

or chemical telephone. This receiver was based on a chemical principle. Directly back of a micro-diaphragm was a cylinder of plaster of Paris moistened with a chemical solution. A strip of platinum bore, spring fashion, against the surface of the cylinder, the other end being attached firmly to the center of the diaphragm. The instrument was placed in a circuit, one wire connecting with the spring and the other with the cylinder. When the cylinder was turned, it pulled upon the diaphragm evenly and no sound was produced. If a current from the transmitter were passing, its action on the chemical solution caused the mechanical resistance or the friction between the cylinder and the spring to vary, and thereby the diaphragm was vibrated in exact accordance with the original motions of the diaphragm of the transmitter. In this way the message was very loud and could be heard over the whole room. The telephone at once went into extensive use and was introduced everywhere. Enormously expensive law suits were instituted to determine the proprietorship in the basic inventions, which were decided in favor of the owners of the Bell patent, who have succeeded in maintaining a monopoly of the business for many years.

As now used, the telephone operating with a microphone transmitter and a Bell telephone receiver uses the secondary or induced current. To put subscribers in communication with each other what are known as switch boards are operated in the central exchanges. Some of these switch boards are enormous pieces of work representing thousands of dollars in value and embodying in their construction hundreds of miles of wire. Gradually the instruments have taken a single type of construction and the telephone industry has become one of the greatest electrical interests of the day. By the use of more perfect instruments and heavy copper wire the area covered by the telephone has been greatly extended and long distance lines have been established between the leading cities of the world.

STATISTICS OF THE TELEPHONE BUSINESS OF THE UNITED STATES FOR 1895.

Number of exchanges.....	927
" " branch offices.....	686
" " instruments in hands of subscribers.....	674,976
Miles of wire on poles.....	260,324
" " buildings.....	12,861
" " underground.....	184,515
" " submarine.....	172
Total employees.....	11,930
Total stations.....	281,695
Estimated daily exchange connections.....	2,351,420
Average cost of connection to the subscriber, from 1 cent to 10 1/2 cents.....	
Miles of underground wire in New York.....	38,986
" " " Chicago.....	20,352
" " " Boston.....	15,687
" " " Philadelphia.....	10,999

FIFTY YEARS OF THE SCIENTIFIC AMERICAN.

The present issue is published in the form of an historical review of the progress of science and mechanical industries during the past fifty years, and as it is commemorative of the fiftieth anniversary of the publication of the SCIENTIFIC AMERICAN by the present owners, it will, we feel sure, not be considered amiss if we give some account of the early beginnings and struggles through which the journal passed before it had made for itself a position of authority in the particular field to which it is devoted. The early numbers of the paper are rarely attainable, and cannot generally be reached even in our large public libraries. We have reproduced some pages of the first issues, in order to give our readers some idea of the character

of the paper at its inception, and we give below some account of its peculiarities and characteristics.

The size of the paper was more like that of the present daily newspaper. It had four pages. All the matter was printed on both sides of one large sheet and folded in the center so as to make a folio 19 x 13 1/4 inches.

Across the engraved heading, on which were shown steamboats, waterfalls, windmills, factories and a temple, as may be seen by examining the facsimiles of these early issues published on the front page, was printed the name, "SCIENTIFIC AMERICAN," in large letters.

Fifth Avenue Hotel, opposite to what is now Madison Square Park. In the issue of October 9 is a short description of the fair. Among the 1,300 entries is Hoe's printing press, Colt's repeating pistol, and Gurney's daguerreotypes, all of them time honored.

It was quite difficult to get up good illustrations then. The engravings were crude, yet they enhanced the popularity of the paper in the eyes of subscribers and readers. The illustrations covered several different subjects. On the front page of the second issue is shown a self-regulating windmill; in the next number

is a rotary steam engine, and in the succeeding number appears a picture of a traveling balloon, which may be accounted for by the fact that Mr. Rufus Porter was a strong believer in the possibilities of aerial navigation. In later issues may be found as front page embellishments illustrations of a semaphore telegraph, a steam carriage for common roads, Brown's dovetailing machine, a combination trunk lock, and an improved tubular boiler.

On October 20, 1845, the office was destroyed by fire, which caused an omission of two issues of the publication. In the November 13 issue, the first published after the fire, is a very characteristic editorial giving interesting details. The loss is placed at seven hundred dollars; not insured. In the same number as many as eight vessels are spoken of as being engaged in commerce on Lake Superior, while more vessels are building. It also mentions that a line of telegraph is being laid from New York to Pittsburg and that one between New York, Philadelphia and Baltimore will soon be completed.



