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TRAIN SIGNALLING

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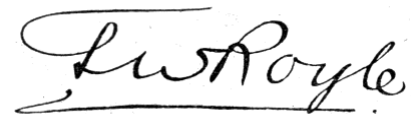
T. H. CARR

MAY, 1939

FOREWORD.

This booklet contains the "Train signalling" articles which appeared in the L.M.S. Magazine during 1937 and 1938, revised to include the amendments to the regulations concerned up to the date of publication.

I sincerely hope that the re-issue of these articles in this form will assist those members of the staff who are interested to a better understanding of the Regulations for Train signalling on double lines by the Absolute or Permissive Block System.

A handwritten signature in black ink, reading "L. W. Royle". The signature is written in a cursive style with a horizontal line underneath the name.

Chief Operating Manager

TRAIN SIGNALLING.

(1) -The Block System.

WHEN railways were first brought into use it was the practice, to provide for the safe working of trains which required to follow each other on the same line by what might be termed a "Time interval" system, the principle being that after an agreed time had elapsed it was quite satisfactory to consider the way clear for the passage of a following train over the same line and in the same direction.

To cover any unusual circumstance or happening on the journey, policemen, as the signalmen of that day were called, were stationed at a few selected points en route, and these men exhibited a hand signal, or in some instances operated a type of semaphore stop signal usually by means of a lever at such signal, if they were aware of any reason why the-second train should not proceed. Apart from this, the line was considered clear and the driver was responsible for the safe working of his train.

"Time interval" gives way to "Space interval".

This arrangement worked satisfactorily while trains were few, permitting an adequate time interval to be maintained between them, and while such trains travelled at a more or less uniform speed. When the number of trains increased, and their speed and weight varied according to type, it became impossible to retain a fixed distance between trains travelling in the same direction by merely relying upon the time of their departure. To cover the changed conditions an arrangement of dividing the line into "space intervals" known as "block sections;" and providing block posts staffed by men whose duty it was to ascertain if these sections were clear before allowing a train to enter was evolved.

Our various systems of "Train signalling" are the present day interpretation of this method of controlling the passage of trains. Although future events may reveal reasons for additions or amendments to the regulations now in force governing these systems, they are the result of experience gained from past events, and in almost every case have had very careful consideration by Railway Clearing House Committees, whose members are representative of all the railways in this country, before being adopted.

A "Block section" and the "Station limits".

It can be assumed that everyone knows the method usually employed to divide the line into block sections, namely, by the provision of signalboxes with a minimum at each box of one stop signal for each direction and a distant signal for such stop signal positioned sufficiently far on the approach side of it to enable a driver to bring his train to a stand at the stop ("home" as it is named) signal if necessary, should the distant signal be at caution.

The "block section" is that portion of the line between the last stop signal of one signal-box and the first stop signal of the next signal-box in advance.

Where more than one stop signal is provided for the same line at a signal-box the portion of line between the first and last stop signal for that box is what is termed the "station limits."

The diagram on page, 6 illustrates "block sections" and "station limits" at consecutive signalboxes, and it is for the safe passage of trains through these successive "block sections" that the various "Train signalling" regulations have been formulated to provide.

Communication between signalmen.

One of the first items WI) meet in the booklets containing the various Regulations for Train signalling is "Bell signals." These, in conjunction with the block and token instruments where such are provided, are the means by which the signalmen communicate with each other to ascertain whether or not a train may enter a section or make certain specified movements and, in addition, they convey information from one signalman to another of unusual occurrences, including emergencies.

With the exception of the Regulations for Train signalling by Telegraph Bells where the "Is line clear?" is not used, this type of bell signal comprises quite a good proportion of the bell signals detailed in the various Train signalling Regulations and it may be thought that these are too numerous.

This, however, is not the case when consideration is given to the fact that a signalman is frequently the man responsible for the regulation of the traffic passing his box. Unless he knows the type and importance of the train he is asked to allow to approach he cannot perform these regulating duties efficiently, and efficient regulation plays an important part in the satisfactory working of the trains which, in turn, means satisfied customers, whether they be passengers or those who use our, parcel and freight services for the conveyance of their goods.

Signalmen may say that these are not the only "Is line clear?" signals they have to know, and those who are not directly connected with the working of signal-boxes may be interested to learn that these particular bell signals have, on occasions, to be supplemented to supply information respecting the route, etc., the approaching train requires to travel. These special "Is line clear?" signals are detailed on the special instructions amplifying or modifying the standard regulations which it is the practice to exhibit in each signal-box.

The foregoing is a brief outline of the change over from the "Time interval" system used in the earlier days of railway operation to the "Space interval" system of the present day. The division of the line to form these "Space intervals" or "block sections" has been explained and a reference made to the method used by the signalmen to ascertain and advise the condition of the block sections.

(2) Fixed signals.

Intermediate Block signals.

It is assumed that everyone is familiar with the standard types of fixed signals provided in connection with running lines and which are dealt with on pages 74 to 94 of the Rule Book. References are made in the various Train signalling Regulations to Intermediate Block signals, but as these are not specially mentioned in the Rule Book, and they are only provided at comparatively few places, the majority of the staff may not have had an opportunity of seeing them, or discussing them with their colleagues who have.

A detailed account of an installation employing this type of signal was published in the July 1935 issue of the L M S Magazine under the title "Installation of Searchlight signals, Weedon and Welton;" but for the benefit of those readers who have not retained a copy of this issue of the Magazine, a brief outline of the basic principles may be of assistance in understanding the application of the regulations where intermediate block signals controlled from the signal-box in rear are concerned.

Intermediate block signals as referred to in the Absolute Block Regulations may be of the semaphore or colour-light type and are controlled from the signal-box immediately in rear of them.

An intermediate block home signal is fixed as far as possible in advance of what would normally be the last stop signal for a signal-box to divide to the best advantage the forward block section. A distant signal is provided for the

intermediate block home signal at the standard braking distance to the rear of this home signal.

