the warnings issued for the benefit of the fruit industry of Florida, the sugar interest of Louisiana and the truck-growing districts of the Eastern seaboard. The rain warnings from the San Francisco office for the benefit of the raisin district, during the drying season, were very successful. During the last three years not a single rain occurred in the raisin-drying region without a warning, and in only one instance was an unnecessary warning issued. The distribution of forecasts and warnings has been continued on practically the same lines as in former years. The climatic work of the Weather Bureau was very valuable, the statistics being collected concerning cotton, corn and wheat. The publications of the bureau show the usual care which is bestowed upon all government publications. The scope of the Monthly Weather Review has been enlarged and its usefulness increased through the untiring efforts of its editor, Professor Cleveland Abbe. It should be noted that Professor Abbe was one of the most active of those who thirty years ago advocated a government weather service. The scientific meteorological work of the Weather Bureau has been important as usual, and the results obtained with kites have been discussed in detail in a series of articles published in the Monthly Weather Review. The international simultaneous cloud observations were concluded on June 30, 1897. About 7,000 observations for cloud heights and probably 2,000 pairs of observations for direction and velocity were obtained at the primary station in Washington. Altogether, the report shows that this bureau of the government is well and economically administered, both from a utilitarian and scientific point of view.

## ARTIFICIAL FLIGHT.

The fact that so many gifted scientists and engineers are engaged on the problem of artificial flight affords, in itself, a strong presumption that sooner or later a successful motor-driven flying machine will be an accomplished fact. It is only in recent years that the question of artificial flight has been recognized as deserving a high place among the many unsolved problems which are worthy of the serious efforts of the scientist and mechanic. It was not so long ago that the flying machine was classed as a kind of first cousin to the perpetual motion device, and the mere suggestion that anyone was attempting to fly caused a smile of pitying contempt.

The early experimenter, with his flapping wings, his curious and cumbrous mechanisms, and his manifold misconceptions of the fundamental laws of flight, has given place to a notable array of talent in the person of such men as Maxim, Chanute, Langley, Lilienthal and Hargrave. In their hands the problem has been attacked from the scientific and mechanical standpoints. The laws of flight have been determined by years of such successful investigation that to-day aeronautics may be classed among the exact sciences; and the mechanical difficulties, on the other hand, have been so far mastered that the world is only waiting for a sufficiently light and powerful motor to see a practical flying machine as much an accomplished fact as the pneumatic bicycle.

We publish in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT a remarkable paper by Octave Chanute, the distinguished engineer and scientist, which gives the results of his own exhaustive experiments of the last few years to determine the principles of flight. It is impossible to review this valuable paper at any length, and it will be sufficient to enumerate the various elements of the problem which are mentioned by Mr. Chanute as having each to be solved separately and the results combined in the successful machine of the future. The elements to be determined are as follows: The supporting power and resistance of the air; the motor, its character and energy; the instrument for obtaining propulsion; the form and kind of the apparatus; the extent of the sustaining surfaces; the material and texture of the apparatus; the maintenance of equilibrium; the guidance in any desired direction; the starting up under all conditions; the alighting safely anywhere. The seventh element, that of equilibrium, is the one which Mr. Chanute has successfully solved.

In December, 1895, Mr. Chanute secured the services of Mr. A. M. Herring, a civil and mechanical engineer, and together they carried out a lengthy series of experiments in "gliding," with the purpose of solving the problem of equilibrium. This he has successfully accomplished by reversing the method of Lilienthal, who moved his body to bring the center of gravity under the ever-shifting center of pressure of the machine. Mr. Chanute provided mechanism within the machine which shifted the supporting planes over the center of gravity of the operator, and the results have been highly gratifying. The paper is accompanied with a large number of illustrations made from snapshot photographs taken during flight, and they show that the problem of equilibrium—perhaps the most essential of all—has been successfully solved. It was the failure of Lilienthal's device to maintain equilibrium, it will be remembered, that caused his death, the machine pitching suddenly forward and throwing him head first to the ground.

