got in blocks of almost any size, but from the tie of the jointing is costly to quarry. This fact, and the competition of quarries nearer the sea, ruined the Dartmoor granite industry, and Heytor has been disused nearly fifty years.

The gage of the tramway was apparently 4 feet between the faces of the ledges or rebates which guided the wheels; but some blocks have tilted outward a little from the load not coming in the center line. The fall from the quarries to the canal must be at least 1,000 feet, so that loaded wagons ran alone a large part of the distance. They were very small and low, on four cast iron wheels nearly 3 inches broad and 2 feet in diameter. The leading vehicle was fitted with removable shafts for a horse. Other horses were, no doubt, sometimes used in tandem fashion. The absence of cross sleepers was, of course, very advantageous in horse traction, for which they are greatly in the way. Quite five miles of the course of the line are readily traceable, over the greater part of which the blocks were still down two or three years ago. Although it is a single line, there was not more than one passing place in that distance. A walk of about three miles from Bovey Station brings you to Heytor, where the most perfect part of the line remains, and the view from the top of the rocks, above it, is extremely fine on a clear day.

Some 16 miles southwest from Heytor are the remains of another derelict railway, formed by an Act of Parliament of 1819 for bringing down stone from Dartmoor to Plymouth. This was mainly laid with cast iron fish-bellied rails, but some of the sidings or passing places have short pieces of granite rail. In this case, the wheels having flanges in the usual way, the top of the blocks is dressed to a surface along the inner edge. The greater part of this line was opened in 1823; a small portion near Plymouth is still in use, and the company owning it, the Plymouth and Dartmoor, can boast of being the oldest railway company in the world.

In the American Cyclopædia, 1875, article Railroad, it is stated that on the Quincy Railroad in Massachusetts, opened in 1827, there were stone rails at the level crossings, the line being a short one for quarry purposes, like those just mentioned. There can be little doubt that good stone, in sufficiently large pieces, would be a stronger material for railway construction than the very light iron rails then used, where heavy weights and horse traction were used in combination.

Aeronautical Notes.

On Tuesday, the 10th instant, the first new military dirigible balloon to be constructed in England for the British War Department made its trial trip near Farnborough. Two trials of the airship were made on this date. In the first one, after a flight of about two miles had been made around Farnborough and Cove Common, the engines stopped, and the balloon settled down near some trees. The aeronauts threw out all the ballast (800 pounds) without being able to get the airship to rise. In this test the new dirigible stemmed a wind of fifteen miles an hour, navigating against it without difficulty, and traveling over the ground at about five miles an hour.

In the second trial the airship performed different evolutions, and completed a three-mile circle at a height of about half a mile. It afterward descended successfully near its shed.

This new dirigible is said to consist of a sausage-shaped balloon about one hundred feet long by thirty feet in diameter, which gives it a lifting capacity of about two tons. The balloon is provided with a framework of aluminium covered with canvas, on which are carried the engines and other apparatus. An arrangement is provided for keeping the balloon distended by means of ballonets, which are inflated in the usual way by blowers operated by the engines. Three men can be readily carried by this new airship.

M. Bleriot made a successful flight with his new aeroplane above the drill grounds at Issy, France, on the 17th instant. After running along the ground for a distance of about 75 yards, the machine rose to a height of some 50 feet, and flew a distance of 598 feet. The motor stopped working, and the aeroplane settled down rather abruptly, which damaged it somewhat and cut the daring aviator about his head. The distance covered in this flight is the nearest approach to Santos Dumont's record of 689 feet.