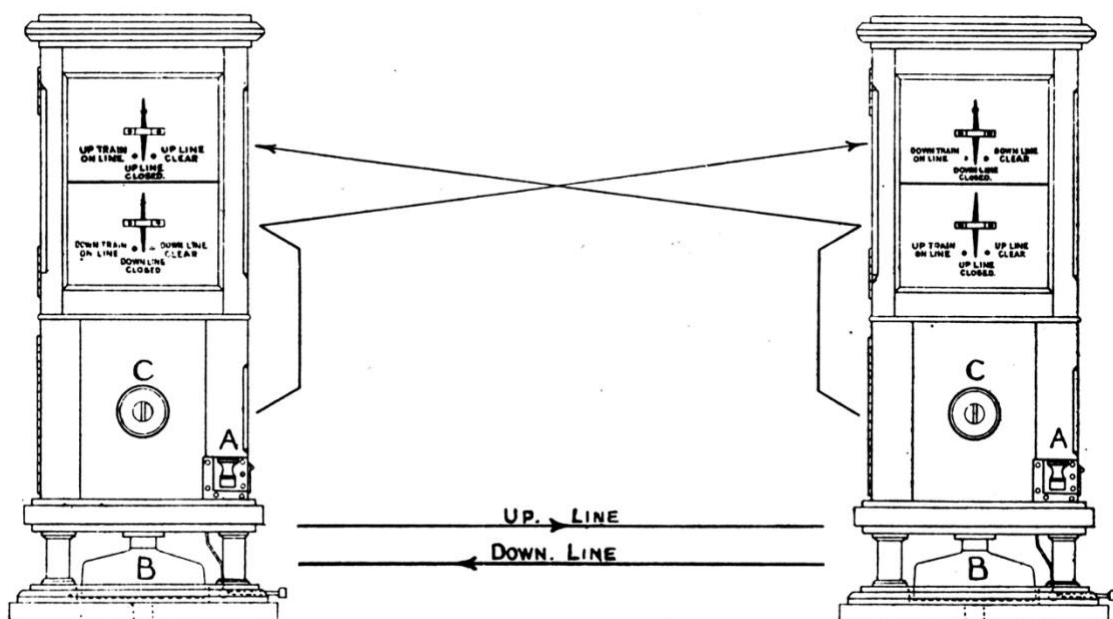
Track circuiting is provided from the signal referred to in the preceding paragraph as the last stop signal through to a point, speaking generally, 440 yards in advance of the intermediate block home signal.

This track circuiting provides for the signalman an indication as to the state of the line through what is virtually an additional block section, and a study of the regulations will show that a train is allowed to travel through the station limits at the box controlling the signals, and forward to the intermediate block home signal, under practically the same conditions as would apply had the additional block section so created been one for which a signal-box was provided.

Equipment is provided to guard against failure of the signals, but these are technical features outside the scope of these comments and were described in the article previously referred to.

Additional instructions respecting the method of working where intermediate block signals are provided will be found on pages 60 and 61 of the "Regulations for train signalling on double lines" and in the Sectional Appendices.

It is the practice to name an intermediate block home signal, and as will be seen from the lists contained in the Sectional Appendices this name is quite distinct from that of the signal-box controlling the signal.



(3) Description of Block Instruments.

BEFORE proceeding with comments on the Regulations, it would perhaps be advisable to give a detailed description of a block instrument for the benefit of those who have not had an opportunity of examining one, so that they will be able to follow clearly these comments.

Mention has been made of the use of "Bell signals" between signalmen. These constitute the audible means of communication, but in addition, and used in conjunction with them, on lines where, the Absolute Block Regulations are in operation, a visual means of communication is provided namely, the needle (or some type of indicator which performs the same function) embodied in the block instrument.

As may be expected on a railway system comprised of several what were previously independent Companies, there are various types of absolute block instruments in use. It is not possible to describe all of them, and for the purpose of these remarks the double needle combined absolute block instrument, has been taken as a representative instrument, and is illustrated on this page.

"Double needle" is self-explanatory, and the word "combined" refers to the fact that the key (A) for sending the bell signals and the bell (B) on which bell signals are received, are incorporated in the one instrument.

The diagram shows the instruments at adjacent signal boxes and illustrates all that is necessary in the way of block instruments to signal trains on the double (up and down) lines between these boxes.

As previously stated, each instrument has two needles, or indicators as they are termed in the various regulations. The lower one alters its position according to the movement of the commutator (C) below it, and is therefore the needle which records the authority given by the signalman at the box in which the instrument is installed for a train to proceed towards that box. The lettering and the needle in this half of the instrument are black.

The needle in the upper portion cannot be moved by means of the commutator on this instrument, but its position is altered by the operation of the commutator of the companion instrument in the signal box at the opposite end of the section. The lettering and the needle in this case are red.

As the lettering below the needles in the illustration is not very legible, that on the left-hand instrument is repeated below, and, so far as the right-hand instrument is concerned, the lettering is similar except that the "down" line is referred to in the upper half (red) and the "up" line in the lower (black). To make the connection between the instruments and the lines -clearer the running line directions have been shown, and each commutator and the needles it affects linked by a line.

Red. Up train on line. Up line clear.

Up line closed.

Black. Down train on line. Down line clear.

Down line closed.

As a train must not enter a block section where the Absolute Block System is in operation without the permission of the signalman at the box in advance, the normal position of the block indicator is "Line closed," that is, with the needle vertical, a position controlled by gravitation.

It is deflected by an electric current from this position so that the lower tip points to the right to indicate "Line clear," or to the left to indicate "Train on line," and the corresponding red needle in the signal box at the opposite end of the section moves in unison with it.

This movement is made for the "Line clear" position by rotating the commutator a short distance in an anti-clockwise direction, and to the "Train on line" position by rotating the commutator to a similar position in the reverse, or clockwise, direction. There is a white line in the centre of the commutator which, as the commutator is turned, corresponds approximately with the angle at which the needle stands.

The importance of the block instrument is that it provides the signalman at both ends of a block section with a visible indication as to whether or not authority has been given for a train to enter the block section, and, having entered, reminds him of its presence.

