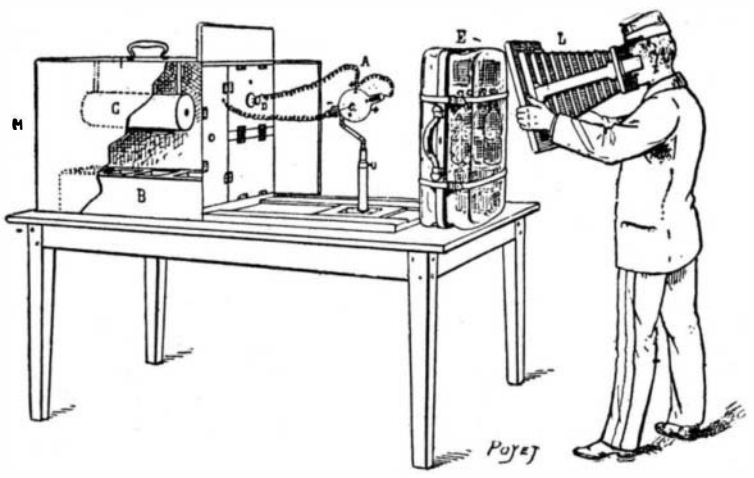
THE X RAYS IN THE CUSTOM HOUSE.

The X rays are winning fresh laurels nearly every day through some new application of their mysterious and irresistible power. The most recent of such applications is the utilization of these inquisitive and all-seeing radiations by the custom house. In the railway stations of Paris, the X rays have been employed for a week past for examining packages of all kinds and sizes, from small parcels and valises up to trunks and large bales, in order that their contents may be ascertained without having to open them. The experiments are not confined to baggage, for the travelers themselves are inspected, in order to have the X rays reveal any objects that may have been concealed under the clothing. Before long a radioscopic service is to be organized in one of our frontier cities, probably in Bellegarde.

Our readers will certainly not be very greatly surprised to hear about the experiments that are being made by M. Pallain, director of the custom house, a man of learning and progress, who has a thorough dislike for routine; nor will they be surprised either to learn the very satisfactory results given by such experiments. Nearly six months ago we described in these pages, in its minutest details, the method of investigation of which the custom house is now endeavoring to make a happy and supplementary application. The apparatus proposed for the instantaneous inventory of packages are the same as those used for experiments in radioscopy or fluoroscopy. Let us again briefly explain the principle of the method. Let us take a Crookes tube in which a vacuum up to a millionth of an atmosphere has been formed, and let us cause the current of an electric machine (preferably a Ruhmkorff coil) to circulate therein; and let us place before the tube a screen covered with a fluorescent substance, say (to confine ourselves to the most active materials) platinocyanide of barium or tungstate of calcium. The screen will be immediately illuminated, even when the Crookes tube has been covered with a thick envelope of black paper. This is the fundamental Roentgen experiment. As all the radiations known are incapable of traversing an envelope of blackened paper in order to go far enough to influence a fluorescent substance, it became necessary to suppose the existence of radiations formerly unknown, invisible to us, and capable of passing through obstacles impermeable to other radiations. These are the Roentgen or X rays.

Scientists have multiplied the observations and have found that, as with light, there are bodies transparent to the X rays, that there are others that absorb them more or less, and that there are others again that are opaque to them. But, while with light it has been impossible to connect these differences of transparency with another physical or chemical property of bodies, for X rays a sufficiently exact rule has been formulated, viz., substances are so much the more opaque to the X rays in proportion as they are more dense, and so much the more transparent in proportion as they are less dense. Thus wood, a porous body, opaque to light, is traversed by the X rays, while glass, a dense body, transparent to luminous radiations, arrests the X rays. If, then, between the Crookes tube and the fluorescent screen we interpose a thin piece of wood or even a box, the latter will arrest but a small number of X rays, the screen will remain illuminated, and the illumination of the part corresponding to the box will undergo scarcely any reduction. If, on the contrary, we interpose a metallic object, the latter, arresting the X rays, will project upon the screen a shadow of which the dimensions will depend upon the respective distances of the tube, object and screen, as well as upon the position of the object with respect to the tube and screen. If we place a coin in a wooden box and look at the latter, nothing will apprise us as to the presence of the money, because the wood is opaque to light; but if we arrange the whole between the Crookes tube and the screen, a shadow will immediately appear upon the latter and reveal to us the existence of a metallic object in the box. Finally, if we interpose an object of variable density between the tube and screen, the hand, for example, the fleshy parts of the latter will allow most of the X rays to pass and produce but a slight reduction of the illumination, while at the same time the bones, which are dense, will project a shadow that will detach itself sharply from the screen.