## EDISON ON PATENTS.

Thomas A. Edison has taken out probably more patents, says The New York Sun, than any other inventor. He owes his fortune and his fame to some of them; he has lost greater fortune and perhaps greater fame because he was not able to protect his rights in others. Naturally his knowledge of patent practice is extended, and when he talks of invention as a profession he speaks by the card.

"The value of a patent," says the inventor, "diminishes in the ratio at which the value of the thing patented decreases. That is to say, if a man gets up a patent on a wrench, that patent has a real value and may be profitable; but if he gets up a patent on a system which revolutionizes things and is of tremendous value to the world at large, that patent is not valuable to the inventor, on account of the procedure of the court.

"In a great many cases, outside of mechanical things, the trade secret is more valued as a protection than a patent. Dishonest persons often can get the inner track of an important discovery or patent, and make use of it illegally, while the inventor may never realize anything on his work, although he may spend thousands of dollars and continue the fight for years. Yes, the value to the inventor of a patent increases just as its value to the public decreases; the reward for his services increases with the lack of value of the patent. There is less reward than ever for the industrious inventor.

"One of my biggest inventions, for which patents were asked years ago, has just been declared mine by law. Meantime other men have been and are using it and are deriving the financial benefit, all on account of the workings of the patent system. Of course, I can sue them, but it will be a long time before I can do anything. In short, there is comparatively little reward for the inventor of the important machine. A trade secret is of value in the chemical line, for there it can be guarded. For instance, in the case of Bessemer of Bessemer steel fame. He made his money by making bronze powder by a secret process, and kept the secret in the family for years before it was finally given out to the world. As with the small patent, the small trade secret has the advantage in holding the market and in keeping the device from being stolen. Get up trivial inventions of minor importance and they are valuable.

"Infringers of patents take advantage of the practice of the United States Supreme Court. If you get out a patent which is likely to become valuable to the public at large, you will find that it will sooner or later be infringed upon. If it were possible to get an injunction immediately against an infringer all would be well, but you cannot do this. When you start up, the other fellow sails right in and begins manufacturing and selling just as you do, and generally at a lower price. You cannot do anything in court for five or six years, and the infringer knows this. After having spent a large amount of money and time in inventing your patent, you place the price of it to the public at a figure which will, you think, reimburse you for your expenditure. The infringer does not have to meet any of these exenditures, and can therefore afford to sell far below your price. A lawsuit for you is a costly matter; for him it is comparatively a trifle. For instance, in order to prove your patents you have got to make researches, you have got to have expert drawings made, and there are numberless other expenses which eat up profits. All the infringer has to do is to employ a lawyer who is noted for causing delays in court. Every time your case comes up he attempts to delay it, and generally succeeds. Meantime, you are manufacturing at a loss, while the infringer is manufacturing at a profit.

"If after five or six years you prove to the court that you are rightfully entitled to the invention, there is but one thing left to you—to attack your opponent's factory. At this point you will awake to the fact that he has no factory. You will find that the machinery has been rented, or else it is in the name of his wife, or that he has an irresponsible company made up of his employes or of his family, and when finally you swoop down upon him all you can find in his office is a desk and a chair. He can still run the shop machinery and give more trouble, and in the end there is not only no reward for the inventor, but absolute loss. It takes time to pioneer all new things. After you talk to the public, other people see that you have a good thing and organize irresponsible factories. You have, perhaps, spent $100,000 for machinery, tools, etc., then along comes the other fellow, without any responsibility, and makes all the money he can before you are able to get judgment against him.

"The laws are all right and don't need revision. It is not the laws. The Patent Office is all right, too. There is no corruption there. It all lies with the power and practice of the United States Supreme Court. Years ago they would grant an injunction on the face of the patent. The patentee had better rights. Now they don't, and that is what is driving every good man out of the business, or driving him into details, because they are safe. If you get up a wrench, there is not the danger of another man coming in and spending $200,000 or $300,000 fighting you on a thing which don't pay you $5,000.