(4) The Absolute Block System-Object of.

THE Absolute Block System of Train Signalling is designed to ensure that not more than one train travels through a block section on the same line at the

same time. If this fundamental principle of the regulations is rigidly adhered to in normal working one of the main objectives for the safe operation of trains under this system has been achieved.

There are cases, of course, where a second train can be in the section, but these are cases of emergency and specially catered for in the rules and regulations.

As distinct from emergencies, attention may be called to the following occasions when a second train can be said to be in an absolute block section.

(a) At a block post with merely one stop signal (i.e., without a "station limits" area) when it is necessary to bring a train within such stop signal as laid down in Rule 37 (b).

(b) Where Regulation 35 is not authorised and a shunt is made into the forward section as laid down in Rule 38 (b) (ii), or with the authority of the shunt-ahead signal referred to in Rule 46.

Both these movements can be made into the forward section during the time a train is travelling through the section towards the box in advance, but it must not be overlooked that they do not come within the category of the normal passage of a train through a block section.

(5) Is Line Clear?

As already explained, the normal position of the block indicator is "Line closed," therefore no train must be allowed to proceed until the permission of the signalman at the box at the opposite end of the section has been obtained.

The fact that the normal position of fixed signals is caution or danger as laid down in Rule 35 (f) makes the signalman master of the situation, and is his safeguard against a driver proceeding without the authority referred to in the preceding paragraph first being obtained.

In considering the permission a signalman requires before he can allow a train to proceed let it be assumed he has received the "Train entering section" signal from the signal-box in rear; in other words, an indication that the train he has authorised to approach, and which he desires should enter the forward section in the ordinary way, is leaving that box.

On receipt of this signal, having previously received the "Train out of section" for the preceding train, he first looks at the block indicator applicable to the line on which it is desired the train shall travel forward and only (except in certain specific circumstances) if it is in the normal position, that is, "Line closed," does he send the appropriate "Is line clear?" signal, preceded of course by the "Call attention" signal.

The fact that the signalman does not generally signal a train unless the block indicator is normal is in itself a safeguard. In other words, he does not tempt the signalman at the box in advance to receive another train until at least the section is clear.

The acknowledgment of the "Is line clear?" bell signal and the placing of the block indicator to the "Line clear" position constitute the permission the signalman requires for the train to proceed, and he may then take off his signals for the train to enter the forward section.

As the train passes the signal-box (except as provided for in Regulation 3, clause (d), (ii)) the "Train entering section" signal is forwarded. The signalman at the box in advance then moves the indicator from the "Line clear" to the "Train on line" position.

The replacing of the signals behind the train is a point worth mentioning. Rule 68 covers the procedure, and as will be seen from this rule, the method provides for the travelling train being protected by the fixed signals at the earliest possible moment.

Regulation 3 clause (b) refers to the desirability of sending forward the "Is line clear?" signal as soon as it has been acknowledged to avoid delay to a train. It will be realised that a train travelling at high speed over a portion of line where the signalboxes are spaced at rather short intervals will be checked, owing to the signals still being at caution or danger when the train approaches them, if the signalman waits until he receives the "Train entering section" signal before obtaining permission for the train to proceed. In areas where the operation of clause (b) is desirable a reminder to this effect is included on the special instructions issued to the signalmen.

(6) The "Train Approaching" Signal.

THE use of this signal is not general and a brief outline of a circumstance when its adoption is an advantage is given below.

On stretches of line over which fast running trains operate and where series of signal boxes divided by short distances exist, the "Is line clear?" signal has to be forwarded on acknowledgment as described above if checks to these trains are to be avoided.

A series of closely positioned boxes, however, may extend for ten miles, and to send the "Is line clear?" box to box all this way is more than is necessary to enable signals to be taken off. Such an arrangement would in fact prevent freedom of movement at perhaps half the boxes for a longer period than the circumstances justify.

To limit the period during which shunting operations or the working of a junction is restricted, arrangements would be made for the "Is line clear?" signal to be sent forward on acknowledgment over the first half of the series of boxes, to be held at that point until receipt of the "Train approaching" signal.

In this instance the "Train approaching" signal would no doubt be initiated by the signalman at the box at the commencement of the series on receipt by him of the "Train entering section" signal, and passed forward on receipt by the intermediate boxes to the box withholding the sending forward of the "Is line clear?" signal.

It will be appreciated that this method curtails the headway for the "Is line clear?" signal to a distance sufficient to provide an adequate time interval to prepare an unrestricted passage for a train and at the same time allows freedom of movement for station or junction working for the longest possible period consistent with avoiding delay.

(7) Line Clear.

THE action to be taken by a signalman who has been requested to give permission for a train to enter a block section is detailed in Regulation 4. Although a cursory glance may give the impression that this particular regulation is somewhat involved, the principle is simple, namely, the maintenance of a length of clear line ahead of the first stop signal during the time a train is approaching through the block section in rear. Its seeming complications are merely variations of this basic principle to cover positioning and types of signals, proximity of signal boxes, layout of line, weather conditions, and a failure of the signalman's means of communication.

Observation of instruments, track and points.

Before permitting a train to approach, the signalman must first of all satisfy himself by reference to the block instrument that the rear block section through which the train requires to travel is clear. Having done this, he must next ascertain that the section of line ahead of his first stop signal which he intends to reserve as an over-lap for the train is clear and any points in that line correctly set. This he does by observation, either of the actual track or of the apparatus (such as track circuit indicators) taking the place of vision of the track, and by examining the position of the levers in the frame.

This reservation of a section of line within the first stop signal is a precautionary measure to eliminate, or minimise, the risk of serious results should a train inadvertently pass the stop signal in the event of it being necessary to keep this signal at danger.

The "Clearance point".

The forward extremity of the over-lap mentioned above is called the "clearance point" and the standard distance adopted is one-quarter of a mile ahead of the first stop signal as laid down in the first paragraph of clause (a) of Regulation 4.

