

TANK LOCOMOTIVE FOR THE MIDLAND RAILWAY.

CONSTRUCTED FROM THE DESIGNS OF MR. S. W. JOHNSON, LOCOMOTIVE SUPERINTENDENT.

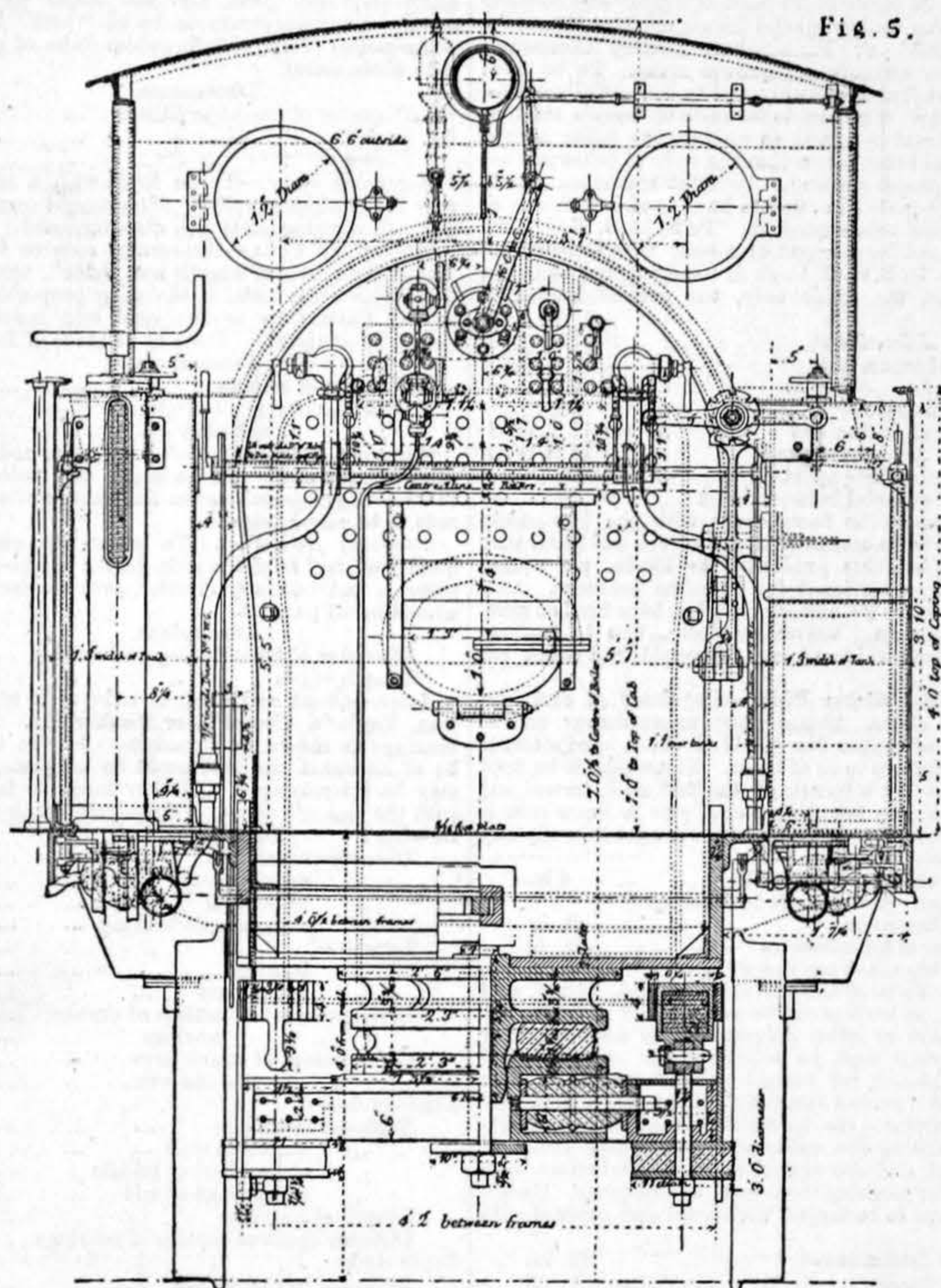


FIG. 5.

