

SCIENCE AND MECHANICS.

NAIRN'S SIX-HORSE POWER ROAD LOCOMOTIVE.

On this page we reproduce from *Engineering* three illustrations of one of Nairn's road locomotives, constructed by Messrs. J. & T. Dale, of Kirkcaldy, the particular engine shown being one built by the makers for New Zealand. Fig. 1 is a side elevation, Fig. 2 an end elevation part in section, and Fig. 3 a plan half in section.

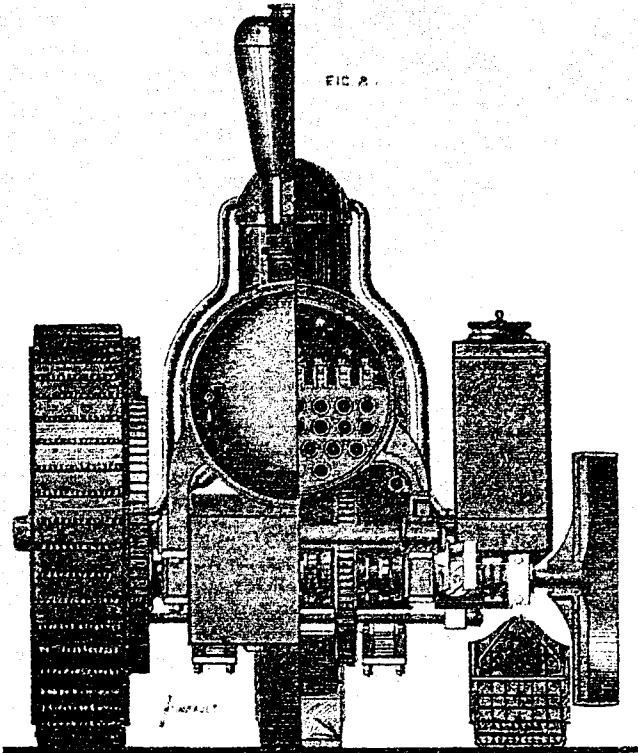
The following is the description of the locomotive given by *Engineering*:

The boiler is of the ordinary locomotive type, the barrel being 2 ft. 3 in. in diameter and 6 ft. long, and fitted with twenty-two 2½ in. wrought-iron tubes. The total heating surface is 98 ft., and the grate surface is 2.8 ft. The seams throughout are double rivetted, and the working pressure is 120 lb. per square inch. The chimney is fitted with an efficient spark catcher, making the locomotive perfectly safe both for towns and for farm purposes.

To the firebox end of boiler is attached a wrought-iron girder frame, which forms the front part of engine; an angle iron turntable is fastened to this frame, the upper part being bored out to receive a corresponding angle iron turned to fit it. Upon this last-mentioned angle iron are fixed two ordinary laminated springs which carry the front of the engine upon the front or steering wheel. The steering is performed by means of a steel rack bolted to the turntable, a pinion gearing into this rack being actuated by a worm and worm-wheel on the top of the column, immediately in front of the driver; this arrangement does away with the upright bracket and fork, which were found to be always in the way.

The cylinders are 5½ in. in diameter with a stroke of 8 in., and are placed horizontally and fastened to the wrought-iron girder frame under the bunkers; they are, along with the valve gear, placed altogether outside the framing, so that any part can be easily got at for repair or cleaning; the gearing also is so arranged that any part of it can be got at without difficulty. Two side brackets of cast malleable iron are bolted to the boiler for the purpose of carrying the gearing and driving wheels, and to these is attached the drawbar.

The gearing is entirely of cast malleable iron, thus insuring



strength and lightness. There are two speeds provided, the slow gear having a ratio of 14 to 1, and the fast gear a ratio of 8 to 1. The gearing is so constructed that either driving wheel can be thrown out of gear when turning sharp corners; this is done from the foot plate without stopping the en-