Should the signal box in advance be within this distance of one-quarter of a mile, it will be realised the signalman desiring to give permission for a train to approach cannot assume responsibility for the condition of the line under the jurisdiction of the signalman at the advance box, so, in the absence of any special instruction to the contrary being included on the special instructions exhibited in his box, all he is asked to do in these circumstances is to confirm that the forward block section is clear in the manner described in the first paragraph of clause (b) of Regulation 4.

Having satisfied himself that the rear block section is clear, the section of line he intends to reserve for the approaching train is not obstructed, the points in that line are correctly set for the safe passage of the train, and also that points in adjoining lines and sidings are set (where possible) to avoid the risk of any train or vehicle on such lines or sidings fouling the over-lap, the signalman may then acknowledge the "Is line clear?" signal.

Maintenance of over-lap.

Permission has now been given for the train to approach, and the conditions applicable at the time of acknowledging the "Is line clear?" signal must not be altered, except as permitted by the last paragraph of the instruction on page 3

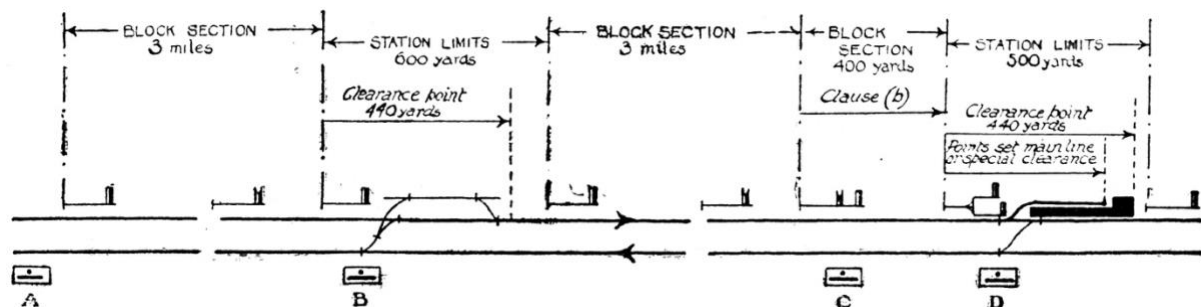
of the Absolute Block Regulations under the sub-heading "Working of fixed signals at junctions and other diverting points," until the train has been brought to a stand at the home signal, has passed into the section in advance (or been otherwise disposed of). or, in the event of the train not leaving the signal box in rear, the "Cancelling" signal is received from that box.

This preservation of the over-lap is a most important point, and is the subject of clause (C) of Regulation 4, and is emphasised in clause (h) of that regulation which deals with an instance of a train. returning in the wrong direction under the authority of a wrong line order.

Terminal lines.

All lines are not through lines, and a signalman may be authorising the approach of trains into a terminal station, or with the points set for a dead end bay at a through station, In such circumstances the standard clearance point applies, either being obtained on the terminating line, or some other line for which the facing points can be set. If this cannot be done the special instructions exhibited in, the signal box describe to what point the line concerned must be clear before the "Is line clear?" signal is acknowledged.

The method of working the signals applicable to the- terminal or bay lines is laid down in Rule 96.



The diagram above illustrates the division of the "block section " and "station limit," and will assist the reader to appreciate points mentioned in these initial comments on Regulation 4 "Line clear or giving permission for a train to approach."

Working during fog or falling snow.

The circumstances under which permission can be given for a train to approach, reviewed in the first part of this chapter, were those applicable to clear weather when visibility is good.

Unfortunately, the weather is not always clear, and so far as the running of trains is concerned, fog and the period during which snow is falling are the two adverse weather conditions which the Railway Companies have decided to cater for specially, owing to the extent to which they can reduce visibility.

In the first. place, to obtain uniformity, some guide must be given as to when visibility is to be considered as reduced to a distance when the proper observance of signals by the driver of a running train may become difficult.

It is therefore laid down in the "General Instructions to signalmen" included in the Regulations for Train signalling pamphlet, that, when visibility from a signal box is reduced to 200 yards owing to ,fog or falling snow the time has arrived to carry out the special conditions applicable to working during fog or falling snow.

To assist the signalman it is the practice, where possible, to name on the special instructions exhibited in his signal box a signal (or some other suitable object) at a distance of from 180 to 220 yards from his box, which he takes as a guide.

When this "Fog object" as It is called, becomes obscured by fog or falling snow, or at signal boxes where it is not possible to name a "Fog object" the signalman is unable to see a distance of 200 yards; he arranges {or the fog-signalmen (where such are appointed) to be called out.

The presence of a fog-signalman at a signal to acquaint drivers of the position of the arm or aspect displayed, thereat by means of detonators, hand signals, and verbal Instructions, as laid down in Rules 91 and 92, is considered to overcome the difficulties experienced owing to bad visibility.

Until these men take up their duties at the signals laid down to be fogged, however, and at signal boxes where fog-signalmen are not appointed signalman must only give permission for a train to approach in accordance with the ·conditions laid down in clause (e) of Regulation 4.

This clause extends the usual clearance by requiring the forward block section to be also clear and no standing train occupying the overlap at the box in advance.

If the box in advance is only a short distance ahead an instruction is usually included on the special instructions exhibited in the signal box prohibiting the acknowledgment of the "Is line clear?" signal until such a signal has been

acknowledged by the signalman at the advance box. This provides an overlap comparable to that obtained by the method described in the preceding paragraph where the box in advance is a reasonable distance ahead.

It is not the practice to employ fog-signalmen at continuously lit colour-light signals, and Clause (i) of Regulation 4 permits a signalman to treat this type of signal during fog or falling snow as if fog-signalmen were stationed at them.

Junction working.

Paragraphs (1) to (iv) of clause (f) of Regulation 4 describe in detail the method of controlling conflicting movements at junctions, and the clause includes a diagram for use in conjunction with the paragraphs mentioned.

Briefly, these paragraphs of clause (f) mean that at junctions where trains can cross or foul each other, a signalman is not allowed to give permission for trains to approach the junction at the same time (except as described below) unless there/are facing points which can be set to give each train an independent overlap.

