GEORGE N. SAEGMULLER.

MR. GEORGE N. SAEGMULLER was born in Bavaria and received his education, which combined a thorough practical and technical course at the technical school of Erlangen and the Polytechnic school of Nurnberg. After graduation he went to England and entered the business of Thomas Cooke & Sons at York, the greatest makers of astronomical instruments of the time. Cooke was a man of solid attainments, and his ideas and example gave young Saegmuller a powerful impetus in the direction he was consistently to follow. Both gave much thought to the building of Automatic Graduating Machines and several were produced. After staying with Cooke for four years Mr. Saegmuller went home for military service and served his time with the Fourteenth Infantry at Nurnberg as a one-year volunteer.

Returning to York he found the head of the firm dead and the outlook no longer promising. He therefore crossed the ocean, determined to make his home in America. From New York he went to Washington and there he met Mr. Wuerdemann, who was at that time a prominent maker of astronomical instruments. He was struck with Mr. Saegmuller's ideas on Dividing Engines and the construction of instruments in general and gladly engaged him for his business. Mr. Saegmuller stayed with him for nearly four years, constructing during this time a large Dividing Engine and other new apparatus. While with Mr. Wuerdemann he became acquainted with the head of the

Scientific Department of the United States Coast Survey, Professor Hilgard, who was favorably impressed by his ideas on the construction of geodetic instruments. The result was that, in 1874, he entered the service of the government as Chief of the Instrument Division of the Coast Survey. At that time the instruments used for primary triangulation were cumbersome theodolites with circles of 20 and 24 inches diameter. The construction of these unwieldly instruments aimed more at architectural beauty than the rigidity which is their prime essential. Mr. Saegmuller discarded the supporting Ionic columns and substituted for them the now universally used U-shaped standards. From that time the instruments, instead of being made of a multitude of pieces screwed together, all highly polished and lacquered, began to be constructed from an engineering standpoint, and more value placed on serviceableness than looks. The first instrument built on the new plan was exhibited at the Centennial Exhibition in 1876 and has remained the standard ever since.

The Coast Survey was then in possession of a Troughton and Sims Dividing Engine, made automatic by Saxton. It was, however, in no condition to do accurate work. Mr. Saegmuller devised plans for its reconstruction, and his recommendations were partly carried out, but the old center was retained. Even with this partial reconstruction the machine, if kept at an even temperature, did very good work. Instruments with the Saegmuller improvements, with twelve-inch circles, did as good work as the old ones of twice that diameter. Today large instruments are obsolete.

In connection with the determination of longitude, in which the chronograph plays an important

part, Mr. Saegmuller found the instruments in use cumbersome and unreliable. He devised the now universally adopted Centrifugal Regulator and Maintaining Power for the chronograph and gave the instrument the compact form which it has since retained. Numerous other improvements in instruments were devised, such as the Penta-Prism for vertical sighting, the Quick Leveling Head, and the Solar Attachment, by which last named instrument Mr. Saegmuller is perhaps more widely known among engineers than by any other invention.

While at the head of the Instrument Division of the Coast Survey, he devised the Automatic Level Grinding Machine, which, by means of variable link motions, allows curves up to 1200 feet radius to be ground with mathematical accuracy, and is the prototype of the machines now in use.

Mr. Saegmuller devoted much time to the development of the Tide Predicting Machine. This was devised by Professor Ferrel, who furnished the mathematical data. The calculations for the gear wheels, however, and the construction of the instrument, were the work of Mr. Saegmuller. This machine was built at Fauth & Company's manufactory under his supervision, and, after 25 years of continuous service, it is still in working order and performs the work of twenty computers.

In 1887 Mr. Fauth retired on account of ill health, and Mr. Saegmuller, purchasing his interest, from that time conducted the business alone. He gave much time to the construction of astronomical instruments and devised numerous improvements. Among the larger instruments he built were the 20-inch Equatorial at Denver, the 24-inch at Manila, while a number of 12-inch telescopes and others of smaller size are located all over

the country, as well as in Europe and Japan. The 12-inch Equatorial, built for Georgetown College, was the first instrument to contain the Finding Circles or Star Dial and the Compound Anti-Friction Roller. The Photo-Chronograph, carrying out the ideas of Professor Fargis of Georgetown College, was also devised at that time, as were the Prismatic Transit and the Double Surveying Sextant. The Automatic Dividing Machine was also completed—perhaps the best ever made—which does automatically what was done up to that time by hand correction, and makes it possible to graduate circles with such accuracy that errors no longer need be taken into account.

