

DIAGRAM OF SIX-COUPLED BOGIE EXPRESS PASSENGER LOCOMOTIVE, EAST INDIAN RY.

EXPRESS LOCOMOTIVE, EAST INDIAN RAILWAY.

ON page 281 of our eighth volume, April 25th, 1903, were given illustrations and a description of some of the early locomotives built by Messrs. Kitson, Thompson & Hewitson, of Leeds, and Messrs. Slaughter, Grüning & Co., of Bristol, for service on the above railway, which has just lately celebrated its Jubilee. Originally single-wheel tanks with 14-in. by 22-in. cylinders and 6-ft. wheels, these were afterward converted into tender engines and in that condition for many years ran the mail trains and light passenger traffic. One on being withdrawn from service in 1901 was placed on a pedestal outside the Jamalpur loco. shops, with a suitable inscription, and the last survivor as a tank engine was until recently still at work shunting in the yard of the Lilloah carriage and wagon shops at Calcutta.

To point the advance made in 50 years, we offer for comparison with the original engines illustrated in the issue already referred to, the accompanying photo-reproduction and dimensioned diagram, for which we are indebted to the courtesy of the consulting engineers, Messrs. Sir A. M. Rendel & Robertson, of Westminster, S.W., of one of the large six-coupled bogie express locomotives recently built for the East

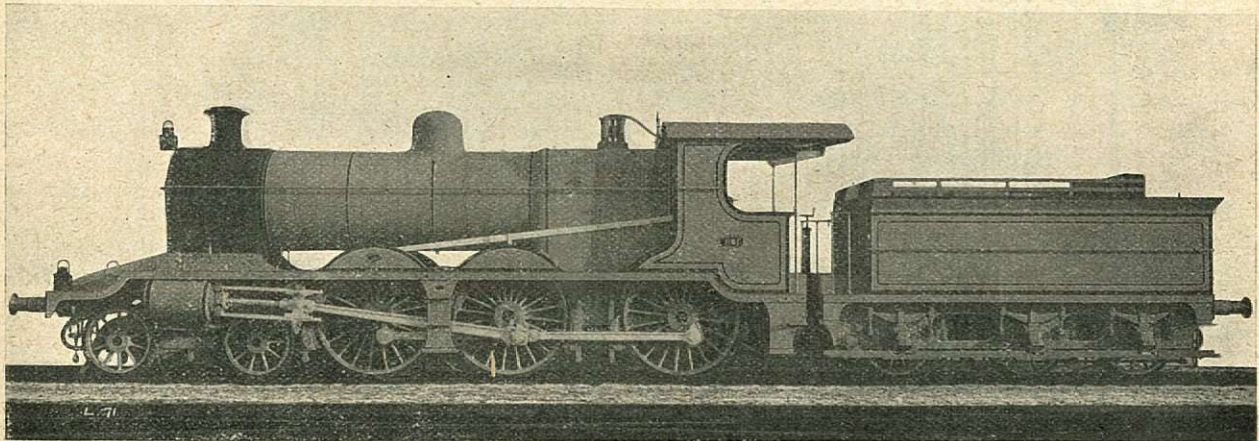
Indian Ry. by the North British Locomotive Co., Ltd. The leading particulars are all detailed on the diagram and it will be seen that these fine engines are quite in line with modern ideas and represent what may be called the XXth century type of express passenger locomotive.

RECENT LOCOMOTIVES OF THE BELGIAN STATE RAILWAYS.

(Continued from page 46.)

THE five types of locomotives already referred to present no great feature of novelty and have prototypes on many European railways. One can scarcely claim for them as novelties the increased size of the boilers and the application of the superheater to some of them. But in 1904 the officials of the Belgian State Railways made a study of three entirely new types of express locomotives supplied by the La Meuse and John Cockerill Companies, and have now examples of these machines in actual service. The engines built by the former works are of the six-coupled bogie type, with four simple cylinders, and the two other examples, built by the Société John Cockerill, having the same arrangements of wheels, are both four-cylinder compounds.