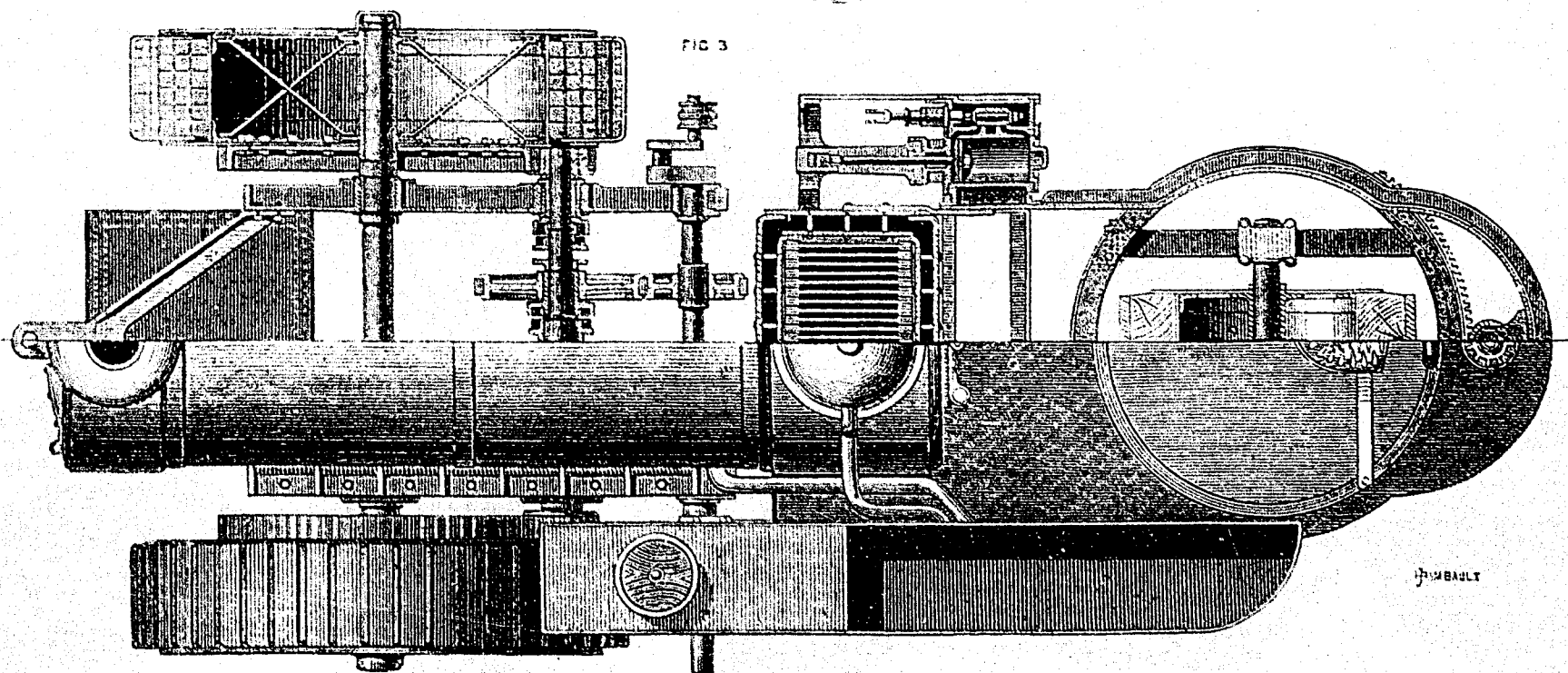
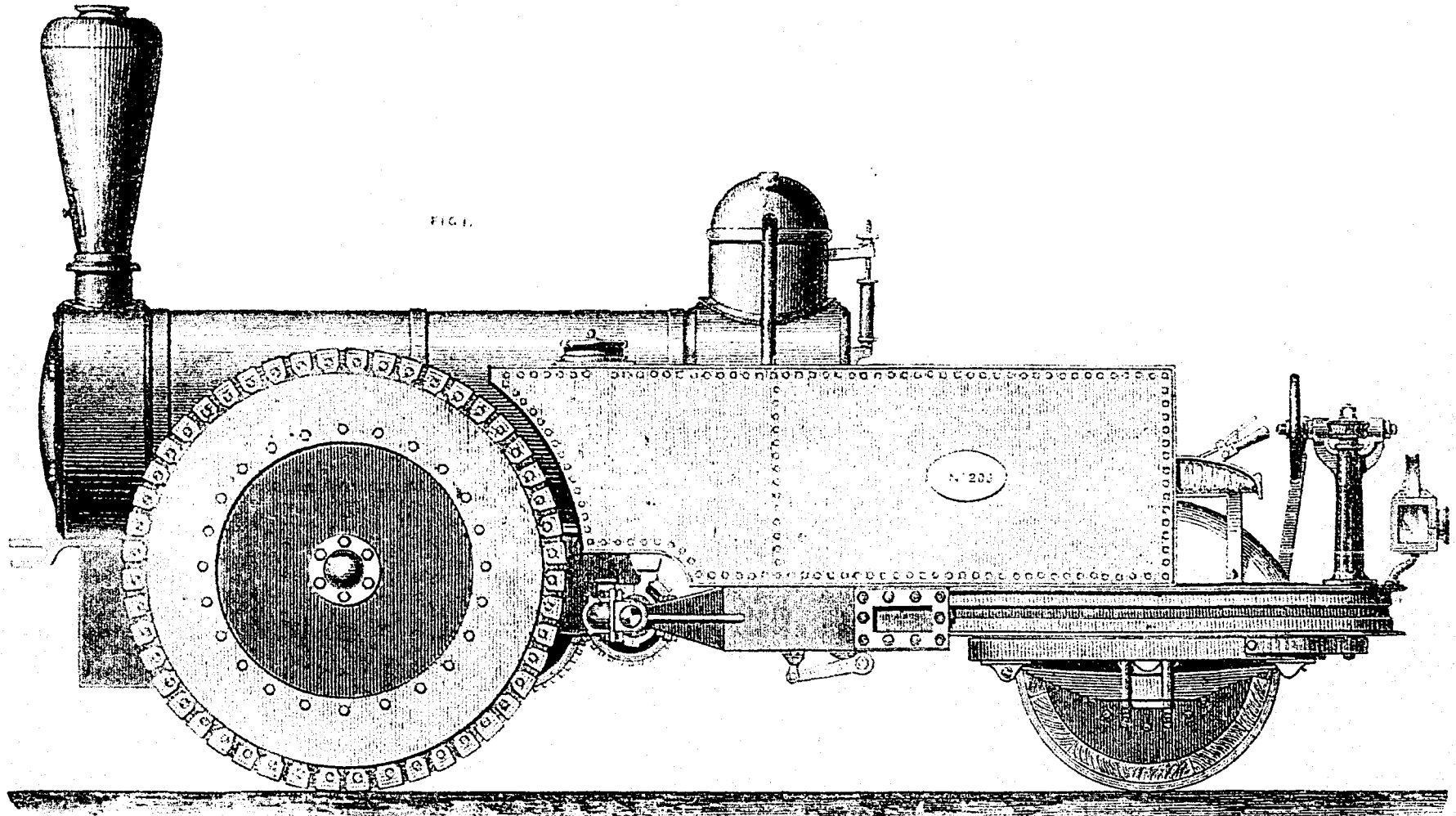
gine, the change of speed is likewise effected in the same manner.