As regards the exceptions, the first is , where an additional home signal is provided at least a quarter of a mile in rear of the home signal protecting the junction, the signalman may permit a train to approach with the junction occupied provided the line is clear to the inner home signal and the weather is clear, or during fog or falling snow fog-signalmen are on duty at the distant and outer home signals if these signals are not of the continuously lit colour-light type.

A train accepted in this way, however, must not be permitted to draw down from the outer to the inner home signal if the junction ahead of the inner home signal is in use; nor conversely must a movement be allowed to cross the junction during the time a train is drawing down from the outer to the inner home signal. This is , covered by paragraph (v) of clause (1) of Regulation 4.

The second exception is , that two trains, neither of which must be conveying passengers, may be allowed to approach a junction from directions with an overlap common to both, but the signals must be kept at danger against both trains until the one required to cross or foul the junction last has come to a stand at the home signal. This exception is covered by clause (g) of Regulation 4, but must only be worked to when specially authorised on the special instructions exhibited in the signal box concerned.

Outer home signals.

Reference is made in various clauses under Regulation 4 to "an additional home signal at least a quarter mile in rear of the inner home signal".

A number of signal boxes have more than one home signal fixed at varying distances apart, and to distinguish them in the lever frame in the signal box, the levers working them may be labelled in various ways.

Before the outermost of these dual home signals can be utilized for the acceptance of trains in the manner described in these clauses, however, there must be a distance of not less than a quarter mile between such signal and the next stop signal, the inner home. This matter of distance, and the provision of fog-signalmen at both the distant and outer home signals during fog or falling snow (other than continuously lit colour-light signals) are most important; in short they are the factors which govern the use of outer home signals for acceptance purposes.

(8) The Warning Arrangement.

THE overlap reserved when the "Is line clear?" signal is acknowledged by repetition as laid down in Regulation 3 may not be available, and for traffic reasons or owing to the class of train requiring to approach it is not considered necessary, or, even if the overlap is available, the circumstances existing at a signal box are such that it is undesirable to allow the unrestricted approach of a train. When such is the case the signalman employs what is known as the "Warning arrangement". that is, he acknowledges the "Is line clear?" signal by the bell signal 3-5-5-"Section clear but station or junction blocked" instead of by repetition.

This method of working is covered by Regulation 5 and must only be used in the special circumstances detailed in the Block Regulations and General Appendix, and where specially authorised on the special instructions exhibited in the signal box.

The "Is line clear?" signal may be acknowledged in this way without special authority during normal working with the line clear to the home signal only in the following circumstances :

- (a) Ballast train or inspection train requiring to stop in section or freight train calling at intermediate siding in section. Regulation 8.

(b) Trolley going into or through one of the tunnels enumerated in the Sectional- Appendices and dealt with as laid down in Regulation 9.

(c) Motor trolley for use of the Engineering Departments staff, as shown in the special booklet.

During the period of exceptional working the 3-5-5 signal, can be used with the line clear to the home signal only and without special authority as under:.

(a) When the line is obstructed within the home signal and assistance is required from the rear as described in Regulation 14 (b).

(b) During single line working. Rule 200.

(c) Motor trolley for use of the Engineering Department's staff during mishap or emergency. Page 56 of the General Appendix.

As regards the use of the "Section clear but station or junction blocked," signal with an overlap ahead of the home signal and without special authority, the following Regulations provide for this ;.

Regulation 4, clause (b), paragraph 2; clause (e) (i), paragraph 3;. clause (e) (iii) and (iv).

Regulation 24, clause (d).

Controlling the Train.

When the "Is line clear?" signal for a train is acknowledged by repetition, the distant and stop signals worked from the signal box receiving this acknowledgment are taken off immediately, and the train has an unchecked run into the forward section.

(It would be as well to mention that the preceding paragraph describes what takes place in long sections and not in short sections where distant signals may be slotted, underbolted, or worked in conjunction with indicators as laid down in Regulation 34).

When the "Is line clear?" signal is acknowledged by the bell signal 3-5-5 the margin of safety provided by the overlap is not present in the ordinary course of events, or if an overlap is reserved there is some circumstance which does not justify the unrestricted approach of the train. The absence of overlap or the presence of an unusual circumstance at the box in advance is provided for

by the signalman receiving the bell signal 3-6-5 instead of the repetition acknowledgment of the "Is line clear?" signal maintaining his distant signal at caution, and the stop signals at danger, until he is prepared to warn or has warned the driver of the train which is to proceed into the forward section under the "Warning arrangement."

In the meantime he should place a metal link or lever clip on the lever of the signal controlling the entrance of trains into the section ahead to remind him this signal must not be taken off until the driver has been warned.

The signalman who has accepted a train under the "Warning arrangement" and finds prior to receipt of the "Train entering section" signal that the circumstances at his box have so changed as to permit the train being accepted in accordance with Regulation 4, must advise the signalman at the rear box of this by giving the special bell signal 3-3-5, and the signalman receiving this signal is then authorised to take off his signals for the train to proceed without being warned.

Methods of Warning.

The method of warning the driver varies according to the signals provided at the box in question and may be classified as follows:

(a.) At a box with merely a distant and home signal, the signalman must stop the train at the signal box in accordance with Rule 40, inform the driver verbally that the section is clear to the next home signal but that the station or junction ahead is blocked, and then authorise him to proceed by the exhibition of a green hand signal held steadily.

(b) If there is a starting signal, the train must be checked at the home, a green hand signal held steadily exhibited to the driver as the train passes the box, and on his acknowledging by giving a short whistle that he has seen the hand signal, the starting signal can be taken off, If the driver does not acknowledge the hand signal, the starting signal is not taken off until the train has been brought to a stand at that signal.

(c) At a signal box where a "warning" signal as described in Rule 45 is provided on the signal controlling the entrance of trains into the section in advance, the train is allowed to proceed on the authority of the "warning" signal after having been brought quite or nearly to a stand at that signal. no verbal warning or hand signal is necessary in such circumstances.