Fig. 6 shows the four-cylinder simple engine No. 3303, built by La Meuse; it is provided with



SIX-COUPLED BOGIE EXPRESS PASSENGER LOCOMOTIVE, EAST INDIAN RY.

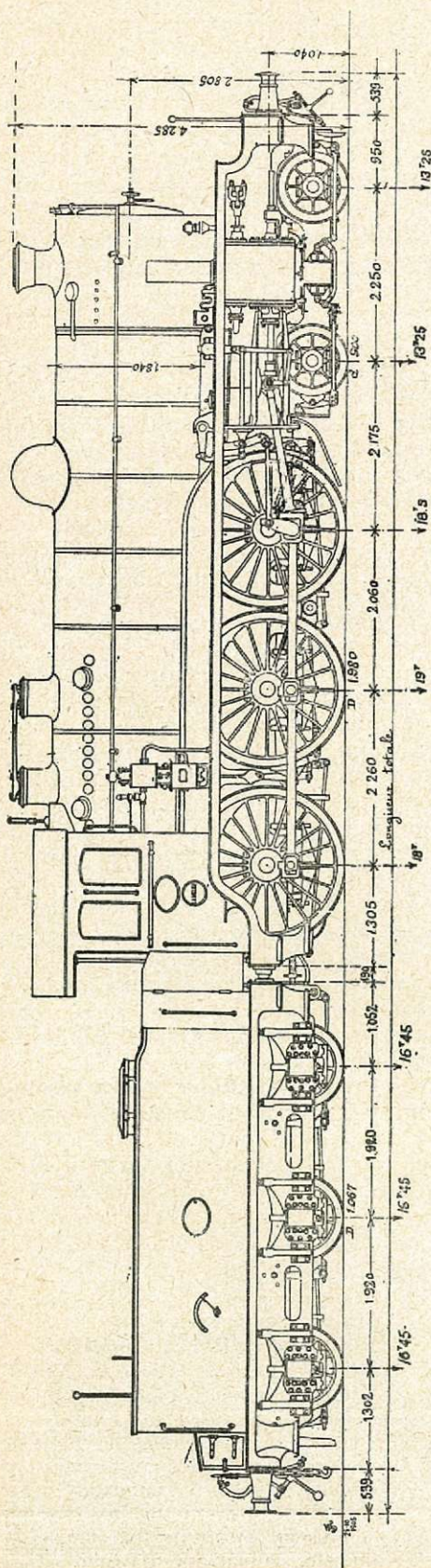


FIG. 6.—SIX-COUPLED BOGIE FOUR-CYLINDER SIMPLE LOCOMOTIVES NOS. 3302-3303, BELGIAN STATE RYS.

