

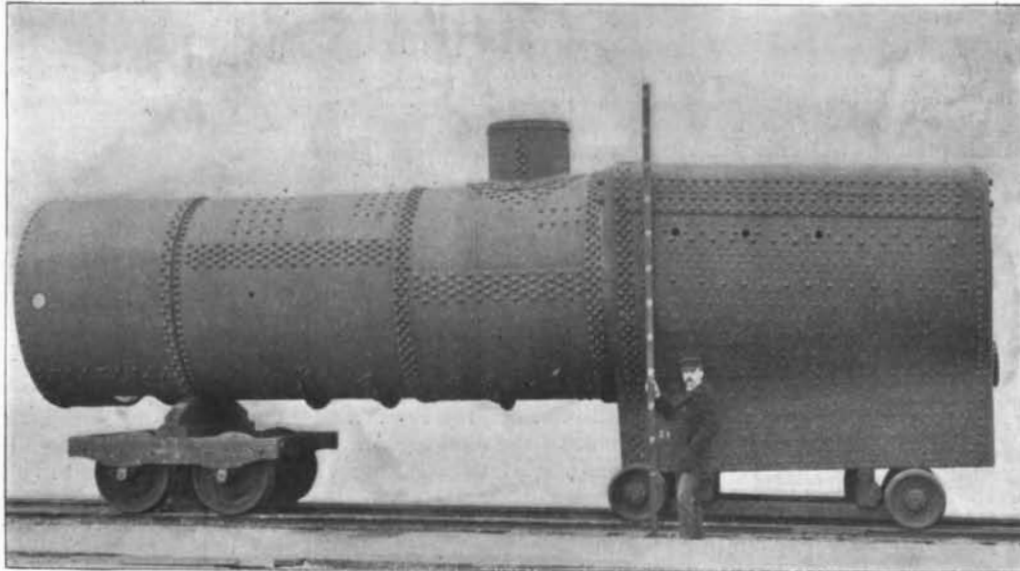
THE LARGEST LOCOMOTIVE EVER CONSTRUCTED.

We give two illustrations of what is undoubtedly in all respects the largest locomotive in the world. It is one of two which have been built by the Brooks Locomotive Works for the Great Northern Railway, for the purpose of hauling heavy trains over the mountain division of that road. The giant proportions of this machine are evident at a glance by comparing its various parts with the figures which are shown in the photographs. We have from time to time illustrated the most powerful locomotives as they were put in service, the most notable of which of recent date are the Decapod freight locomotive for the New York, Lake Erie and Western Railway, illustrated in the SCIENTIFIC AMERICAN July 15, 1896; the twelve-wheel locomotive for the Northern Pacific, illustrated in our issue of April 24, 1897; and a special mountain locomotive for the Mexican Central. The particulars of these engines are shown in tabulated form below, and they afford an interesting comparison with the powerful machine which is the subject of the present article.

Of these engines, there is only one whose total weight on drivers is equal to that of the Great Northern engine. This is the powerful Decapod, owned by the New York, Lake Erie and Western Railroad, the total weight on drivers in

both cases being 172,000 pounds. The weight on the first pair of drivers of the Great Northern engine is 42,000 pounds; on the second pair, 45,000 pounds; on the third, 43,000 pounds; and on the fourth pair of drivers, 42,000 pounds. In addition to this there is a load of 20,375 pounds on each pair of truck wheels, the total weight of the whole engine

to haul a train weighing 7,700 tons over a level road. The valves are of the piston type and balanced; they are 16 inches in diameter, or as large as the pistons of many passenger engines which are still in active service. The dimensions of the various working parts are all large in proportion. Thus the piston rods are 4½ inches in diameter; the journals of the driving axles measure 9 by 11 inches; the main rod bearing measures 6½ by 6½ inches, and the side rod bearings 7½ by 5 inches. The piston rods, crank pins and crosshead pins are of high grade open hearth steel, and the piston rods and crosshead pins are made hollow. The driving wheel centers, engine truck wheel centers, driving boxes, driving box saddles, spring fulcrums, pistons, front and back cylinder heads, crossheads and guide yoke ends are of cast steel; the cylinder head casings, smokebox front and door, smokestack base, dome casing and sandbox casing are of pressed steel. Special attention has been given to the design of the engine frame, which is made exceptionally heavy. It is forged solid and measures 5 by 5 inches at the jaws and it is 4 inches deep elsewhere at the top, the bottom bar being 3¼ inches thick at the jaws and 2½



BOILER FOR THE GREAT NORTHERN LOCOMOTIVE.