We give this week a two-page engraving, together with other views on the present and opposite pages, of one of a class of powerful tank locomotives constructed from the designs of Mr. Samuel W. Johnson, for working heavy local passenger traffic on the Midland Railway. The engine now illustrated may be considered to be a development of the type introduced by Mr. Johnson on the Great Eastern Railway, while he was the locomotive superintendent of that line—a type which has done excellent service. As will be seen from our engravings, the engine has two pairs of coupled wheels 5 ft. 6 in. in diameter, the axles of these wheels being situated under the barrel of the boiler at a distance of 8 ft. apart from centre to centre. The trailing end of the engine is carried on one of Mr. William Adams' bogies, this bogie having two pairs of 3 ft. wheels placed at 5 ft. centres, and the centre of the bogie being 11 ft. 3 in. in the rear of the centre of the driving axle. The total wheel base is thus 22 ft. 9 in., or measuring from centre of leading axle to centre of bogie, 19 ft. 3 in.

The cylinders are inside, and are 17 in. in diameter, while the stroke is 24 in., the tractive force being thus:

$$\frac{17^2 \times 24}{66} = 105.09 \text{ lb.}$$

for each pound of effective pressure per square inch on the pistons. The particulars of the heating surface and leading proportions of the boiler are as follows:

Heating surface of tubes (external) ...	1105. sq. ft.
" " firebox ...	104.4 "
Total heating surface ...	1209.4 "
Grate surface ...	16.7 "
Flue area through tubes ...	2.7 "
Least sectional area of chimney ...	1.33 "
Total heating surface ÷ firegrate area =	72.4
Firegrate area ÷ flue area ...	6.18
Firegrate area ÷ least sectional area of chimney ...	12.55
Length of tubes ÷ internal diameter =	88.3

The firebox, it will be noticed, is provided with a firebrick arch, and also with a hanging bridge formed by a kind of transverse pocket fixed to the crown of the firebox. The pocket or hanging bridge, it will be observed, is slightly arched on the other side, so as to facilitate its being kept clear of deposit. The firehole is fitted with a scoop or air deflector, as shown, and the firedoor is pro-

vided with louvres for the admission of air. The general dimensions and constructive particulars of the boiler are given in the specification which we subjoin, but we may point out here that the central plate of the barrel is strengthened at the dome opening by an internal thickening plate, which is not a mere ring, but which extends to the adjacent circumferential seams. This mode of strengthening a dome opening or manhole is an excellent one.

We have said that the trailing end of the engine is carried on one of Mr. Adams' bogies. The leading features of this bogie, as many of our readers are aware, consist, first, in the centre bearing being taken on a large india-rubber pad, and, secondly, in the bogie frame being not only free to turn upon the bogie centre, but also to shift laterally to an extent controlled by springs acting horizontally. In the case of the engine under notice, the main frames are reduced in depth behind the firebox, their thickness, however, being at the same time increased from 1 in. to 1½ in., and they are tied together just above the bogie centre by a pair of strong transverse stays which not only transmit the load to the bogie, but also take the pull of the trailing draw-bar. The bottom flange—as we may call it—of the box girder formed by the two transverse stays just mentioned, consists of a plate 1 in. thick and 2 ft. 7 in. wide, and to this plate is bolted a casting of the form shown in Figs 1 and 5. Between this casting and another sliding on the bogie frame is placed an india-rubber ring 2 ft. in diameter and 4 in. thick, this ring forming an elastic centre bearing for the bogie and leaving the latter free to cant in any direction as regards the engine frame. A thin brass dish is interposed between the india-rubber ring and the lower casting, the interposition of this brass dish allowing any necessary circular movement to take place between the india-rubber ring and the lower casting. The upper casting, it will be noticed, has a centre pin 6 in. in diameter formed on it, this pin entering into a correspondingly bored hole in the lower casting. This latter casting rests upon steel rubbing pieces fixed to the central transverse stays of the bogie frame, a part of the casting also fitting between the angle irons forming this transverse stay. The lower casting is capable of sliding laterally 2 in. each way, but its lateral movement is controlled by the india-rubber springs arranged as shown on the plan, Fig. 2, and

transverse section Fig. 5. The axle-boxes of the bogie wheels are connected on each side of the engine by a compensating beam, through which the load is transmitted from the ends of a steel spring. This spring is attached at its centre to a link, which passes down through the transverse frame of the bogie and a thick india-rubber ring below, as shown in Fig. 5. This arrangement of springs and india-rubber pads gives, as may be anticipated, very easy riding. We have frequently expressed a favourable opinion of Mr. Adams' bogie, believing, as we do, that it is the best arrangement of its kind yet brought out, and this being so, we are glad to learn that it has found its way into very extensive use, not only in this country, but also on lines abroad.