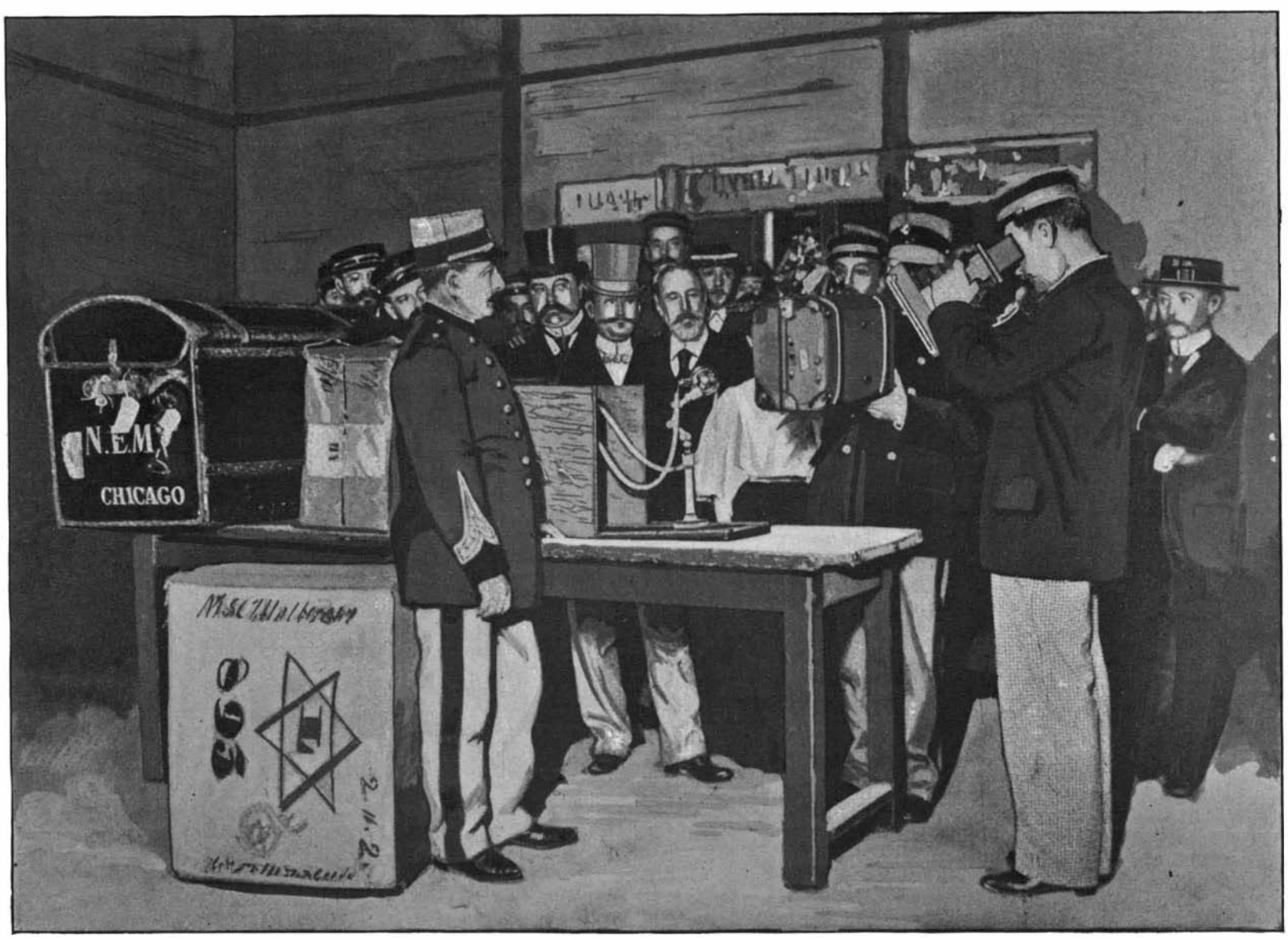
ARRANGEMENT OF THE INSPECTION APPARATUS.

