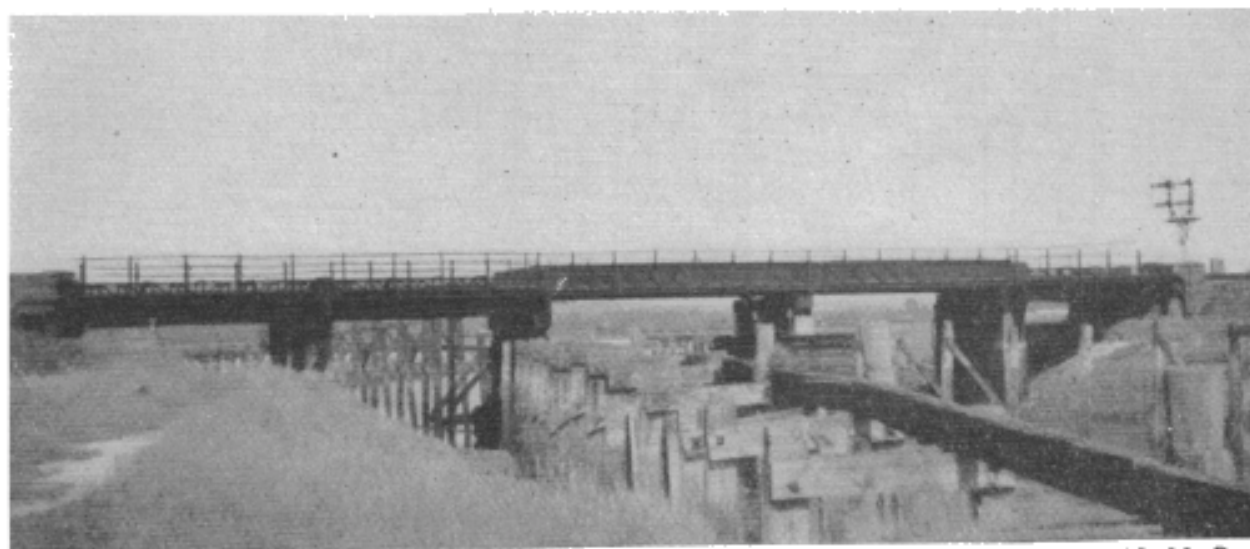


# The Arun Bridge at Ford

By J. M. DUNN



Photo]