(d) Where intermediate block signals are provided the driver is informed that his train is to proceed under the "Warning arrangement" when he telephones the signalman that his train is at a stand at the intermediate block home signal. unless a fixed "warning" signal is provided.

(e) Should a train be standing at the signal controlling the entrance of trains into the section in advance, or at an intermediate block signal not provided with a fixed "warning" signal, when this signal is taken off, the driver will assume that his train is being allowed to proceed under the "Warning arrangement."

So far as the driver is concerned, Rules 41 and 45 in the Rule Book, and the extracts from the Block Regulations contained in the " Book of extracts from the Train Signalling Regulations" with which he is supplied, acquaint him with the methods adopted for advising him that his train is being allowed to proceed under the "Warning arrangement."

(9) Assisting trains in rear.

ON those sections of the line specially authorised in the Sectional Appendices, and in the circumstances detailed therein, trains may be assisted in the rear by an engine or engines, or in the case of trains not conveying passengers this assistance may be given by an engine with one or two brake vans. Assistance should not be given at any other point except in case of emergency.

In the majority of cases assisting engines or engine and brake vans are not coupled to the train they are assisting, and as they are capable of movement independent of the train it is necessary that the signalman should in every case be advised of their presence in the block section.

Regulation 6 instructs the signalman to forward to the signalman at the box in advance the bell signal 2-2 for an engine assisting in the rear or the bell signal 2-3-1 for an engine with one or two brake vans assisting in the rear, immediately after he has received the acknowledgment of the Train entering section signal for the train which is being assisted. If more than one engine is assisting the train In the rear the bell signal 2 2 must be forwarded and acknowledged for each engine.

Rule 133, clause (a), provides for an assisting engine or engines leaving the train they are assisting only at a signal-box unless specially authorised , and clause (b) of this rule states that the tail lamp of a goods train assisted by an engine in the rear must, except where otherwise provided, be removed and

only replaced, if practicable, within sight of the signalman at the signal-box at which the assisting engine leaves the train.

It will thus be seen that everything possible is done to avoid any risk of the section being considered clear before the assistant engine has passed clear of it.

When light engines are coupled together or when more than one engine is coupled to one or two brake vans, similar arrangements are carried out, and Regulation 7 describes in detail the method of signalling the various coupled combinations.

(10) Trains working in section.

WHEN a ballast train requires to work in the section, the signalman, instead of acknowledging the "Is line clear?" signal in accordance with Regulation 3 and maintaining an overlap as laid down in Regulation 4, acknowledges it in accordance with Regulation 5.

Regulation 8 gives the signalman this authority at all times and without reservations, and it will be appreciated that this facility to accept the train in accordance with the Warning arrangement avoids restricting the movement of trains at the signal-box at the forward end of the section in which the ballast trains requires to work. This facility is a distinct advantage to the working of traffic where a junction is concerned.

Clause (c) of Regulation 8 allows a freight train calling at an intermediate siding in the section or an inspection train requiring to stop in the section, to be dealt with in a similar manner.

An instruction on page 47 of the General Appendix authorises a signalman, when advised by the driver of a train that it is absolutely necessary to stop for water near the signal box ahead which is switched out, to signal such train in accordance with this regulation.

On page 48 of the General Appendix there is an interesting instruction concerning ballast trains returning to the signal-box in rear in the wrong direction.

(11) Signalling of Permanent Way Trolleys.

THE trollies used by the Engineering Department's staff, while in use on running lines where the Absolute Block Regulations are in operation are not, as a rule, signalled on the block instruments, but are protected by hand-Signalmen and where possible by fixed signals.

When a trolley is signalled on the block instrument It is because one of the tunnels specially named in the various Sectional Appendices exists in the block section concerned, Regulation 9 describes the method of signalling a trolley in these circumstances and the same regulation gives the signalman at the box in advance his authority for acknowledging the "Is line clear?" signal in accordance with Regulations 5 (Warning arrangement).

Motor trollies for the use of the Engineering Department's staff are authorised to be used on certain sections of the line. These vehicles are always signalled on the block instruments and the method of signalling and the authority to use Regulation 5 are contained in the special booklet issued to the staff concerned for the working of them.

Motor trollies can also be operated during mishap and emergency on sections of line other than those authorised, and the necessary instructions are shown on page 56 of the General Appendix.

(12) Train out of section.

THE sending of the "Train out of section" signal and the restoration of the indicator of the block instrument to the normal position as laid down in Regulation 10 is the concluding phase of the signalling of a train through a block section. After this has been done the block section concerned should, in the ordinary course of events, be available for the passage of a subsequent train.

The correct observance of this regulation is of major importance and is essential If the fundamental principle of working in accordance with the Absolute Block System, i.e. only one train in the block section on the same line at the same time, is to be carried out with the possibility of irregular working reduced to a minimum.

Rule 120 states that every train must carry a lamp attached to the rear of the last vehicle when on any running line and this lamp, which has a red lens must be alight during the hours of darkness and in certain other circumstances.

The presence of this tail lamp is the signalman's evidence that the train has arrived complete, and he must see it, or when the train does not pass the signal box before the "Train out of section" signal has to be given, he is authorised in clause (b) of Regulation 10 and Rule 147 to ascertain from the guard or shunter in charge of the train, or the fireman in the case of a light engine, that the lamp is there.

Everything possible is done to minimise the risk of the "Train out of section" signal being given before the train has passed clear of the block section or when only part of the train may have cleared.

As regards the electrical or mechanical safeguards, there is the track circuit and the fireman's call plunger, either of which, when installed at a home signal, in addition to operating an indicator in the signal box, usually prevents the indicator of the block instrument being replaced to the normal position when a. train is standing on the track circuited portion of the line, or when the fireman's call plunger has been operated, until the home signal has been taken off for the train to proceed and then replaced.

Where these are not provided Rule 55 instructs the fireman of a train detained at a signal to go immediately to the signal box to remind the signalman of the presence of the train, and the signalman is provided with an appliance which he can place over the commutator or handle of the block instrument to remind him not to give the "Train out of section" signal prematurely.