Largest diameter, 87½ inches; heating surface, 3,280 square feet.

being 212,750 pounds, this being the first time that a locomotive of the standard type has been built which exceeded 100 tons. The total weight of the engine and tender is 308,750 pounds. The boiler, of which we give a separate view, is of enormous size and capacity. Its outside diameter is 78 inches in the smallest ring and 87½ inches at the largest part. The heating surface is 3,280 square feet, the grate area being 34 square feet and the firebox heating surface 235 square feet. It is of the Belpaire pattern, and the working steam pressure is 210 pounds a square inch.

The cylinders, as may be imagined, are of unprecedented size, the diameter being 21 inches and the stroke 34 inches. This is the longest stroke ever used on a locomotive, with possibly one exception, in the case of an engine built many years ago at the Sacramento shops of the Southern Pacific Railroad Company, and named, we believe, "El Gobernador." The driving wheels are 55 inches in diameter, and this combination, under the working pressure of 210 pounds of steam, gives a tractive effort of 46,300 pounds. That is to say, when the engine is working up to its full power the pull on the drawbar is 23 tons. This would suf-

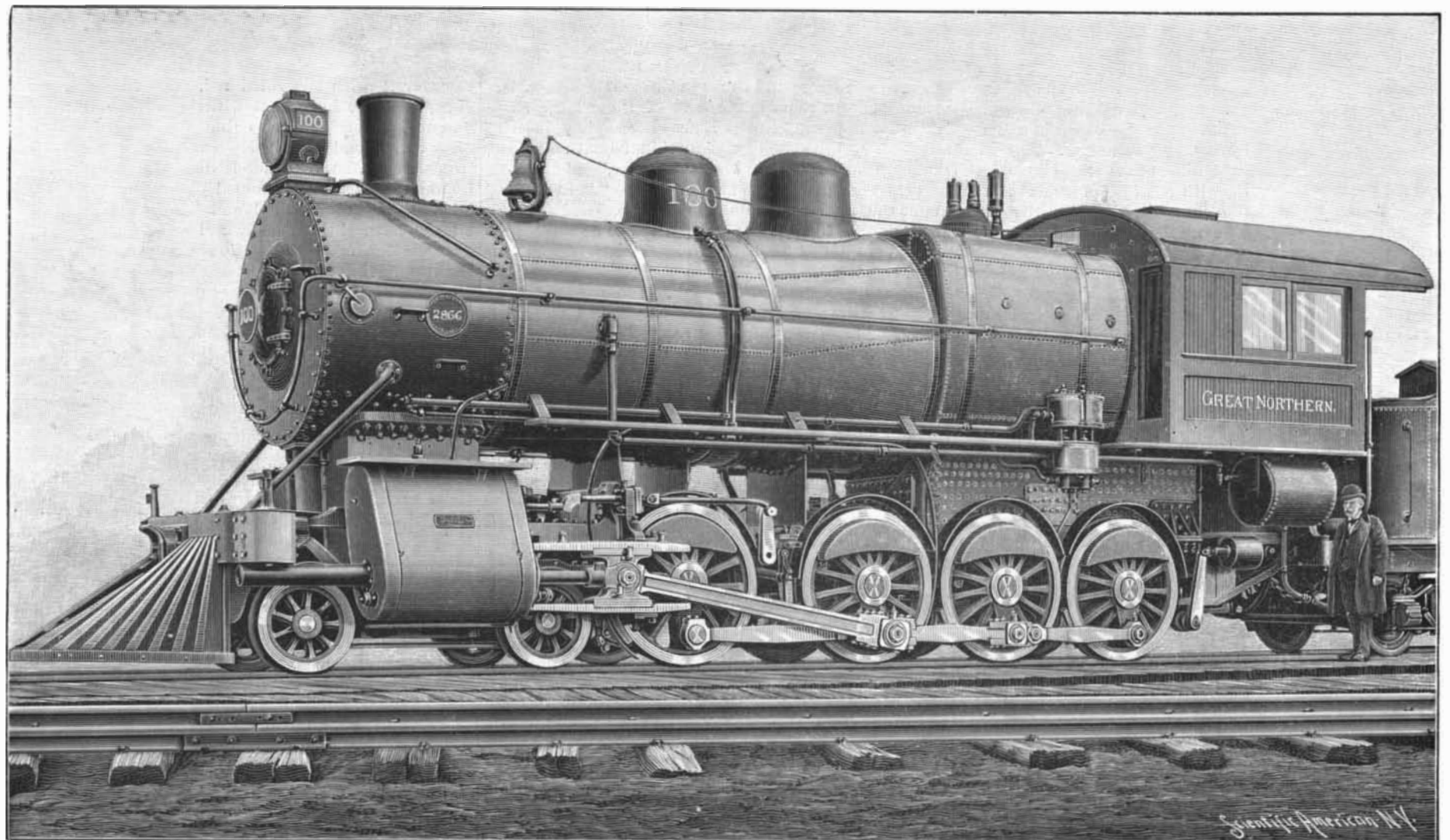
ice to haul a train weighing 7,700 tons over a level road. The valves are of the piston type and balanced; they are 16 inches in diameter, or as large as the pistons of many passenger engines which are still in active service. The dimensions of the various working parts are all large in proportion. Thus the piston rods are 4½ inches in diameter; the journals of the driving axles measure 9 by 11 inches; the main rod bearing measures 6½ by 6½ inches, and the side rod bearings 7½ by 5 inches. The piston rods, crank pins and crosshead pins are of high grade open hearth steel, and the piston rods and crosshead pins are made hollow. The driving wheel centers, engine truck wheel centers, driving boxes, driving box saddles, spring fulcrums, pistons, front and back cylinder heads, crossheads and guide yoke ends are of cast steel; the cylinder head casings, smokebox front and door, smokestack base, dome casing and sandbox casing are of pressed steel. Special attention has been given to the design of the engine frame, which is made exceptionally heavy. It is forged solid and measures 5 by 5 inches at the jaws and it is 4 inches deep elsewhere at the top, the bottom bar being 3¼ inches thick at the jaws and 2½