In 1896 began a new era for the business. At the instance of Captain, afterwards Admiral Sampson, Mr. Saegmuller turned his attention to the development of Telescopic Gunsights. A year or two before the war with Spain, Captain Sampson had told how difficult it was for the gunners to take accurate aim with open sights. Three points had to be brought into alignment, the sight at the breech of the gun, the sight at the muzzle, and the object aimed at. To bring these three points into exact relation one with another by means of the unaided eye, was a matter of such difficulty that it injected into marksmanship a high proportion of pure chance. Captain Sampson wanted Mr. Saegmuller to devise some means whereby shooting might be made more scientific. The solution was simple; it consisted in laying a telescope along the gun, exactly parallel with its bore. The telescope itself thus became a substitute for the two sights on the gun. This paralleling of the bore presented difficulties which were solved by Mr. Saegmuller by the invention of the Bore Sight Telescopes, which

are now in use on every United States man-of-war. The first sights were telescopes of very low power. In those days the machinery for manipulating ordnance was very slow and unwieldly, and it was necessary that the telescope should have a large field, so that the object aimed at might not be lost sight of. With the improved mountings the guns can now be moved with the greatest ease in any direction. The large field is, therefore, no longer necessary, and high power telescopes are being used. They have become so perfect, indeed, that they are interchangeable; i. e., one will point at the same point the others do; they transmit a maximum of light and can be used even at night; and the eyepoint is far enough away to allow the interposition of a rubber eyeguard to shield the eye from the recoil of the gun. By an ingenious method of illumination it is possible to point at night without illuminating the field and obscuring faint objects. Mr. Saegmuller has applied an Automatic Shutter, which closes the telescope at the moment the flash appears, saving the gunner's eye from the blinding flash of the discharge. With the improved mountings devised by the Bureau of Ordnance of the Navy and the other developments, shooting is no longer a matter of chance; it is a science.

Relations between Mr. Saegmuller and Messrs. Bausch & Lomb date from the formation of Fauth & Co. Optical requirements brought Mr. Saegmuller to Rochester with increasing frequency. Bausch & Lomb had been making lenses for surveying instruments for years, and in this and other departments of work their operations fitted in with those of the Washington manufacturer. As time progressed Rochester became more and more the

base of supplies for optical appliances. Every month saw the two houses coming into contact at a larger number of points. Eventually, in 1905, the two concerns joined hands and formed the Bausch, Lomb, Saegmuller Co. Since that time both branches of the firm have steadily increased. Mr. Saegmuller started with a comparatively small floor space, and, during the time of his location in Rochester, it has been more than trebled. Factory extension soon became imperative for all concerned.

Like Mr. Bausch and Mr. Lomb, Mr. Saegmuller has brought up his three sons to assist him in the business. Lee Saegmuller was for five years at Stuttgart, studying and practising the manufacture of astronomical and engineering instruments. Fred B. Saegmuller attended the University of Virginia and afterwards studied mathematical optics with Dr. Kellner. At the present time he is studying Zeiss methods at Jena. George M. Saegmuller, the youngest son, is taking a course in mathematics and physics at the University of Jena.

Washington D.C. July 29, 1898: The fire began in the 2nd floor carpentry shop. Consuming wood and waste materials, it quickly grew and spread to the adjoining pattern shop, where thousands of wooden casting patterns furthered the conflagration. In spite of the efforts of sixteen workers who tried to extinguish the flames, the fire grew and burst out of the second floor windows. At this point, the men began saving what they could of George N. Saegmuller's completed astronomical and engineering instruments.

A malfunctioning city call-box sent fire crews to the wrong location, but once on scene the fire was brought under control and extinguished. The firemen managed to save the finishing shop machinery on the second floor. However, because part of the second floor was burnt through, the first floor machine shop was drenched in water and cinders.

The good news was that while the building blazed out of control, the workers carried an estimated $12,000 worth of completed instruments to safety. Also, not a single one of the company's specification drawings was lost. All hands set to work immediately to clean and oil the first floor and finishing shop machinery, and those were put in working order by the end of the long day.

The bad news was reported by the local newspaper the following day, July 30: *"Property that cannot be replaced for $20,000 was destroyed in less than an hour yesterday afternoon, when the pattern shop of George N. Saegmuller's astronomical instrument manufacturing establishment, at 108 Second Street southwest, was gutted by fire. The patterns destroyed were models of every part of the largest and smallest astronomical and engineering instruments to the number of several thousand. Three men have been employed almost continuously for twenty-eight years making these models."*

This was a terrible blow; Saegmuller's lost patterns would have represented every single, separate metal piece involved in the manufacture of his surveying and astronomical instruments since 1870. Made of mahogany, the patterns were used to make molds for casting each metal part. The patterns themselves were geometric replicas of the casting to be reproduced, slightly oversized to compensate for a metal's shrinkage during solidification, and to allow for machining of the part afterward. In addition, the casting patterns would also include proper allowance for the draft, meaning the sides would be tapered so the pattern could be removed from the mold without disturbing the impression. Each pattern was thus complicated and unique. Because the working drawings were saved, the patterns could be re-created over time, and indeed more men were hired soon after to aid in the endeavor, but the loss of the originals must have been enough to quell even the stoutest of hearts. ■