PATENT DEPARTMENT OF MUNN & COMPANY, 1849.

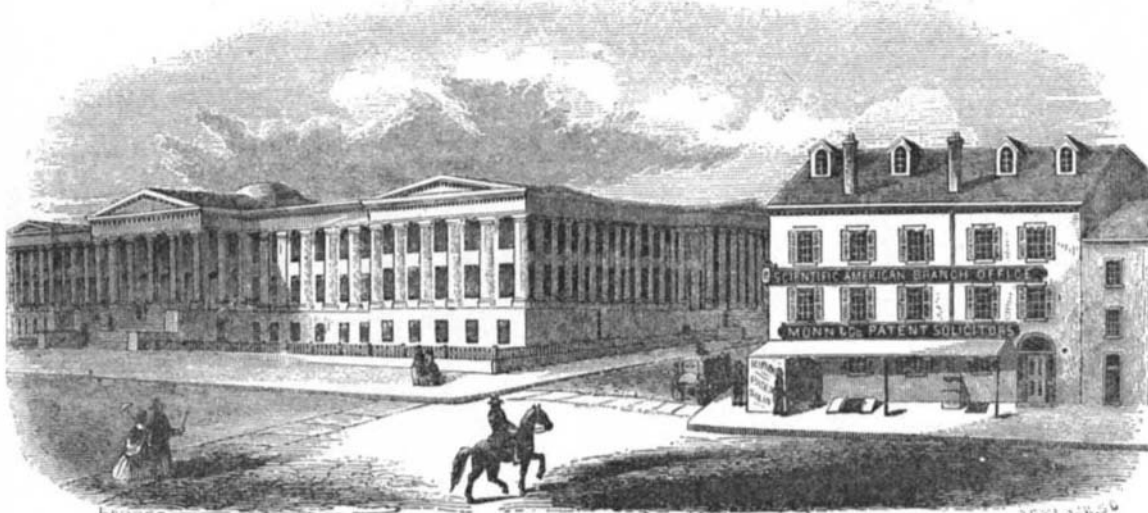
From a contemporary print.

To those interested in studying the progress of science in this country, the first volume is instructive in showing the gradual, yet rapid development that has taken place. The proprietor, then, Mr. Rufus Porter, was a versatile genius. Finding the world of science too small, he branched out in several directions; included poetry, temperance and religion among the subjects for discussions and essays. Temperance combined with science was uppermost in his mind, and gave the journal a high moral tone.

An examination of the business columns of the new paper will reveal many curious advertisements, and in them will be found some names well known to-day. There appears the advertisement of Daniel Davis' journal "Electrical Apparatus," a review of his famous book, "Manual of Magnetism," ranking as the modern "Gilbertus de Magnete." Adams & Company's express advertise largely, stating that it sends daily iron chests to Pittsburg for the transportation of valuables. "The Pioneer and Express Line" takes goods to Philadelphia in three and a half days, in perfect order. Advertisements of daguerreotypes and supplies show the extent and interest in the new art, at that time, of photography. Another interesting advertisement is that announcing the Eighteenth Annual Fair of the American Institute, at Niblo's Garden, October 6, 1845, with its cattle show out of town on the present site of the

Another item describes the steamship Great Britain, one of the earliest screw vessels, and attacks the practicability of screw propulsion. Railroad progress is given a prominent place. One item tells its own story: "Norris, of Philadelphia, has sent two more of his splendid locomotives to Russia." It demonstrates at how early a date the American locomotive was appreciated abroad, and is prophetic as regards the adoption of American machinery by Russia. It has been recently stated that an immense locomotive plant will be established in Russia, based on American ideas, as carried out by the Baldwin Locomotive Works, of Philadelphia, for the equipment of the great Siberian Trans-Continental Railway, which was at that time projected, but which is not yet completed. Another item alludes to a great work that is being done in the grading of thirty miles of roadbed, expecting it would be completed during the winter. The Baltimore and Ohio road has 177 miles finished. Most extraordinary of all, in the issue of December 11, 1845, is found the statement that "the last project we have heard on this subject is that for the construction of railroads elevated on rows of permanent columns to be erected in the principal streets of this city. We believe this project to be not the most visionary, however, and shall probably give an illustration in a future number." Quite a remarkable suggestion in view of the fact that it was not actually carried out until twenty or more years later, and may be said to be the foreshadowing of our present elevated railroad system.