In order that the locomotive may be used as a stationary engine the crank shaft is extended at one end and supported by an outside bracket, beyond which is keyed the driving pulley; a small portable governor of simple construction is provided for fixing at the top of the boiler, the engine may be thus converted from a locomotive to a stationary one in a few minutes.

Between the side frames is a small tank upon which the feed pump is fixed, and this is connected to two tanks above, of which the bunkers form a part; there is thus provision made for about 15 cwt. of water. The driving wheels are 5 ft. diameter by 12 in. over the shoes; the tyres are constructed, as shown, with three layers of coir rope, measuring in all 6 in. thick, while between each layer and the next is placed a thin sheet of rubber for the purpose of keeping the layer apart. The outer part of the tyre is composed of hard tarred hemp rope in three layers, and measures 3 in. in thickness; in the centre of this band, and corresponding to the protecting shoes, are woven in thin iron pipes which serve as bolt holes for the shoe bolts; sometimes rubber is used, and sometimes wool for the inner tyre, but coir is found to serve the purpose equally as well, being quite as elastic and durable at a fraction of the cost. The shoes, as will be seen, are quite independent of each other, there being no working parts to wear out.

On each flange of the wheel are rivetted light steel segments with projections which fit between the shoes, by which means the strain is equally distributed round the wheel on the shoes and outer tyre alone, the inner tyre merely being subject to compression at that part next the ground. It is claimed that this arrangement does away with the greatest objection hitherto found against all wheels having elastic tyres, namely, that of the whole wheel becoming useless upon the breaking of the links connecting the shoes. The shoes in this arrangement will, it is stated, last for years without any repairs being necessary. The front or steering wheel is filled with hard wood and hooped.

On page 378 will be found a table giving the results of repeated trials carried out by the makers with engines of this class.



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