In order to succeed with these simple experiments in radioscopy or fluoroscopy, that is to say, in order to perceive the fluorescent screen, and, upon the latter, the shadow of the objects opaque to the X rays, it is essential to operate in darkness. In the full light of the day the feeble glow emitted by fluorescent substances would be extinguished. Nothing is easier, however, than to succeed with these experiments in broad daylight. It suffices to fix the screen to a tube of black paper and to look through the other extremity in order to immediately observe upon the screen the appearance of the shadow of invisible objects placed in front of the Crookes tube.

Such an arrangement is within the reach of everybody. It may be very easily realized by procuring half a dozen objects of everyday manufacture; a Ruhmkorff coil, which may be supplied by batteries or accumulators, a Crookes tube or one of those vacuum tubes designated as "focus tubes," a fluorescent screen and a cornet of black paper.

M. Seguy, preparator at the School of Pharmacy of Paris, in inventing his "Human Lorgnette," has merely put this arrangement into a convenient and portable form. As his apparatus has been presented to the Academy of Medicine by Dr. Roux, and as the customs administration is using it in its present experiments, it appears to us of interest to give a description of it. The human lorgnette, as a whole, is contained in a box, M, of cubical form, measuring 24 by 24 by 24 inches and weighing 62 pounds. This box is provided with three compartments, one of which contains four light accumulators, B; another, a special high tension transformer, C; and the third the tube that produces the X rays, fixed upon a jointed support that permits of turning it in all directions and moving it along a slide. It is likewise in this third compartment that is placed the lorgnette, L, properly so called, the body of which consists of a bellows similar to that of a camera. One of the extremities of this is closed by the screen, the fluorescent surface of which, formed of a sheet of paper covered with platinocyanide of barium, is turned toward the interior. The other extremity is provided with a silk-lined mask that entirely covers the upper part of the observer's face and thus prevents the introduction of the surrounding light.