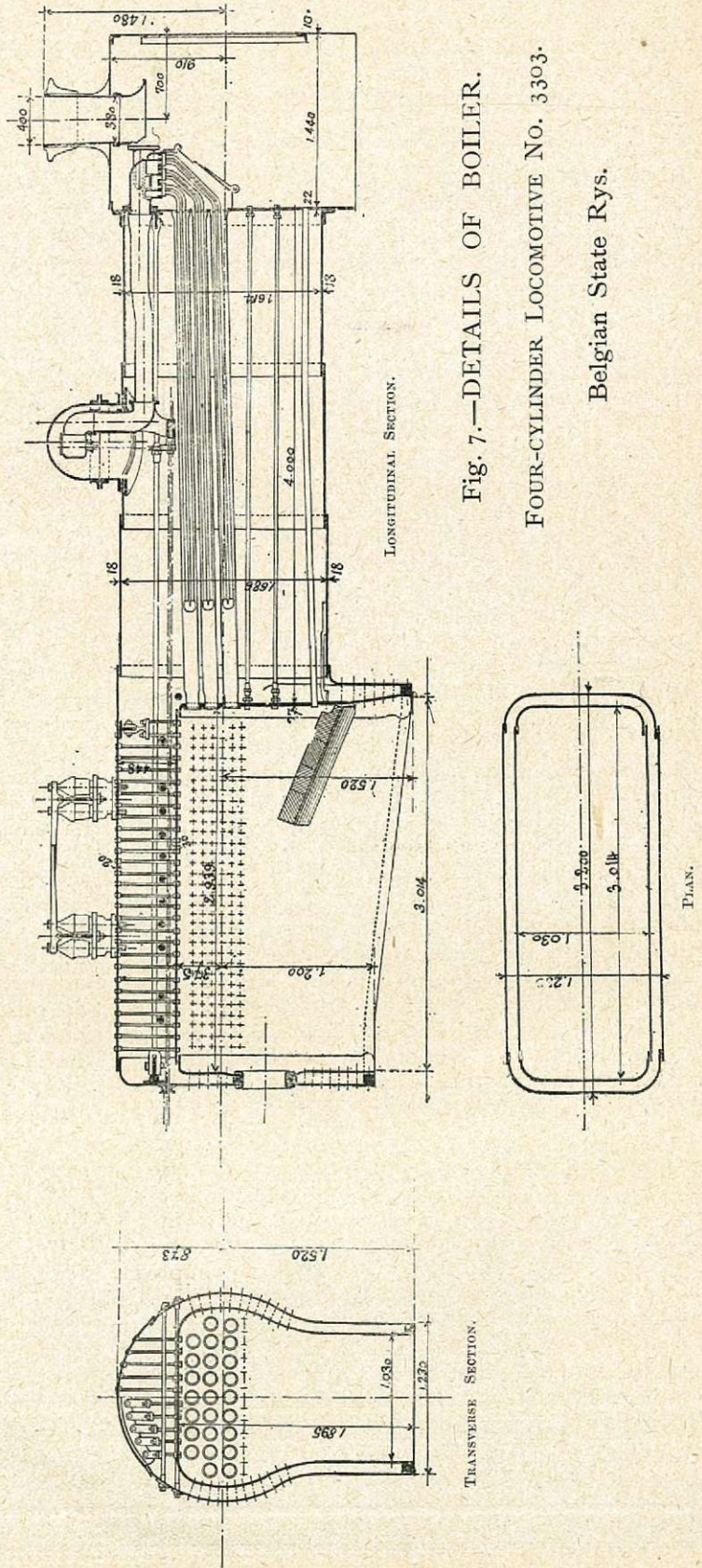


Fig. 7.—DETAILS OF BOILER.

FOUR-CYLINDER LOCOMOTIVE No. 3303.

Belgian State Rys.

the Schmidt superheater, whilst No. 3302, also by the same firm, is of similar type, but has no superheater, and is fitted with cylinders of smaller diameter. The principal dimensions of No. 3303 are as follows: diameter of cylinders 17 $\frac{1}{8}$ -in., stroke 24-in., diameter of bogie and coupled wheels 2-ft. 11 $\frac{1}{2}$ -in. and 6-ft. 6-in. respectively, wheelbase of bogie 7-ft. 4 $\frac{5}{8}$ -in., total wheelbase 28-ft. 8-in., total length over buffers 38-ft. 4 $\frac{3}{8}$ -in.; diameter of boiler 5-ft. 6 $\frac{1}{2}$ -in., height

and a similar means of attachment causes the motion given to the valve-spindle B of the inside cylinder to be transmitted in the reverse direction of travel to the valve-spindle H of the outside cylinder. It should be mentioned that the inside and outside cranks on the same side of the engine are set at angles of 180°, and that all four cranks are therefore quartered, and this arrangement renders the use of two sets of radial motion possible and indeed considerably simplifies the details of the motion.

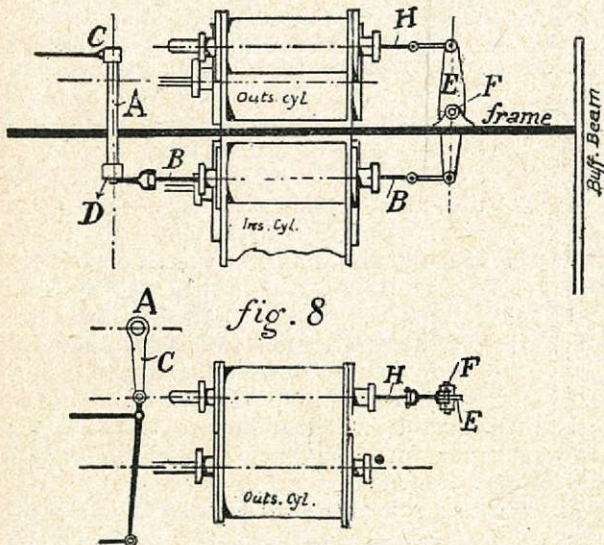


DIAGRAM OF VALVE MOTION OF FOUR-CYLINDER LOCOMOTIVES Nos. 3302-3303, BELGIAN STATE RYS.