It is to the signalman's advantage to make prompt use of this appliance whenever the occasion requires it as an aid to memory, even in those cases, where the train can be seen from the signal box, In addition, if there is a signal protecting the standing train, the signalman should place on the lever working the signal one of the metal clips or links provided for his use as a reminder that the protecting signal must not be taken off.

(13) Engine running round train.

It may be necessary on occasions for a train which has been brought to a stand at a signal box with the whole or part of the train beyond the last stop signal to be propelled to the forward box or Withdrawn from the block section at the signal box at which it has been stopped.

Regulation 10A describes the method of signalling to be adopted in such circumstances and provides for the train engine running forward to the box in advance and returning from that box on the right line to be placed to the rear

of the train under the supervision of the signalman at the rear box, or alternatively, the train engine going forward and another engine being placed to the rear of the train.

Points to remember in connection With this particular movement are:-.

The " Engine arrived" signal, which is given by the signalman at the forward box, and is actually the signal the signalman at the box in the rear uses as his guide for authorising the vehicles to be propelled to the box in advance, must not be given until the train engine has arrived and the line is clear to the point to which it was clear when the train left in the section was accepted.

The signalman at the box in rear must not give the "Train drawn back clear of section" signal until the train has been crossed to another running line, or has been shunted into a siding.

The "Train out of section" signal must not be given until the whole of the train is clear of the section, i.e., It has been propelled to the forward box or the "Train drawn back clear of section signal has been received from the rear box.

(14) Train an unusually long time in section.

A SIGNALMAN knows, as a rule, from his knowledge of the locality the distance at which the next signal box open in rear is situated. If not, he can ascertain the distance by reference to the Sectional Appendix. He is advised the class of train which is approaching by the descriptive "Is line clear?" signal and knows when such train passes the rear box because he then receives the "Train entering section" signal. Experience tells him how long the particular type of train should take to reach his signal box, and If the usual time is exceeded Without any sign of the train, some action must be taken to safeguard traffic ,on the opposite line. Regulation 11 detail, the precautionary measures considered necessary.

Provided the weather is clear and there is no tunnel in the section through which the overdue, train is travelling, the signalman merely advises the driver of the first train proceeding in the opposite direction of the circumstances and instructs him to proceed with caution. If, however, the weather is foggy or snow is tailing or there is a tunnel in the section. conditions under which It would be difficult for the driver to observe the track, no train must be allowed

to enter the section in the opposite direction until the signalman has ascertained that it is safe for it to do so.

As is already known, a train may be allowed to pass the signal box and draw to an intermediate block home signal without the "Is line clear?" signal being forwarded to the signal box in advance. In these circumstances the signalman at the advance box is not aware of the fact that all may not be well with a train which may have travelled some distance in the direction of his box. The instruction in the Sectional Appendix dealing with intermediate block signals states that the fireman of a train detained at an intermediate block home signal must telephone the signalman, and should this telephone message not be received within a reasonable time or the track circuit indicators in the signal box reveal that the train drawing forward is not proceeding in a normal manner, the signalman controlling the intermediate block signals forwards to the signalman at the box in advance the "Train an unusually long time in section" signal (6-2). On receipt of this signal the signalman at the advance box acts in the same way as he would do had he become aware of the fact by his own observations.

Trains on parallel lines which may possibly be obstructed are dealt with in a similar manner.

An engine may be permitted to examine the opposite or parallel line during fog or falling snow or where a tunnel intervenes, as laid down in Regulation 14A.

(15) Obstruction danger.

A variety of things may happen to make it unsafe for trains to travel over a section of-line, and it is the responsibility of the signalman who either sees or is advised of these dangers, to traffic to prevent trains approaching the obstruction. He does this, except where otherwise provided for in the regulations, by giving the "Obstruction danger" signal, 6 beats consecutively, to the signalman at the box in-rear on each line that may be affected.

The signal is sent irrespective as to whether or not the "Is line clear?" or the "Train entering section" signal has been received for a train, the indicator of the block instrument. is placed to the "Train on line" position (if not already in that position) to record the presence of the obstruction and the signals placed or maintained at danger.

The signalman receiving the "Obstruction danger" signal must place or maintain the signals for the obstructed line at danger, then acknowledge the

bell signal and place 3 detonators, 10 yards apart, on the-line concerned. Steps must also be taken to protect a parallel line which may possibly be affected.

Should the signalman receiving the "Obstruction danger" signal succeed in stopping a train for which the "Is line clear?" signal has been acknowledged he must forward the Cancelling signal (3-6). This signal will be acknowledged but the block indicator will be maintained at the "Train on line" position to record the presence of the obstruction.

If the signalman in rear cannot prevent the train entering the obstructed section, he will forward the signal "Train or vehicles running away on right line" (4-6-5) and the signalman at the forward, box must then do all in his power to stop the train, afterwards acknowledging the signal.

It will be appreciated that prompt and decisive action by the signalmen concerned in carrying out the provisions of this regulation is imperative if serious consequences are to be avoided to what may have been, in the first instance, a minor mishap.

No subsequent train, except a breakdown van train or other train going to render assistance, must be allowed to enter the obstructed section until the "Obstruction removed" signal (2-1) is received. The "Obstruction removed" signal will not be given, nor (except as shown in the following paragraph) the block indicator restored to the normal position until the obstruction has been removed and any train which may have entered the section owing to the inability of the signalman at the box in rear to stop it, or a breakdown van train or train rendering assistance, have cleared the section.

The block indicator can be restored to the normal position when single line working is brought into operation as described in Rule 198 (b) or, if the obstruction is inside the outermost home signal with the section otherwise clear, it is necessary to allow a breakdown van train or train rendering assistance to be accepted in accordance with Regulation 5, as laid down in Regulation 14 (b).

The "Obstruction danger" signal is also given if a signalman observes a train approaching his box for which he has not acknowledged the «Is line clear?" signal or has not received the "Train entering section" or "Train or vehicles running away on right line" signals.

(16) Line Obstructed.