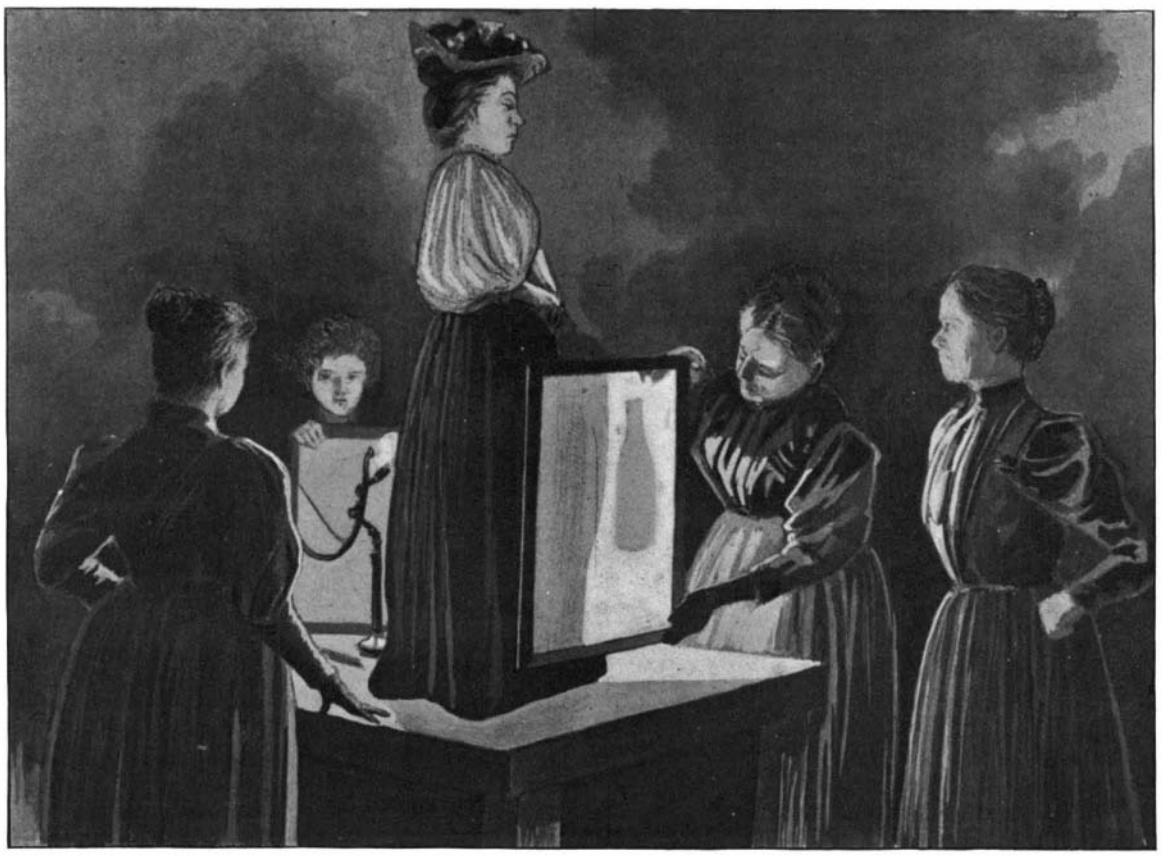
In order to proceed to the examination of a package, E, by radioscopy, the box is opened, the lorgnette is extended, the support of the vacuum tube is moved forward, and the button of the commutator, C, is then pushed. The current of the generator of electricity enters the tube, and cathodic rays are emitted by the cathode or negative pole arranged in the form of a concave mirror. These rays, striking the anode or positive pole, which is in the form of a plane mirror, give rise to the X rays. The package to be examined



RADIOSCOPIC EXAMINATION OF A VALISE AT THE CUSTOM HOUSE.

is placed as near the lorgnette as possible, that is to say, almost in contact with the screen, and at a distance of about eight inches from the tube. It suffices to look into the lorgnette in order to perceive at once the shadow of the densest objects contained in the package under observation. We therefore perceive only the densest objects, and, consequently, the use of radioscopy in customs examinations is limited. In fact, the aid afforded by the X rays to the officers whose business it is to inspect the entry of dutiable objects or materials at the frontier or at the gates of cities must not be exaggerated.

We reproduce a photograph of a scene that occurred recently in the large merchandise hall of the Saint Lazare station. We have seen a customs inspector examining a valise by means of the human lorgnette and in the presence of the members of the High Commission of Customs. It is certain that the inspector distinctly perceived in the interior of the valise the metallic objects that the latter contained. Amid the linen he plainly saw cigars and metallic boxes in which contraband objects could be concealed. But the fluoroscopic examination could not teach him any more. It would be impossible, for example, to distinguish by fluoroscopy such things as new fabrics and laces, which are dutiable, from those that have been worn and are admitted free.



A SMUGGLER DETECTED BY THE X RAYS.

M. Remond, who presented M. Seguy's apparatus, afterward proceeded to make a series of very interesting experiments. He brought in a carelessly wrapped package tied without any precaution, and which was apparently valueless. Having placed this before the fluorescent tube, there were at once observed upon the screen a number of loose cigars scattered through the bundle. He showed a deal box, which, when opened, appeared to contain nothing but straw and rags. This box had a false bottom, and upon the fluorescent screen there were instantly seen the objects that were concealed beneath the partition.