Captain Eads' proposed ship railroad, across the Isthmus of Panama, attracted considerable attention, because of the ingenious application of hydraulic power to sustaining the strains on ships. But in the first volume of the SCIENTIFIC AMERICAN is to be found a ship railroad which solves the problem at once. It is proposed to mount a great tank upon wheels, to float the ships into it, then to close its ends like a lock, and carry the whole across the land,



THE FIRST WASHINGTON OFFICES OF MUNN & COMPANY.

United States Patent Office at left.

the vessel quietly floating in the tank or moving lock.

Other features of the paper include a series of articles on the Science of Mechanics, really excellent and worthy of reproduction, on account of the simplicity and aptness of the experimental illustrations. The subject of patents also begins to be noticed, a list of the patents issued in May and June, 1845, occupying less than a column.

However attractive and interesting the early numbers of the SCIENTIFIC AMERICAN may be from a retrospective point of view, it did not possess the elements of success, and, after a brief existence of ten months, Mr. Porter decided to part with all his interest in the paper, and in the early part of July, 1846 (according to the text of the bill of sale), all right, title and interest in the paper, including good will of the business, all types, cuts, engravings, composition cases and the various paraphernalia of a publishing office, including the subscription list, the most important of all, were transferred to the firm of Munn & Company, which was founded for the purpose of acquiring the publication. The value at which the SCIENTIFIC AMERICAN was at that time held, may be judged from the fact that the purchase price was eight hundred dollars. The new firm consisted of Orson D. Munn and his friend and schoolmate, Alfred E. Beach. The latter had been brought up in the office of the New York Sun, of which his father, Moses Y. Beach, was at that time the proprietor, and the young men with the enthusiasm of youth saw a great future, under proper management, for the feeble and struggling little journal. An office was secured in the old Sun building, on the corner of Fulton and Nassau Streets. The knowledge and experience acquired by being in such close relationship with the great daily was of great service to the young publishers. The interior of this office, as it appeared some three or four years later, is shown in one of the cuts reproduced from an early print published at the time. We regret to say we have not been able to procure a picture of the exterior of the Sun building of that day.

The first issue published by Munn & Company made its appearance on July 23, 1846. A facsimile of this number will be found upon the front page of the present issue. It will be seen that Mr. Porter was retained by the young proprietors as editor and for a few months his name still appears in conjunction with theirs upon the title page, but very soon a change is noticeable, and a new spirit is infused into the paper. What was a gain to the general reader at that time is a loss to us to-day, however, for we find the paper begins to lose something of its eccentricities and picturesqueness. It will be observed that articles on the Millerites and the millennium, which was expected in 1846, and in

which Mr. Porter was a strong believer, are less frequently noticed in its columns. It will be noticed also that less space is devoted to a discussion of religious problems and temperance. However much the new proprietors believed in the value of these virtues as touching private character, they did not think that a discussion of such problems formed proper subject mat-

enravings of new inventions and a resident correspondent at Washington is to keep the readers informed about what is going on at the Patent Office. Chemistry, architecture, gardening and mechanics are among the subjects promised. It is with regret that we turn away from the first volume, but in opening the second volume, September 26, 1846, we find the promises well fulfilled.

In 1847 the Mechanics' Journal, published at Albany, by Joel Munsell, was purchased, and its editor, Mr. Robert McFarlane, succeeded Mr. Porter as editor of the SCIENTIFIC AMERICAN.

In 1849 Mr. Salem H. Wales, now one of the commissioners of the new East River bridge, purchased an interest in the SCIENTIFIC AMERICAN, and was very actively interested in the editorial department till 1871, when he retired from the firm and became actively engaged in politics. Soon after this he was nominated by the Republican party for Mayor of New York City, but was defeated at the polls by the Democratic nominee.

The changes gradually introduced in the paper began to produce the anticipated results, and the journal slowly but surely increased in influence and circulation. The young proprietors were at this early date brought into contact with inventors, some of whom were successful, the great majority of whom were struggling. A Mr. Elias Howe was one of the latter, who frequently called with reference to a wonderful machine of his which would sew by

simply turning a crank. His name was soon destined to be known all over this continent and all through Europe as well. Needy and discouraged like the typical inventor, he could not find anyone who was willing to risk his capital in this curious machine. A. B. Wilson, the inventor of the Wheeler & Wilson sewing machine, was also a frequent caller at the office, and it was through the agency of Munn & Company that he procured his patents. He was much in the same condition financially as the great Howe. He was

fortunate in associating himself at an early date, however, with a man of means, great foresight and good judgment, Mr. Nathaniel Wheeler. The great Wheeler & Wilson establishment was the result of the uniting of their talents. Mr. Munn and Mr. Beach were in this way at an early date brought into contact with the inventors of the country, and they decided to establish a patent department in connection with the publication of the SCIENTIFIC AMERICAN, which had now been in existence several years, and which was this time a successful and influential paper.

