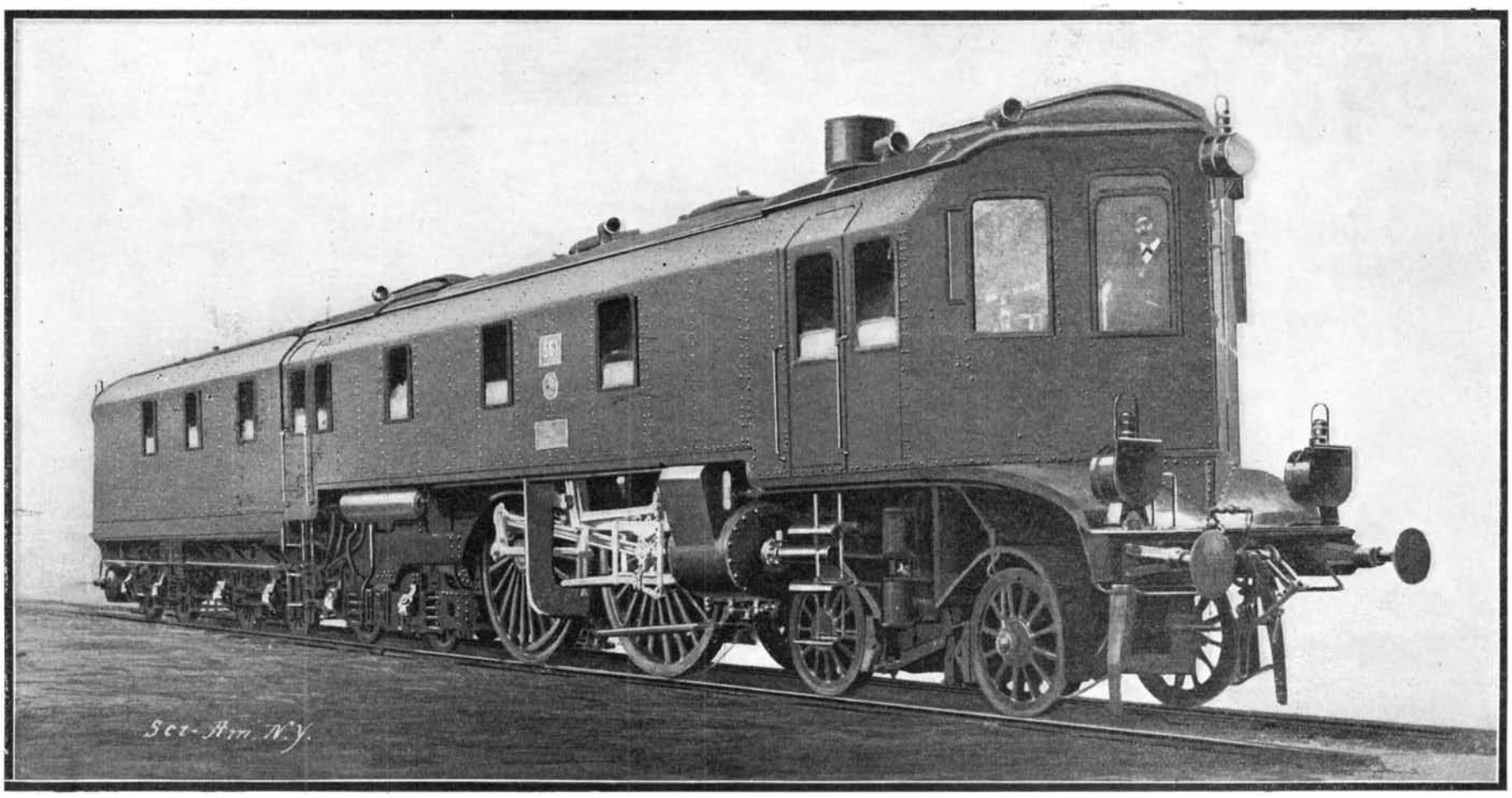
A GERMAN HIGH-SPEED LOCOMOTIVE.