The most curious scene was undoubtedly the examination of a female smuggler, as such examinations will hereafter be conducted by the searchers skilled in radioscopy. We reproduce this scene from a photograph taken upon the spot. A woman whose appearance was such as to avert any suspicion was placed before the telltale apparatus, and there was immediately observed upon the screen a bottle in front of her legs. This appearance had not all the success that it merited, since it had been predicted to us by a customs officer, whose practiced eye, skillful in detecting fraud, is no less piercing than the X rays. M. Remond, complaisantly making the smuggler walk, asked the spectators if they remarked anything abnormal about her. The inexperienced answered, No; but a customs officer present was not to be deceived. "This woman," said he, "has something under her frock." He had observed some embarrassment in her walk, and had guessed the presence of the bottle.

It would be wrong, then, to imagine that the X rays are going to suppress customs inspectors and to substitute therefor what has been called, by an amusing neologism, "radioscopers." The indications furnished by the X rays will, in many cases, be inadequate, and will not allow travelers to escape an inspection of their trunks.

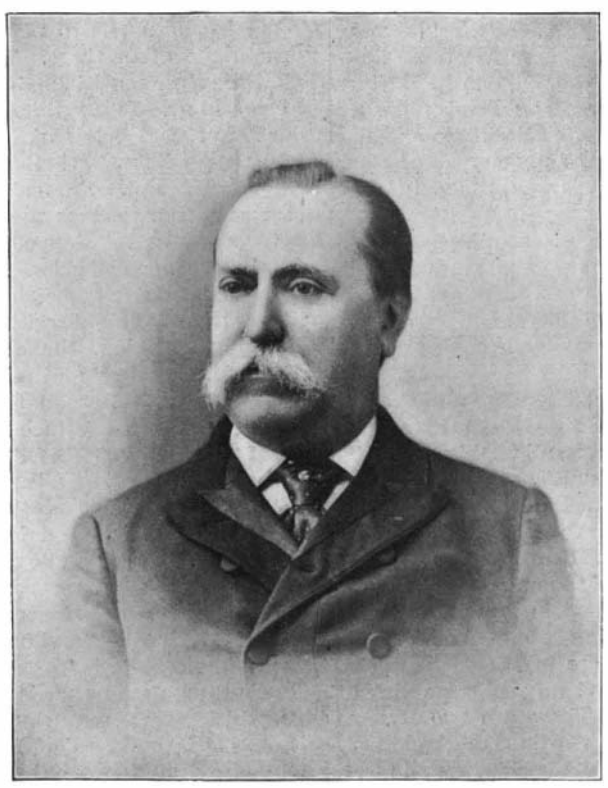
On the contrary, the rays discovered by Prof. Roentgen will be very usefully employed for the rapid examination of small parcels, postal packages, and valises. The officers of the custom house will have a method, either with the human lorgnette or with an analogous apparatus consisting simply of an electric source, a focus, tube and a fluorescent screen, of immediately ascertaining at a glance the relative accuracy of the declarations made by shippers or travelers. They will thus be able quickly to detect fraud; and, if they desire, to avoid submitting honest people to the useless annoyance of inquisitorial inspection. What is most unpleasant and vexatious in such inspections is the contact of the officers' hands with the linen and other objects contained in the baggage.

If the new process does away with the necessity of such contact, or simply permits of diminishing the frequency thereof, the director of the custom house will gain the thanks of the public by adopting it.—L'Illustration.