This announcement had hardly been made before the office was besieged with inventors, who engaged Munn & Company to prepare their specifications and drawings and attend to their interests before the Patent Office at Wash-



SCIENTIFIC AMERICAN OFFICES, No. 37 PARK ROW, 1859-1882.

ter for the columns of a scientific journal. In like manner the Muses began to be neglected, and it will be seen that the department of poetry is gradually curtailed until it finally disappears. The most noticeable change, however, was in the form and size of the paper.

Near the close of the first volume the important announcement is made that it is proposed to enlarge the SCIENTIFIC AMERICAN, to print it from new type on fine paper, and to make it of quarto instead of folio size. Every number is to contain from three to six original



INTERIOR OF SCIENTIFIC AMERICAN OFFICES AT No. 37 PARK ROW, 1859-1882.

ington. Affairs now moved rapidly and it was found necessary to establish a branch office at Washington. A view of these first offices as they appeared at that time has been reproduced from a print of early date. These offices were opposite the Patent Office.

Judge Mason, when he retired as Commissioner of Patents, became associated with Munn & Company in their patent department. He was an able man, very popular with inventors, and was most successful in fighting to a successful issue the extension of the Morse telegraph patent. This noted inventor was at this time a constant visitor at the office of the SCIENTIFIC AMERICAN, in consultation with Judge Mason.

Captain John Ericsson Commodore Edwin A. Stevens, and Captain James B. Eads were among the other celebrities of those days who were constant visitors at the office.

In 1859 the offices in the old Sun building were found to be too contracted, and new quarters were secured at 37 Park Row (now the Potter building), opposite the City Hall and the New York Post Office. These offices were in a central and convenient location and were large and commodious, and admirably adapted to the work of the office. Several views of the exterior and interior are shown reproduced from contemporary prints.

On January 31, 1882, the Park Row office was destroyed by fire, the second conflagration the business had to pass through. The old building was a great center for patent lawyers, and a large quantity of irreplaceable models and valuable papers were destroyed. Temporary quarters at 261 Broadway, corner of Warren Street, were secured on the same day and were opened for business the next morning. In the fire was destroyed the type plant used for printing the subscription lists. To avoid writing wrappers and not delay the issue of the paper, photographic copies of the subscription lists that had been saved were made, and these photographic prints were attached to the regular wrappers in the usual way—an illustration of the



MODEL ROOM AT No. 37 PARK ROW.

utility of the science of photography in an emergency. The temporary quarters being too contracted for the business, the present commodious and well lighted offices at 361 Broadway, corner of Franklin Street, were secured, where two spacious floors are required to accommodate this large business. The engravings published on another page show the various departments of the patent business.

It was decided at the time of the Centennial Exposition in 1876 to publish a supplementary weekly paper, which could be devoted to the many objects of interest shown at the exhibition, and in which articles relating to the progress of the arts and sciences in foreign countries could be published, as well as abstracts of lectures and papers read before the various scientific and technical societies at home and abroad. This