[J. M. Dunn

The bridge over the Arun at Ford, converted into a fixed structure in 1938

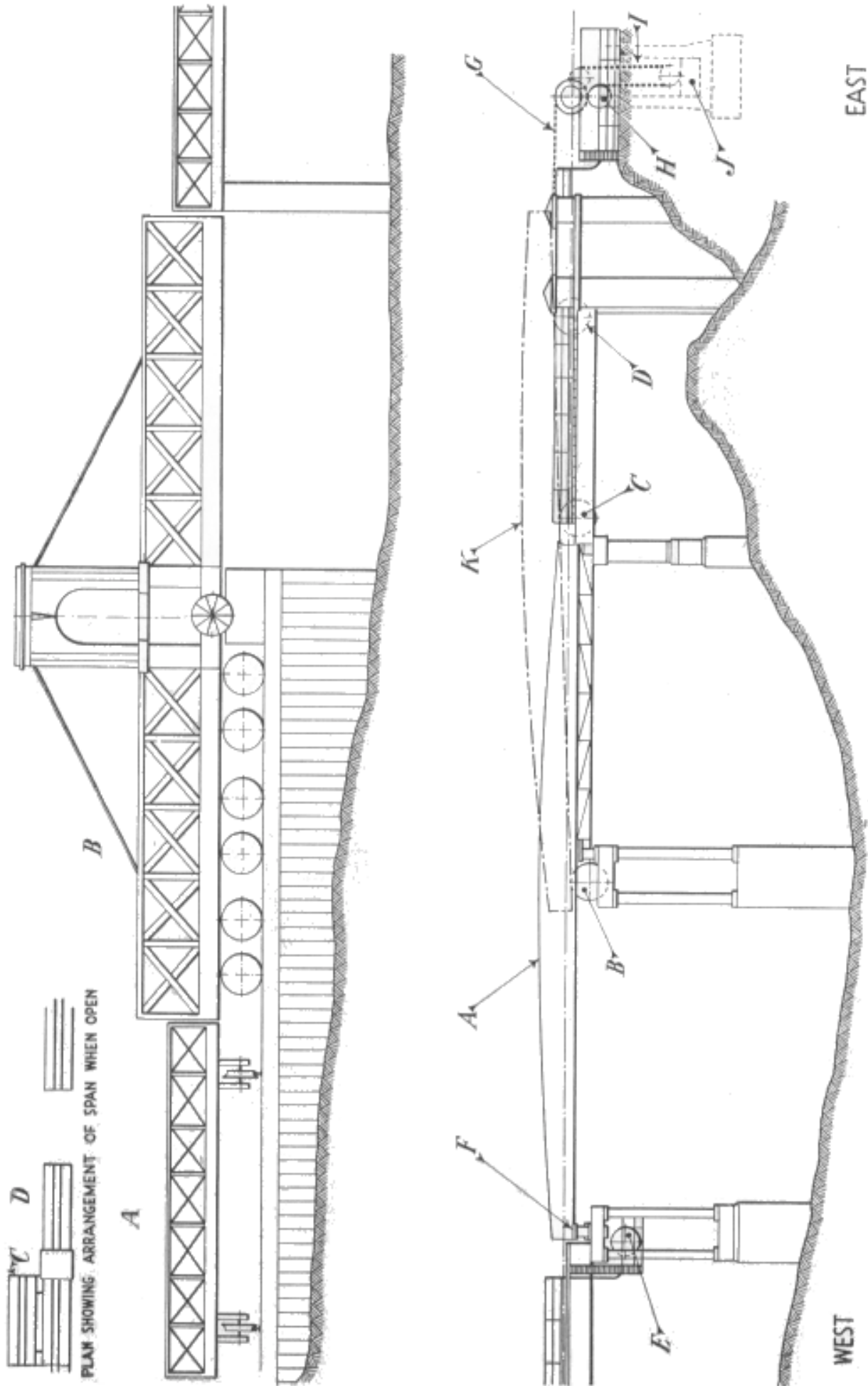
A QUARTER of a mile east of Ford Station, the coast line of the former London, Brighton & South Coast Railway crosses the River Arun by a five-span girder bridge of very ordinary appearance but which, nevertheless, has an interesting history. The present bridge is the third structure that has carried the railway across the Arun at this point, the first one having been built for the opening of the line from Littlehampton & Arundel (Lyminster) to Chichester on June 8, 1846. The Arun had been widened and deepened between its mouth at Littlehampton and the town of Arundel by Henry Fitzalan towards the end of the sixteenth century, and as sea-going vessels of over 200 tons were still going up to Arundel when the railway was built, it was necessary for the bridge to have an opening span.

A local man, John Eede Butt, a contractor of Littlehampton, who was of an inventive turn of mind, submitted a proposal for a bridge having a swing span mounted on a sort of circular pontoon floating on water in a circular tank built in the central pier. The idea was that when it was desired to swing the span, water could be pumped into the tank, thus lifting the span off its end bearings and making it float. It would then have been comparatively easy to swing the

span clear of the waterway by hand and, after the river traffic had passed, to restore it to its closed position; when, the water having been run out of the tank, the pontoon would sink and allow the span to settle on its end bearings.

Butt built a working model of the bridge constructed on this plan, which was then new, and personally gave a demonstration at the House of Commons before the Committee dealing with the matter. The Committee was impressed with the idea, but as it had not been tried before, decided that a structure of the importance of a railway bridge was an unsuitable subject for experiments and rejected the proposal. Butt's model is preserved in the Littlehampton Museum. In 1847, Alexander Allan of the London & North Western Railway built at Crewe a locomotive turntable which floated on water on similar lines to Butt's proposal of 1846, but it is not known whether this was an independent invention or what degree of success was attained.