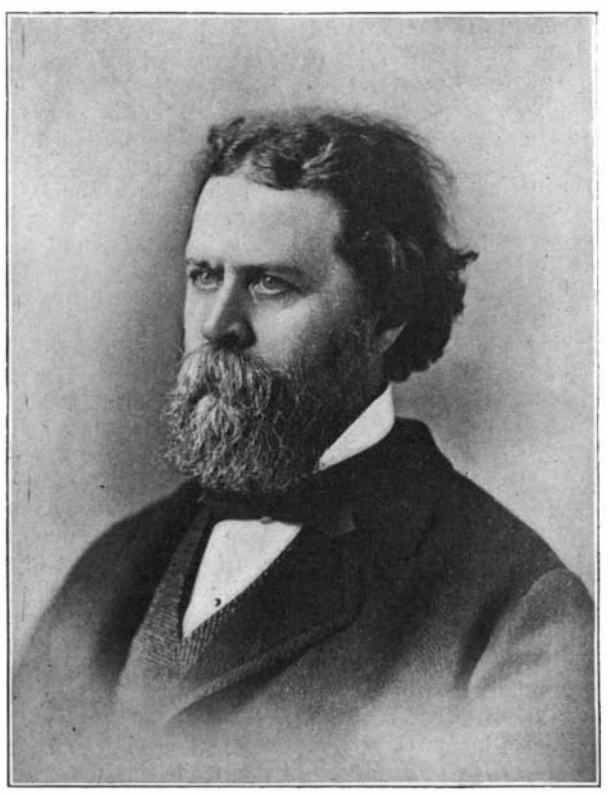
MEETING OF THE AMERICAN ASSOCIATION.

BY MARCUS BENJAMIN, PH.D.

It has often been noted as an interesting fact that the American Association has commonly three presidents in attendance at one of its meetings. These are the retiring president, who yields the chair to the incoming president at the opening of the session and delivers his address on the same evening, and the president elect, who is chosen at the meeting held on the last day. This year, by the death of Edward D. Cope, whose demise in the spring deprived this country of one of its most brilliant scientists, a fourth name presents itself in that of the senior vice president, who succeeded to the presidency, and who will call the meeting to order in the place of President Cope and deliver the retiring address, which on this occasion, at the request of the council, will take the form of a critical description of Cope's contributions to science. No one is more competent to attempt this task than Prof. Gill, for he has been the friend and fellow worker of Prof. Cope in similar lines since the early sixties, when the two young men were fellow students in natural history under Prof. Baird in the Smithsonian Institution. That the address will be a splendid summary of the work in natural history for the last quarter of a century is confidently expected by those who are already familiar with Gill's admirable biographies of Huxley and Goode that were prepared on the deaths of these two men.



PROF. THEODORE NICHOLAS GILL, PRESIDENT OF THE AMERICAN ASSOCIATION.



PROF. OLIVER WOLCOTT GIBBS, PRESIDENT ELECT OF THE AMERICAN ASSOCIATION.

PRESIDENTS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Theodore Nicholas Gill, who ranks among the very first of American zoologists, is a native of New York City, where he was born on March 21, 1837. His early education was received in private schools and from private tutors, and then he studied law, but never was admitted to the bar. As he grew to manhood he developed an interest in natural science, and during the winter of 1857-58 he visited Barbados, Trinidad and other West Indian islands for Mr. D. Jackson Stewart, for whom he collected shells and other specimens in natural history. The results of his explorations were worked up mainly in the library of Mr. J. Carson Brevoort, and published in the Annals of the New York Lyceum of Natural History and in the Proceedings of the Philadelphia Academy of Science. It was in the library (the best of its kind in the United States) of this patron of science that he laid the foundations for that great knowledge of books and authorities which, combined with a splendid memory, has stood him in such good stead in his latter years. In 1859 he visited Newfoundland and studied its fauna, and in 1860 prepared a report of the fishes of the northwest boundary for the State Department.

It was about this time that he came to Washington, which has since been his home, and in 1862 he became librarian of the Smithsonian Institution. This office he held until 1866, when the library was transferred to the Capitol, where he was continued in service until 1874, having become chief assistant. Subsequent to the last named date he has devoted his attention almost exclusively to studies in natural history, and is a daily worker in the Smithsonian Institution, having since 1894 held the honorary office of associate in zoology on the scientific staff of the National Museum.

Meanwhile he had become connected with the Columbian University, at first as associate professor of zoology and subsequently as full professor, which appointment he still holds, and gladly meets his classes