"The operations of patent sharks sometimes compel an inventor to obtain patents for articles which are never meant to be placed on the market. A fellow often gets up a machine, and somebody else comes along, and by getting patents through for certain parts, can give the inventor a great deal of bother and make him pay well, even if the inventor gets control of it. A man ought to patent every part of his machine which he intends to use, so that he will have a bona fide claim to use it and cannot be infringed by other inventors. The inventor should first patent the principal parts and improvements, then patent the variations and completed model, to protect himself in the courts of law. In short, as I said before, the value of a patent to an inventor is directly decreased as the value to the public increases. The practice of the United States Circuit Court is such as to drive all the inventors away from revolutionizing inventions into little details."

## THE SMITHSONIAN INSTITUTION, 1846-1896.

We have received from the Smithsonian Institution a handsome quarto volume, entitled "The Smithsonian Institution, 1846-1896." The history of its first half century, edited by the late George Brown Goode. This beautiful volume, which issues from the De Vinne Press, has 856 pages, and is illustrated with engravings of the founder, secretaries and the regents of the institution as well as views of buildings, etc. The text is largely from the pen of the late George Brown Goode, and Messrs. Samuel Pierpont Langley, Cyrus Adler, W. J. McGee, W. C. Winlock, Frank Baker, F. William True and David Starr Jordan. The chapters take up the history of the Smithsonian Institution, giving a biography of James Smithson, followed by an account of the "Founding of the Institution," the "Establishment and the Board of Regents," "The Three Secretaries," "The Benefactors," "The Smithsonian Buildings and Grounds," "The Smithsonian Library," "The United States National Museum," "The Bureau of American Ethnology," "The International Exchange System," "The Astro-Physical Observatory," "The Zoological Park," "The Work of the Smithsonian Institution," "Smithsonian Publications," and a "Biographical Sketch of George Brown Goode." This matter occupies some 500 of the 800 pages, and is filled with important information on the history of the development of science in America. None of these chapters is more interesting than that which is given up to the three secretaries. It will certainly be hard to find three greater men in their respective lines than Joseph Henry, Spencer Fullerton Baird, Samuel Pierpont Langley. Then follows a review of the work of the Smithsonian Institution by such men as T. C. Mendenhall, R. S. Woodward, E. S. Holden, Ed. Drinker Cope, Theodore Gill, the late Gardner Greene Hubbard, H. Carrington Bolton, D. C. Gilman, J. W. Fewkes, Marcus Benjamin, W. G. Farlow, W. N. Rice, John Shaw Billings and A. R. Spofford. This splendid work is completed with an appendix, which gives important events in the history of the institution, compiled by W. J. Rhees. It is not surprising, after examining this book and seeing what this institution, the result of the bequest of a single man, has done to give American science its position in the world, that foreign governments should desire the same kind of an institution for their own countries.

## RECOVERY OF SILVER FROM FIXING BATHS.

Mr. Randolph Bolling writes us from the chemical laboratory of the University of Virginia, Charlottesville, Va., in regard to a new method of recovering silver from fixing baths. He states that, having had occasion recently to make an analysis of photographic fixing baths, to determine the amount of silver present in combination with the sodium thio-sulphate, the unoxidized silver salts on the developed plate were dissolved in a solution of thio-sulphate to form a salt having the formula $Na\,AgS_2O_3$. The silver was first precipitated by ammonium sulphide, and it came down as black sulphide of silver. This was then separated by filtration from the liquid, and, after being washed three times in hot water, was dried and heated on charcoal. The reaction which took place was as follows:

$$Ag_2S + O_2 = SO_2 + Ag_2.$$

The silver was then melted by a blowpipe, and finally it was weighed. Mr. Bolling obtained the following results:

Silver from the fixing solution of two developed $5 \times 7$ dry plates 0·2769 milligramme.

Silver from the fixing solution of two developed $3\frac{7}{8} \times 5\frac{1}{2}$ dry plates 0·2051 milligramme.

As the last plate mentioned is of the standard cabinet size, the analysis may be of some value to photographers. The results are certainly very interesting from a scientific and practical point of view.