Thirty-four balloons ascended in clear air and, carried by a light wind, drifted southward over the field of Waterloo in an international balloon race that was started from Brussels, Belgium, on the 15th instant. This race was conducted by the Belgian Aeronautic Club, the prize being a silver cup donated by the club. The German balloon "Pommern," piloted by Herr Erbslob, won the race by descending at Bayonne, France, 621 miles from Brussels. A Swiss balloon was second, landing at the foot of the Pyrenees after covering a distance of 565 miles. Prof. Huntington, of England, was third, with a distance of 553 miles to his credit, while Mr. Rolls with another English balloon, the "Britannia," was fourth with 534 miles, the balloon landing at Sanguinet. An Italian balloon piloted by Usuelli covered 515 miles, and Herr von Abercron's German balloon came down at Carcans, 481 miles from Brussels. The contest was an extremely interesting one in view of the large number of balloons that competed.

The United States Army Signal Corps officers have recently established a balloon corps. This corps will be under the immediate charge of Capt. Charles De F. Chandler, and will also be under the tutelage of Leo Stevens, the well-known aeronaut and balloon constructor. It is planned to make ascensions from Washington in one of the new army balloons. It is also expected that within the next few months systematic ascensions and test flights will be made at Omaha, Neb., where the Signal Corps has a station, and where special arrangements have been made for the manufacture of compressed gas to be used in the balloons. The new corps will endeavor to learn in a practical way the advantages of the balloon for scouting purposes. In time, no doubt, this branch of the army will experiment with dirigible balloons and with aeroplanes, in the same manner as is being done by the leading foreign governments to-day.

Correspondence.

Apprenticeship System on the Pennsylvania Railroad.

To the Editor of the SCIENTIFIC AMERICAN:

I am in receipt of a letter signed W. S. Vanover, written from Lexington, Va., inclosing a letter from you to him under date of September 6, 1907, in which you advise him to enter the railroad university conducted by the Pennsylvania Railroad Company at Altoona.

There seems to be a pretty general misunderstanding as to what the Pennsylvania Railroad Company is doing in this respect at Altoona; and I thought it advisable, therefore, to let you know exactly what we are doing. Your letter referred to is certainly misleading. We do not conduct a railroad university at Altoona, in the ordinary acceptation of that term. What we do is as follows:

Young men, graduates of technical schools, either in the mechanical or engineering departments, are taken into our service in the mechanical departments as special apprentices, serving a period of four years in the different shops, offices, and laboratories of the company, thus fitting them for positions of responsibility with the railroad company.

In the engineering department these young men are employed as rodmen, from which position they are promoted according to seniority and ability to transitmen, assistant supervisor, and so on up into positions of importance and responsibility with the company. The maintenance-of-way men do not serve any fixed time in any of the positions referred to, but they are advanced accordingly as the vacancies occur and their abilities fit them for.

It will be observed from the above that we do not maintain a university or a school, in the ordinary acceptation of the term.

At Altoona, however, in connection with the public school system there is a manual training school, the higher branches of which are conducted in connection with the Altoona High School; and it is proposed to have this manual training course include a post-graduate course of approximately two years, thus giving special training to graduates of the high school in mechanical work, so as to make them better fitted for mechanical positions, not only with our company, but with any company with which they desire to become connected. The Pennsylvania Railroad Company is interested in this manual training school only to the extent that it increases the available material for them to draw upon for a higher class of mechanics; and for this reason the Pennsylvania Railroad Company donated a sufficient sum of money to properly equip the manual training school in the high school building.

G. W. CREIGHTON,
General Superintendent.

Test of Wellman's Airship in the Arctic Regions.

The following account, by Mr. Walter Wellman, of the first flight of his airship "America" in the Arctic regions may be of interest to our readers, in view of the fact that this test was the culmination of two winters spent in preparing the airship and two summers spent at Dane's Island with it in an effort to get it ready to start for the pole. The start was finally made on the 2d instant, and the following is a dispatch to the Lokal Anzeiger of Berlin, sent by Mr. Wellman from Tromsoe, Norway:

"After the steamer 'Express' cast off the cable, the balloon 'America' did excellently, but an increasing wind soon gave us a hard struggle, and the storm drove us toward some high, jagged mountains near the coast, where the airship would have been destroyed if she struck.