The design adopted for the bridge was that of John Urpeth Rastrick, the Engineer of the L.B.S.C.R. This was a novel arrangement whereby the opening span could be drawn back end-on to the rails on the track formation. The arrangement of the bridge is shown in the diagram on page 518. The structure, which, apart



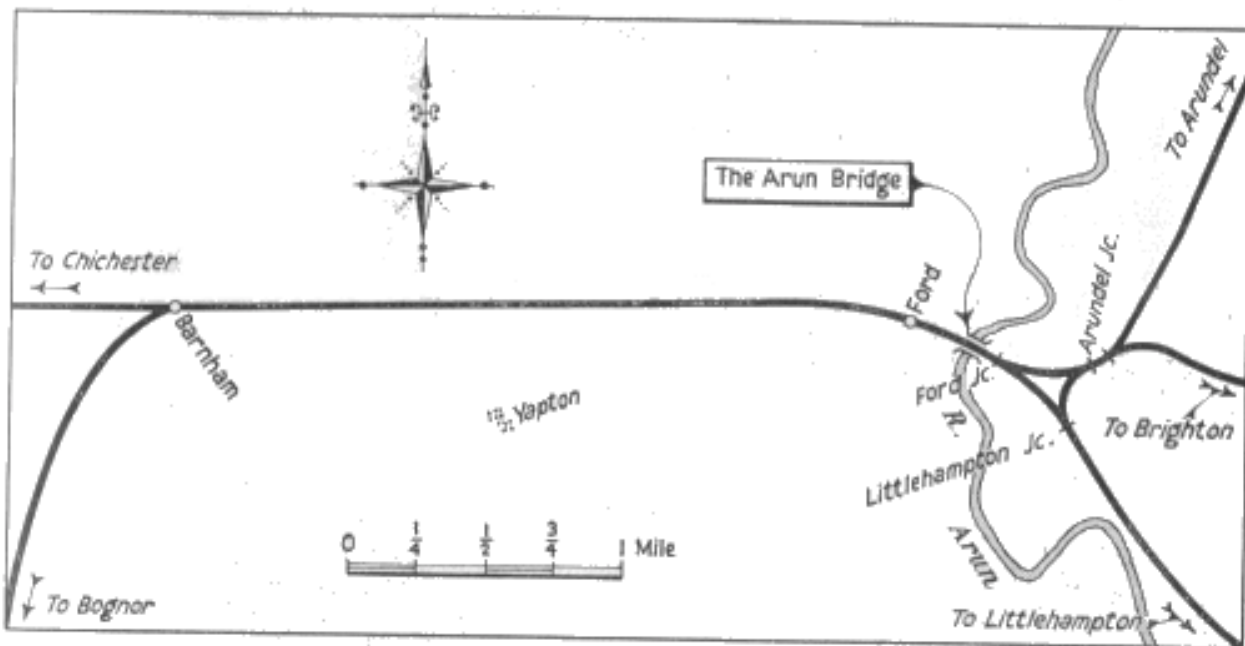
Diagrams illustrating the opening bridges of (above) 1846 and (below) 1862

from its operating mechanism, was of timber, and built for a single track, consisted of two movable portions, *A* and *B*, 12 ft. wide, and 63 ft. and 144 ft. in length respectively. In opening the bridge for river-traffic, the portion *A* was moved sideways into the position shown at *C*, thus leaving a gap 63 ft. long into which the portion *B* was drawn back, as shown at *D*.

The opening span was provided with a tower 35 ft. high, from which braces passed to the extremities of the span, so that the whole of the structure was maintained in correct alignment. It was moved by gearing operated by hand-wheels,

General Pasley and Colonel Codrington before being opened for traffic, two of the heaviest engines and tenders being placed on it for the test.

In readiness for the opening of the line from Pulborough to Ford on August 3, 1863, Rastrick's bridge was replaced, after a life of 16 years, by a double-track "lift-roll" drawbridge, built by Henry Grissell of the Regent's Canal Ironworks, London, to the design of R. Jacomb Hood, Chief Engineer of the L.B.S.C.R. An outline of this bridge also appears on page 518. The moving span *A* which was more than twice as long as the maximum opening of the bridge, was supported by rollers *B*,



Map of the railways converging at Ford, showing the Arun bridge

weighed about 70 tons, and was supported on twelve 6 ft. dia. wheels, six on each side. The end of the span which projected over the river extended between 60 and 70 ft. beyond the wheels.

The bridge, which had a total length of 273 ft., was built by Butt of Littlehampton, who imported most of the timber, in the form of logs, from Danzig. It is recorded that on one occasion during the construction of the bridge there were as many as 40 sailing vessels laden with logs waiting to enter the harbour. When the line was doubled in 1857, facing points, which were hand-worked by the signalman, were installed at each end of the bridge, over which a speed restriction of 10 m.p.h. was then imposed. Two men and a boy could open or close the bridge in five minutes. It was inspected on behalf of the Board of Trade by Major

mounted on a pier placed on the east side of the fairway of the river, and a little nearer the east than the west end of the span. When the "raising and lowering piston gear" (the official description) at *F* was lowered by the hand-wheel *E*, the span tipped, like a pair of scales, and the opposite, or eastern, end rose above the level of the rails on the adjacent fixed span. The moving span was then drawn back to the east over the rollers *B*, *C* and *D* above the fixed track until it assumed the position shown at *K*, when the bridge was fully open for river traffic.