The water is, in the engine we are describing, carried partly in wing tanks at the sides of the boiler, and partly in tanks on each side of the coal bunker at the rear end. The total contents of the tanks is 1050 gallons, while the fuel bunker carries 25 cwt. to 28 cwt. of coal. The weight of the engine is as follows:

Weight in working order:	Tons. cwt. qr.
On leading wheels ...	13 9 1
" driving " ...	14 12 2
" bogie " ...	15 8 0
Total ...	43 9 3
Weight empty:	
On leading wheels ...	12 4 1
" driving " ...	12 16 2
" trailing " ...	12 3 2
Total ...	37 4 1

Inasmuch as we print, below, the specification to which the engines we have been describing have been built, it will be unnecessary that we should enter into further described particulars, but we may direct special attention to the general neatness of detail, as well as the substantial character of the whole design. The engines are in fact well fitted for the work which they have to perform, and they belong to a type which is we think likely to become very extensively adopted for working the heavy local traffic which has to be dealt with on lines in the neighbourhood of the metropolis. In conclusion we subjoin the specification already referred to.

MIDLAND RAILWAY.

Specification of Four Wheels Coupled Passenger Tank Engine.

CLASS D.

General Conditions.—The engines must be made to the dimensions given in the following specification, and to drawings to be supplied by the company's locomotive superintendent, except in cases where his consent to an alteration has been obtained in writing.

The quality of the materials to be of the make specified, and when no instructions are given, both workmanship and materials are to be the very best of their respective kinds. No advantage whatever is to be taken of any omission of details in the drawings or specification, as the contractor may obtain a full explanation of any part of the work not sufficiently shown or understood. The engines must be finished in every respect in the most complete manner and to the entire satisfaction of the company's locomotive superintendent, who shall be at liberty to inspect either personally or by deputy, the work during its progress, and to reject any defective or unsuitable materials or workmanship.

In case of any dispute arising, either during the progress of the contract or at its termination, the decision of Mr. Samuel W. Johnson, the company's locomotive superintendent, is to be taken as final and binding in every respect. The engines are to be delivered by the builders, free of charge, to the Midland Railway Company at Derby, fit and ready for work in every respect; and prior to payment (in the usual way at the end of the second month after delivery), each engine will be required to run 1000 miles consecutively without showing any defects in materials or workmanship, and the builders will be held responsible for all such defects that may appear (accidents being excepted) until they have run that distance. All royalties and patent rights are to be paid by the contractor.

QUALITY OF MATERIALS.

Iron.—In all cases where "best iron," is specified, it must be wrought iron of the manufacture of either Lowmoor, Bowling, Taylor and Co., S. T. Cooper and Co., Monkbridge, or Farnley best iron, and the brand of the manufacturer must be placed where it can be seen when the part of the engine in which it is used is finished.

Brass and Gun-Metal.—Where "brass" is specified, it must be of good tough metal. "Gun-metal" must be composed of copper 5 parts, tin 1 part.

White Metal.—This must be composed of tin 16 parts, antimony 2 parts, copper 1½ parts.

Other materials to be obtained of the manufacture specified under the respective heads, unless the consent of the company's locomotive superintendent be obtained to an alteration.

Boiler.—Barrel, dome, firebox shell, and smokebox tube-plate, with all angle irons, rivets, and stays, to be made of Lowmoor iron in ten of the engines, and the remainder of one or other of the firms as specified. Barrel to be telescopic as shown, and to be made of three plates. Transverse joints to be single rivetted. Longitudinal seams to be butt-jointed and double-rivetted with inside and outside joint plates. Seam joining barrel to firebox shell to be zig-zag rivetted. Joint of middle plate to be welded as shown. Tube plate to be secured to the boiler by a ring of angle iron, bored, faced, and turned on the edges, and to be zig-zag rivetted to the barrel and single-rivetted to the tube-plate; outside covering plate of firebox shell and sides of the same to be made in one plate. The dome to be

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(For Description, see Page 343.)