It will be remembered that toward the close of the recent high-speed electrical tests on the Berlin-Zossen government railroad, it was decided to carry out another series of tests, this time of steam locomotives, to determine what was the highest practicable speed that could be obtained with railroad trains of a given weight hauled by steam locomotives of exceptional power designed especially for this work. The accompanying illustration was made from a photograph of one of these engines which, a short time ago, was completed at the works of Messrs. Henschel & Sohn, Cassel, Germany. The locomotive was designed to haul a train of four or five corridor passenger coaches, of a combined weight of 200 American tons at a sustained speed of 80 miles an hour, and with an indicated horse-power of 1,400.

The locomotive is a three-cylinder compound, with the high-pressure cylinder located inside, and the two low-pressure cylinders on the outside, of the frames. The inside high-pressure cylinder is connected to a crank on the axle of the forward pair of driving wheels, while the low-pressure cylinders are connected to the rear driving wheels; all four wheels are coupled together. Forward under the smokebox is a four-wheeled truck, and another four-wheeled truck is located beneath the firebox.

The tender is carried on two four-wheeled trucks, and all the wheels, both of locomotive and tender, are fitted with both hand and air brakes, the latter working under a pressure several pounds higher than is customary. The total length of the engine from the front of the locomotive to the rear of the tender is 81 feet. The peculiar appearance of the locomotive is due to the fact that both the engine and tender are completely incased in a sheet steel covering, which is finished at the front of the locomotive with a wedge shape, with the object of reducing the air resistance. The chief engineer has his cab in this wedge-shaped front, which is provided with large glass windows to give him an unobstructed view ahead. He has an assistant engineer in the cab, who takes his turn at stoking with the fireman. Communication between the fireman and engineer is had by means of running boards located inside the engine casing; while at the rear of the tender there is a gangway, which permits of communication from end to end of the train, from the engineer in his cab to the conductor or "guard" at the rear of the train.

The locomotive has a grate area of 50 square feet, and a heating surface of 3,000 square feet. The capacity of the tender is 4,000 gallons of water and 7 tons of coal. When it is fully equipped for service, the locomotive weighs 177,000 pounds, and the tender 128,000 pounds, the total weight of engine and tender being, therefore, about 150 short tons. This load has been so distributed that the concentrated wheel load will in no case exceed that which is allowed by the official regulations. It is interesting to know that this locomotive, which has been designed according to Baurat Wittfeld's data, is to be exhibited at the St. Louis World's Fair after a series of trial runs has been completed.



GERMAN HIGH-SPEED LOCOMOTIVE.

A New Mineral from Ceylon.*

BY SIR WILLIAM RAMSAY.

In the beginning of February I bought from Mr. Holland five hundredweight of the mineral described by Prof. Dunstan in Nature. It crystallizes in cubes, and the density is substantially that found by him. Mr. Tyrer, of the Stirling Chemical Works, Stratford, was so kind as to promise to work it up for me, and the process is still being carried on.

I had hoped to have positive and definite results to communicate before describing its constituents, but the publication by Prof. Dunstan of an analysis, and his statement that he is still engaged in its investigation, makes it necessary to write this letter.

The mineral, when heated alone, gives off 3.5 cubic centimeters of helium per gramme; fused with hydrogen potassium sulphate, the amount is increased to 9.5 cubic centimeters. From this source I have already stored about 12 cubic feet of pure helium extracted in Mr. Tyrer's works.