The span was drawn back by a winch operated by hand-wheels *H* (one on each side of the line), and a plaited wire cable *G*, about 1 in. thick and five or six inches wide. The movement of the span was assisted by balance-weights *J*, working in

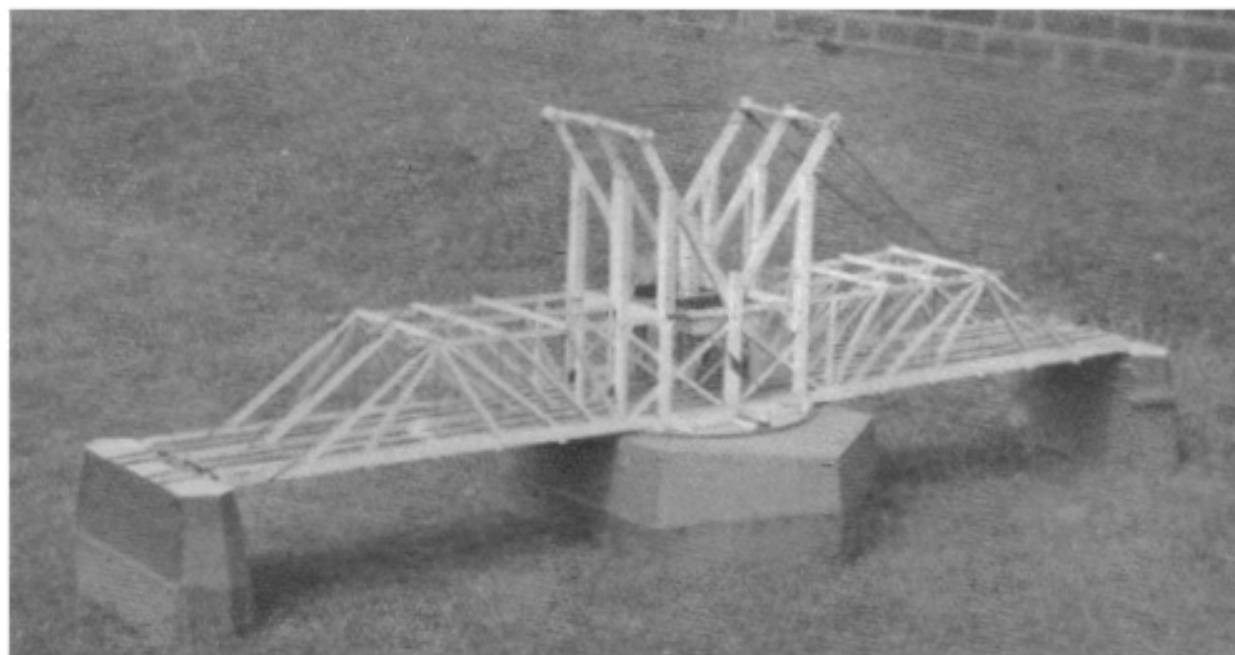
a pit *I*, placed between the tracks. It took eight men to work the drawing gear, and one the "raising and lowering piston gear." The time required to open the bridge was eight minutes. In closing the bridge and making all fit for rail traffic, only five minutes were required, as the moving span was inclined in the open position, and rolled easily to the closed position and was then restored to the horizontal by the "raising and lowering piston gear."

The rail connections at each end of the bridge were ordinary fish-plate joints, and the signal wires were connected by a

The following instructions were laid down for the working of the bridge:—

The signals at Ford Junction Signalbox\* and at Ford Station East Box are interlocked with the bridge release gear by Annett's Patent Lock in both signalboxes.