"There then ensued a hard fight between the storm and the motor. The latter triumphed, and we slowly rounded the north end of Foul Island in the teeth of the wind. Our confidence in the 'America' had so increased in the meanwhile that I gave the order to start for the north pole.

"The wind, however, increased to twelve miles an hour, and the snow fell so thickly that we could not see a quarter of a mile. Just then the compass failed to act owing to defective construction. We were completely lost in a snowstorm above the Polar Sea and threatened with destruction. After a brief deliberation we decided to try and get back to the 'Express' to rectify our compass and start again.

"It was impossible, however, to keep in one direction, and we were again carried into dangerous proximity to the mountains. Vaniman, the engineer, then started the motor at top speed, and the 'America' moved a second time against the wind, which probably was blowing fifteen miles an hour.

"She circled three times in the teeth of the wind. We saw the 'Express' for a moment, but immediately lost her again. We would have returned to the 'Express' if we could have seen where to steer, but under the circumstances the only thing possible was to try to land. With this idea we stopped the motor and let the 'America' drift over the glacier.

"At the end of Foul Bay we used a trailer filled with provisions and a brake rope. Both acted well and dragged over an ice wall 100 feet high without damaging the provisions.

"After crossing the glacier we opened the valve, and landed on the upper glacier, half a mile inshore. The landing was effected so successfully that material weighing nine tons descended three hundred feet and touched the ice with no shock or damage whatever excepting several bent tubes and broken wires. The numerous delicate instruments were not injured. The self-registering barographs, meteorographs, and manometers continued running after the landing. The mantle of the balloon can easily be repaired.

"The 'America' was in the air for three hours and fifteen minutes, and covered about fifteen miles with her own machinery. She made three loops against the wind, proving her power and capability of being steered. The ascent was successful in every respect. The 'America' is from every standpoint the strongest airship and the most durable for a long journey that ever was built. She held the gas splendidly.

"Later in the same day the 'Express' found us, and fetched the steamer 'Frithjoff,' with men and sledges from the camp. The crew of the 'America' lived for three days comfortably in the gondola while the work of rescuing the balloon was in progress. They could have lived there for nine months had it been necessary. The entire airship, including even a part of the gasoline, was returned to the camp in three days.

"The balloon and the entire outfit have been made ready for the winter, and three men have been left on guard.

"After this successful attempt we were all convinced that the 'America,' in normal summer weather, can make her way to the pole. We all regard this plan as rational, practicable, and feasible. The thing can be done, and what can be done shall be done."

The Current Supplement.

Advances in the construction of telescopes and other astronomical instruments have enabled scientists to make new discoveries far surpassing those made even a few years ago. "Recent Progress in Astronomy" is interestingly written about and fully illustrated in a lengthy article in the current SUPPLEMENT, No. 1656. The efforts made to obtain turpentine and other products from waste wood are described by J. E. Teeple, Ph.D., and J. S. Miller writes on asbestos, a useful mineral, of which the supply is insufficient. Few toolmakers know how to test with any precision the grade of a bar of steel. In an article on "The Spark Method of Grading Steel," Albert F. Shore, M.E., describes a method of testing steel with an air blast. The first of a series of practical articles on the "Elements of Electrical Engineering" is written by Prof. A. E. Watson, and an illustrated note on "Automatic Speed Control for Magnets" will also be of interest to electricians. The Cape to Cairo railway, dreamed of for years by Cecil Rhodes, is gradually becoming fact; from its southern end it now stretches through northwestern Rhodesia toward the Congo Free State frontier. Our English correspondent describes and illustrates one of the features of this length of line—the building of the longest bridge in Africa. The fifth of J. H. Morrison's articles on "The Development of Armored War Vessels" brings us to the verge of modern construction. Dr. A. Gradenwitz contributes a valuable note on the "Cause of Vitiation of Confined Air." We have several times lately referred to archæological research in northern Africa; much of this work has been done by European investigators. In the current SUPPLEMENT the Egyptian work undertaken by the New York Metropolitan Museum is described.