of centre above rails 9-ft. 2 $\frac{3}{16}$ -in., containing 180 flue tubes of 2-in. diameter and 13-ft. 1 $\frac{1}{2}$ -in. long between tube plates, and 25 of 5-in. diameter for the Schmidt superheater; heating surface: firebox 181.16 sq. ft., flue tubes 1,494.83, total 1,675.99 sq. ft.; superheater 446.7 sq. ft., grate area 32.4 sq. ft., boiler pressure 200 lb. per sq. in., weight of engine in working order 82 tons, of which 55 tons are available for adhesion.

Details of the boiler of this engine are shown in the sectional views in Fig. 7, and the general arrangements of the four cylinders and motion may be understood from the diagrammatic sketch reproduced in Fig. 8. The four cylinders, which are all fitted with piston valves, are placed in line transversely and actuate the leading coupled axle. Each pair of cylinders on either side of the centre line of the engine is controlled by one set only of Walschaerts valve gear placed outside the frames. The travel of the radial lever of the motion is transferred to the rocking shaft A by means of the crank C, and another crank D transmits the motion to the inside cylinder valve spindle B. The spindle is extended through the front end of the valve chest, as shown, with a link attachment to a vertical rocking shaft F, furnished with balance cranks,

The other locomotive, No. 3302, is exactly similar to No. 3303, as described above, except that the cylinders are of smaller diameter, 16 $\frac{9}{16}$ -in. instead of 17 $\frac{1}{8}$ -in., and that the Schmidt superheater is not adopted. There is a slight diminution in weight, owing to these modifications, and the heating surface is also different, owing to the absence of the superheater tubes; the firebox surface is 181.16 sq. ft., but the tube surface is increased to 1863.4 sq. ft., thus making a total heating surface of 2,044.56 sq. ft. Fig. 9 shows the front elevation of Nos. 3302-3303.

These two engines have been subjected to a series of exhaustive comparative trials, which have so far shown a slight advantage to the one provided with the Schmidt superheater. On a line having gradients of 1 in 200 for many miles together, No. 3303 has hauled without difficulty trains

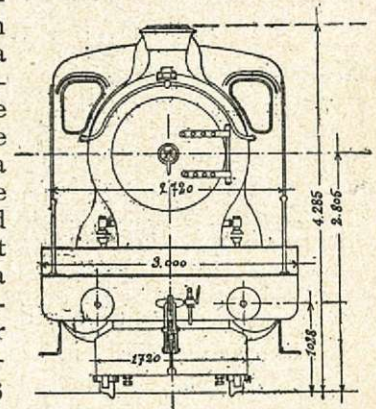


FIG. 9.—FRONT ELEVATION OF NOS. 3302-3303, BELGIAN STATE RYS.

weighing 327 tons, at speeds varying between 40 and 56 miles per hour, reaching a maximum at times of 60 miles per hour, and it is possible that even better results may be attained later. With such large boilers there seems to be no difficulty in keeping the four cylinders supplied with steam, and these two are therefore interesting examples of simple locomotives with balanced motion.

(To be continued.)

WE have received from Messrs. Wm. J. Brooks & Co., of Letchworth, Herts., an ingenious little corner curve for draughtsmen. The instrument is a circular templet of transparent sheet celluloid provided with a number of notches cut in the periphery with curves of different radii. To hold it when in use, a wooden peg is riveted to the centre, while a circular ridge on the underside raises the working edge enough to prevent the ink running under. It should be a useful substitute for compasses for rounding-off fillets, etc., in machine drawing.