As the engines are to be used on mountain work, where the temperature is often extremely low, special care has been given to the lagging of the boiler, steam chests, cylinders, etc., the material used being Sal Mountain asbestos. Altogether the engine, despite its vast size, has a trim and well proportioned appearance that is particularly pleasing to the eye.

Since writing the above we learn that the exact stroke of "El Gobernador" was 36 inches. An even larger stroke was used on some curious experimental express engines built in 1848 for the Camden and Amboy road. These had single 8-foot drivers and 14 by 38-inch cylinders.

We are informed by the builders that in a recent test by the Great Northern Company 32 loaded cars, weighing in all 1,070 tons, were drawn by one of these engines up a grade of 87 feet to the mile, upon which was a 4-degree curve. The combined resistance of grade and curve renders this a very remarkable performance.

	Twelve-wheel locomotive, Gt. Northern.	Special mountain engine, Mexican Central.	Twelve-wheel locomotive Nor. Pacific.	Decapod, New York, Lake Erie & Western.
Weight on drivers, lb.	172,000	145,300	150,000	172,000
" " trucks	40,750	F. 23,450 B. 24,800	36,000	23,000
" total	212,750	193,450	186,000	195,000
Length over all, engine	41 ft. 4 in.	36 ft. 6¾ in.	203.5 sq. ft.	234.3 sq. ft.
Heating surface, firebox	235 sq. ft.	218.0 sq. ft.	2,736.9 sq. ft.	2,208.8 sq. ft.
" tubes	3,045 sq. ft.	2,585.0 sq. ft.	2,943.4 sq. ft.	2,443.1 sq. ft.
" total	3,280 sq. ft.	2,803 sq. ft.	2,943.4 sq. ft.	2,443.1 sq. ft.
Grate area	34 sq. ft.	31.45 sq. ft.	35.0 sq. ft.	39.5 sq. ft.
Drivers, diam.	55 in.	49 in.	55 in.	50 in.
Cylinders, diam.	21 in.	21 in.	23 and 34 in.	16 and 27 in.
stroke	34 in.	26 in.	30 in.	28 in.
Boiler, type	Belpaire	Belpaire wagon top	Extended wagon top	Straight
Working steam pressure, lb. per sq. in.	210	180	200	180
Boiler, outside diam. barrel	78 in.	78 in.	72 in.	76 in.
Firebox, length	10 ft. 4 in.	10 ft. 1 in.	10 ft. 3-16 in.	10 ft. 11 7/8 in.
" width	3 ft. 4 1/8 in.	3 ft. 2 1/2 in.	3 ft. 5 in.	3 ft. 2 1/8 in.
" depth front	86 1/2 in.	82 in.	77 in.
" back	79 in.	75 in.	73 1/2 in.
Tubes, number	376	412	332	354
outside diam.	2 1/4 in.	2 in.	2 1/4 in.	2 in.



THE LARGEST LOCOMOTIVE EVER CONSTRUCTED.

Cylinders, 21x34 inches; steam pressure, 210 pounds; weight, 212,750 pounds; horse power, 2,640; drawbar pull, 23 tons; hauling capacity, 7,700 tons on level