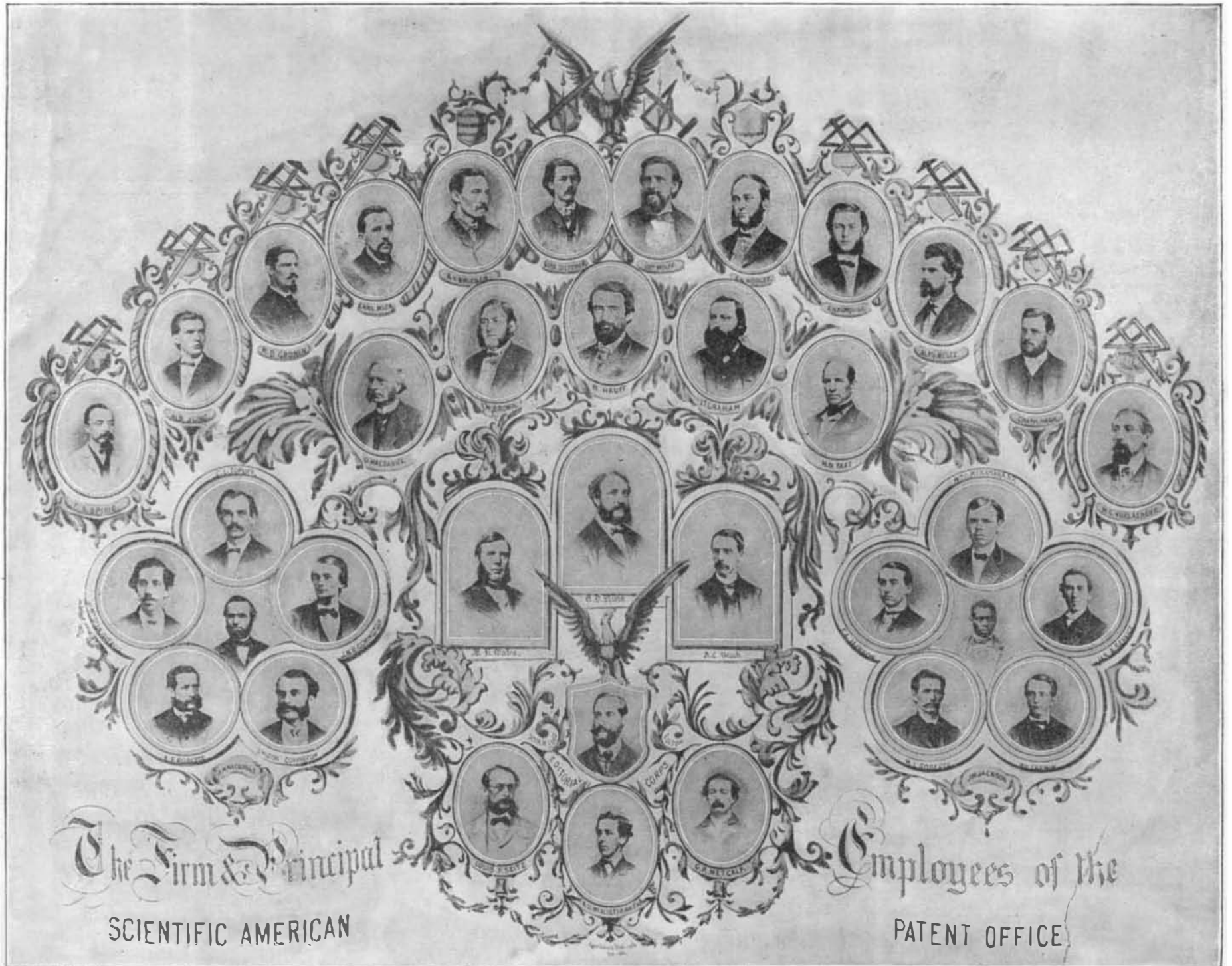
publication is known as the SCIENTIFIC AMERICAN SUPPLEMENT. No further mention of this journal is necessary, as this paper is well known to our readers. About the same time the Export Edition of the SCIENTIFIC AMERICAN made its appearance for circulation abroad. It was practically a monthly reissue of the SCIENTIFIC AMERICAN. During the past few years the trade relations between the United States and the South American republics, Cuba and Mexico, had become so extensive that it was decided to publish an edition of the SCIENTIFIC AMERICAN in Spanish. This journal is extensively read in all the Spanish-speaking countries. In 1885 the Building Edition of the SCIENTIFIC AMERICAN was established, and it at once met with public favor, and has acquired a very large circulation. It is a monthly publication and is well known to most of our readers, so it needs no comment here.

The copartnership which had lasted so many years was terminated by the sudden death of Mr. Beach, on January 1 of this year, thus rendering necessary the conversion of the business into a corporation under the laws of the State of New York.

The following sonnet in honor of the golden anniversary of the SCIENTIFIC AMERICAN was contributed by Mr. George A. Avery, one of our oldest employes:

TO THE SCIENTIFIC AMERICAN.
A laurel garland, through thy name we string,
Since half a century thy work hath grown;
For at thy birth-time arts were little known,
And sciences were meagre chronicling,
Till great invention gave us everything
Which fosters thrift or soothes the sufferer's moan.
Those fifty years are long, Thou art alone
In lapse of years and glories time doth bring.

And still the senior of the youthful twain
That started thee aright in thought and deed
Directs the lamps of knowledge, truth and peace
Upon thy columns with a loving pain
For him who died o'er-conscious of thy need
Of the life work he gave for thy increase.



THIRTY YEARS AGO—STAFF OF MUNN & COMPANY IN 1866.
Group designed by Gustav Dieterich, one of the draughtsmen at that time.