It was at first believed that the mineral was rich in uranium, but different specimens contain only from 8 to 12 per cent of that element, agreeing in this respect with the analyses published by Prof. Dunstan. Next, the other main constituent was believed to be zirconium, but the high density of the mineral rendered this improbable. An analyst of high standing, whose daily business it is to analyze minerals of this kind, returned 82 per cent of zirconia as a constituent; the percentage of thorium was trifling—under 1 per cent. The mineral contains practically no thorium; this has been repeatedly confirmed in my laboratory. Nor does it contain any appreciable amount of cerium, lanthanum, and didymium. The oxalate is almost completely soluble in excess of ammonium oxalate—a reaction which excludes thorium and the cerium group, but which points to zirconium. The equivalent of the elements of the oxalate group, which I at first took for zirconium, excludes the presence of any large quantity of zirconium, although that element is undoubtedly present. Fractionation shows that the oxalate precipitate (the portion soluble in ammonium oxalate) gives equivalents between 25.0 (the most insoluble portion of the double sulphate) and 44.7 (the most soluble portion); by far the major part of the element has the last-mentioned equivalent. The separation of this portion is now being carried out with large quantities of material; several hundredweight is being worked up.

Assuming that the element is a tetrad, which is probable from its behavior, it undoubtedly possesses an equivalent approaching the highest number (44.7), and for this there is a gap in the periodic table between cerium and thorium; one at least of the elements present (supposing that there is more than one present) will probably have an atomic weight of about 177, preceding tantalum (182.5) in the horizontal row of the periodic table.

I am at present engaged in mapping the spectrum of this new body or bodies.

As for the radio-activity, the mineral was bought in the hope that it would have a high content of radium. There is a trace of radium present, due, no doubt, to the spontaneous change of the uranium which the mineral contains. But the radio-activity due to this source is certainly not 5 per cent of the total.

The period of decay of the emanation appears to point to the presence of a radio-active element closely resembling thorium X. The half value is 50 or 51 seconds, and while this is not quite the time for the decay of thorium emanation, it very nearly approaches it; at present the balance of evidence appears to point to the presence of an element closely resembling thorium, but not identical with it. The total radio-activity, moreover, is much greater than can be accounted for by the supposition that the one consists of pure thoria. Within the limits of a letter I am obliged to omit many more characteristics of this curious ore which have been ascertained, but I hope soon to be able to publish more definite results; as it is, I regret to have been obliged to tell an imperfect story.

I should like to conclude by acknowledging the great assistance given me in this work by Mr. Tyrer and by my students, Messrs. Gimingham and Le Rossignol.

* Nature.

Utilizing Whale Carcasses.

It is announced that the American company which established the plant at Balena, Newfoundland, using the Russmuller process of utilizing the carcasses of whales, has met with complete success and that the government of Newfoundland has established new plants at Chateau, St. Lawrence, Agnaforte, Cape Royal, and Snooks Arm. There are now in the course of construction and nearing completion plants at St. Mary's, Trinity, Safe Harbor, Lemonine, Lance au Loupe, Cape Charles, Notre Dame Bay, and one in Labrador, all of which are operated under the same process. Up to 1892 the business of utilizing commercially the carcasses was carried on by an English syndicate, which employed a number of experts, but gave up the business after expending a capital of $180,000. Every ounce of the whale is used in the manufacture of oil, stearin, bone meal or bones, and other articles of commerce which are shipped abroad. This new industry employs a capital of more than $1,000,000 and furnishes employment to over 1,000 men, many of whom were forced to go elsewhere each season to obtain work.

Discovery of a New Comet by Dr. Brooks.

Dr. William R. Brooks, director of Smith Observatory, and professor of astronomy at Hobart College, discovered a new comet on the evening of April 16, in the constellation Hercules. Its position at discovery was right ascension 16 hours, 58 minutes, 10 seconds; declination north, 44 degrees, 10 minutes.

A second observation was secured on the evening of April 17, with a position of right ascension 16 hours, 55 minutes, 5 seconds; declination north, 44 degrees, 48 minutes. This gives a daily motion of three-quarters of a degree in a northwest direction. The comet is at present a fairly bright telescopic object with a short tail.

It is the first comet of 1904 and the twenty-fourth comet discovered by Prof. Brooks.