire put on, as other wheels. In order to remove a spoke it will in such case be necessary first to spring out the felly with a lever until the end of the spoke is clear of the socket, and then holding the spoke to one side unscrew it from the hub.

For further particulars address the inventor, Dr. C. Deaderick, Knoxville, Tenn.

Microscopy.

The Myxomycetes of the United States.—Dr. M. C. Cooke, the eminent English mycologist, has from time to time been making revisions of the various orders, genera, and species of American fungi, from material furnished by his correspondents in this country, and publishing the results of his labors in the *Proceedings* of our various scientific societies, so that they shall be readily accessible to American students, the number of which, in this interesting field of research, is largely on the increase. A contribution of this character, with the above title, has recently been published in the *Annals* of the Lyceum of Natural History of New York.

The group which has, in this case, undergone revision consists of fungi that are mostly minute in size, and characterized in their early stage by their gelatinous nature. They have an especial interest for the student of biology, inasmuch as the celebrated Dr. De Bary, some years ago, excluded them from the vegetable kingdom altogether, and made them companions of those low forms of animal life known as *Amœbæ*, etc. The gelatinous material of which they are composed in their first stages bears considerable resemblance to sarcode, and did they never change from this there would, perhaps, be little doubt of their animal nature; but as they mature they lose their mucilaginous texture and become a dusty mass of spores, intermixed with threads, and the whole surrounded by a delicate covering, called the *peridium*. In a systematic arrangement they are placed in the neighborhood of the "puff-balls."

In the present communication (which is necessarily of a technical nature, but of great utility) the author has taken the opportunity of thoroughly revising the North American species of *Myxomycetes*, on the basis of the classification proposed by Dr. Rostafinski, in a monograph published by him in 1875. And it may be stated here, as a remarkable example of the devotion of a naturalist to his favorite pursuit, that his monograph having been written in the but little read Polish language, Dr. Cooke began the study of the latter and mastered it, in order to avail himself of Rostafinski's views. For half a century the species of this order of fungi have been classified according to external characters alone, or such only as could be discerned by the aid of the pocket lens. The advance of microscopy left behind such an incomplete system for years, until Dr. Rostafinskipublished the outlines of a classification based on new principles. As the old method was based wholly on external features, so the new one has nearly all its essential characteristics relating to internal structures. In using the new system, it is first necessary to determine the color of the spores, then the presence or absence of threads (*capillitium*), and finally the character of the latter, and when present, all its details. The dimensions of the spores are also taken into consideration, but are not regarded as of so much importance as the foregoing features.

The threads which are intermixed with the spores in many of these little fungi exhibit, when examined under the microscope, a spiral arrangement which has given rise to as much controversy as the markings of some of the diatoms. The dispute has been whether the spiral markings were external or internal, whether caused by the twisting of the thread or by the presence of an external or internal fiber.

To return to Dr. Cooke's paper: One who is somewhat familiar with the subject will, on turning to the genera and species, as they are here classified, be struck with the newly proposed generic names and the wholesale conglomeration of species that have hitherto been supposed to have a distinct individuality. But, as an offset to this, we have in some cases what have been supposed to be forms of the same thing, separated and elevated to the rank of distinct species. As the system of Rostafinski is the one that will probably be adopted, the synopsis here offered by Dr. Cooke will prove of incalculable value to American mycologists.

The Stings of Hymenopterous Insects.—At the last meeting of the New York Microscopical Society the President, Mr. Hyatt, read an interesting paper on this subject, made the more valuable from the fact that it embodied the results of his careful studies, extending over a period of eight years. It would be useless to attempt a synopsis of his remarks without the aid of the beautifully executed microscopic drawings which accompanied the paper, and which added so much to its interest and value. The memoir, illustrated with copies of these drawings, made under the personal supervision of the author in order to insure their accuracy, is soon to be published by the society. A point in the structure of the bee's sting, which the author apparently regarded as new, has been mentioned in print several times; and, in fact, has been illustrated in one of the back volumes of *Science Gossip*. We refer to the channels that lead from the central cavity of the sting to the bases of the barbs. Mr. Hyatt stated that, asfar as he had been able to discover, no really correct representation of the sting of a bee had ever been published. If this be so the publication of this paper will not only reflect great