When the bridge is required to be opened for the passage of vessels etc., the signalman at Ford Junction Box must place or maintain his signals at danger and, provided "Line Clear" has not been given for a train or engine to approach from any direction, he must give the "Opening Bridge" signal, six beats given twice with a pause between, to Arundel Junction, Littlehampton Junction\* (or when closed, Littlehampton) and Ford



Photo]

[J. M. Dunn

**Model of the bridge proposed in 1845 by John Eede Butt, now preserved in the museum at Littlehampton**

hook-and-eye arrangement. All wires passing over the bridge had to be disconnected by hand before the span was opened. The wires for the block instruments and telegraph were cabled, and sunk in the river-bed, so that communications were continuously maintained. There was a permanent speed restriction of 50 m.p.h. over the bridge, which, up till about 1909, was opened for navigation on an average of eighty times a year.

The opening of the bridge for river traffic generally meant that the line was blocked for 20 to 39 min., and it was a somewhat trying job for the staff who had to perform the operation, especially in inclement weather. The bridge was under the control of the stationmaster at Ford, and his permission had to be obtained before it was opened.

Station East Boxes. He must also place or maintain the block signalling instruments in the "Line Blocked" position.

The signalman at Ford Station East Box on receiving the "Opening Bridge" signal must acknowledge same, maintain his signals at danger and repeat the signal to Yapton (or when closed, Barnham Junction).

The Signalmen at Arundel Junction, Littlehampton Junction (or Littlehampton) and Yapton (or Barnham Junction) on receiving the "Opening Bridge" signal must acknowledge same and maintain all signals for the line towards Ford Bridge at danger until the "Obstruction Removed" signal, seven beats, thus, 3 pause 4, has been received and acknowledged.

\* Ford Junction and Littlehampton Junction Signalboxes were closed in 1928, since when Ford Station East Box has controlled the west end of the triangle and Arundel Junction Box the other junctions

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When an acknowledgment of the "Opening Bridge" signal has been received at Ford Junction Box and Ford Station East Box from each box concerned, the signalmen at the two former boxes may withdraw Annett's Key from the frame which will lock the signals at danger.

The keys must then be taken to the bridge and inserted in the lock in the control box situated in the six-foot way between the up and down lines at the west end of the bridge. The keys must then be turned to release the bridge control bolt, the withdrawal of which locks the keys until the bolt is again replaced.

In opening the bridge, the Traffic Department's staff will be assisted by the Engineer's bridgeman whose duty it will be to unlock the padlock securing the winding gear at the east end of the bridge (the key of the padlock will be kept in the booking office at Ford Junction), also to detach the fishplates, and disconnect the signal wires and gas and water pipes at each end of the bridge.

During foggy weather or falling snow the bridge must not be opened unless the fog-signalmen are at their posts.

Upon the bridge being closed, the fishplates, signal wires etc., must be re-connected, and when everything is in order for the passing of trains, an entry "Line Restored" must be made in the train register book at Ford Junction Signalbox and signed by the man in charge of the Engineer's men. The time of opening and closing the bridge must be recorded in the train register book. The Annett's Keys must also be replaced in the signalboxes and ordinary working may then be resumed.

When a vessel approached the bridge, the Engineer's bridgeman hoisted on the flagstaff at the east end of the bridge a white flag, to denote that the vessel was seen. If the bridge could be opened with

safety, a black ball was then hoisted, and when the span was open, a red flag was hoisted and kept flying until the bridge was about to be closed again for the passing of trains.

At night, a signal lamp fixed at the south-west corner of the bridge on the down side of the line showed a white light up and down the river, but no light up and down the line, when the bridge was closed. When it was open for a ship to pass through, a red light was shown up and down the river, and up and down the line. This lamp was worked by the opening and shutting of the bridge.

The bridge was strengthened in 1898, but otherwise remained practically unaltered for 75 years, until the electrification of the L.B.S.C.R. line to Portsmouth was undertaken. By this time, traffic up the river to Arundel had virtually ceased, as the result of the silting-up of its mouth, and there was no longer any need for an opening span. Parliamentary powers were therefore obtained for the rebuilding of the bridge as a fixed structure, and this work was carried out on April 23 to 25, 1938. The electric trains starting running for public traffic on July 3 following.

In conclusion, the writer wishes to express his thanks to Mr. F. D. Y. Faulkner, Public Relations & Publicity Officer, and to Mr. J. Parker, District Engineer, Brighton, of the Southern Region of British Railways; to Mr. G. Shorter, Curator of the Littlehampton Museum; and to Messrs G. Bolton, F. Osborne, and H. C. P. Smail, all of whom have assisted him in the preparation of this article.