NOT every obstruction requires the use of, so drastic a measure as the forwarding of the "Obstruction danger" signal described in the last chapter. For instance, animals such as horses or cows straying on to the line are an obstruction for which the Block Regulations provide a less restrictive method of ensuring the safe working of traffic.

The signalman who becomes aware of such an obstruction informs the signalman at the signal box at the opposite end of the block section affected and, of course, makes arrangements for the animal or animals to be removed from the railway as quickly as possible.

Until the line is clear each train proceeding into the block section concerned is stopped, the driver verbally informed of the circumstances and instructed to proceed with caution. If there be a tunnel in the section an additional precaution is taken insomuch that the guard, as well as the driver, is told, and although the train may enter the section, it must not proceed through the tunnel until the trainmen have ascertained that the tunnel is clear. When the animal has been removed and the line is again clear, the signalman who becomes aware of this fact informs the signalman at the other end of the section and normal working can then be resumed.

Regulation 12A describes the method of working, and Rule 155 instructs the driver of a train who observes cattle on the line to warn drivers of trains on the opposite line and advise the stationmaster at the next station at which his train stops or, if the occasion require it, stop his train at the next station. or signal box to acquaint the station staff or the signalman of the obstruction.

(17) Blocking Back Outside Home Signal.

IT has been explained in Chapter 8 that the presence of a train in a block section is recorded by the indicator of the block instrument being at the "Train on line" position, and this applies whether the train enters at the rear or the forward signal box.

Traffic operations at times necessitate a train being placed outside the first stop signal at a signal box ; in other words, enter the block section at the forward signal box instead of at the rear signal box.

This particular movement is known as "Blocking back outside home signal", and before the block section is occupied the signalman at the forward signal box must send the bell signal 3-3 to the signalman at the signal box in rear and receive from him a repetition acknowledgment.

On receipt of this acknowledgment the signalman must place the block indicator for the section into which he intends to place the train direct to the "Train on line" position, unless his block instrument is of the rotary type, in which case he will have to operate the indicator to the "Train on line" position through the "Line clear" position as described in Clause 3 of the instructions respecting the use of rotary interlocking block instruments on page 55 of the Absolute Block Regulations booklet.

As regards the authorisation of the movement by the signalman at the rear signal box, apart from one condition, in which distance is a deciding factor, he can give permission provided he is satisfied it is safe to do so.

The instance in which distance plays a part is when there is less than half a mile between the stop signal outside which it is required to place the train and the first stop signal at which the train approaching in the right direction can be detained by the signalman giving the permission.

In these circumstances, permission must not be given for the block back outside the first stop signal at the forward box if permission has been given for a train to approach in accordance with Regulation 4 (unless an additional home signal is provided at least a quarter of a mile in rear of the inner home signal) until such train has been brought to a stand at the stop signal or been cancelled. Conversely, if a blocking back movement has been authorised under these conditions, then permission must not be given for a train to approach in accordance with Regulation 4 (unless there is an additional home signal as previously mentioned) until the movement blocking back has come to a stand in the block section or has been withdrawn.

To acquaint the signalman at the rear box when a blocking back movement is at a stand the bell signal 3-3-4 is used, but this must not be sent by the signalman placing the train outside his first stop signal until he is satisfied that no further backward movement will be made.

When the train is again brought within the first stop signal, and provided it is not then brought to a stand in the 440 yards which constitute the normal "overlap" of that signal required for the acceptance of trains as laid down in Regulation 4, the "Obstruction removed" signal 2-1 is given and the indicator of the block instrument restored to the normal position.

If the train be brought within the first stop signal and then detained in the 440 yards "overlap" the "Obstruction removed" signal is given, but the block

indicator is maintained at the "Train on line" position and the train signalled to the rear box as "Blocking back inside home signal", a movement which will be dealt with in the next chapter.

It should be remembered that no train or vehicle, other than an engine or engine with one or two brake vans, must be placed outside the first stop signal where the line is on a falling gradient of more than 1 in 300 towards the signal box in the rear unless specially authorised on the special instructions exhibited in the signal box concerned.

(18) Blocking Back Inside Home Signal.

As already explained, an overlap of a quarter of a mile is reserved within the first stop signal for a train accepted in accordance with Regulation 4, and the block indicator is not restored to the normal position until the train has passed clear of this overlap. To be consistent, therefore, the occupation of the overlap by a movement other than a through train should be recorded.

Stationary Occupation Only Concerned.

This recording of the presence in the overlap of a train or vehicles, other than a train signalled in the normal manner, is restricted to stationary occupation and is covered by Regulation 13A.

This regulation instructs the signalman who wishes to place a train or vehicles on a running line within a quarter of a mile of his first stop signal or, alternatively, between his first stop signal and any other point which may be named on the special instructions exhibited in his box as the overlap he must maintain for a train accepted in accordance with Regulation 4 (and such train or vehicles are going to come to a stand there), to first send to the signal-box in rear and have acknowledged by the signalman at that box, the bell signal "Blocking back inside home signal" 2-4.

In addition to the occupation of the overlap by a standing train or vehicles, the signal "Blocking back inside home signal" must also be sent if a rail is taken out within the overlap or any stationary obstruction (except a lengthman's trolley) placed there.

In the circumstances described in the preceding paragraph the overlap must always be considered a quarter of a mile, any special overlap authorised on the special instructions at the box concerned not being applicable.

Method of Signalling.

When the signal "Blocking back inside home signal" is acknowledged by the signalman at the box in the rear, the signalman at the forward box places the block indicator for the line concerned direct to the "Train on line" position to record the occupation of the overlap. If the block instrument is of the Rotary type the handle is moved to the position marked "B.B.I." (Blocking back inside). This has the effect of placing the indicator to "Train on line" but at the same time avoids the necessity for operating the apparatus which normally releases the indicator of this type of instrument from the "Train on line" position.

When the obstruction of the overlap has been removed the "Obstruction removed" signal, 2-1, is given and the block indicator restored to the normal position, except as described in the following paragraph.

When the block indicator is at the "Train on line" position, as a result of the sending of the signal "Blocking back inside home signal", the signalman at the rear box is not prohibited from forwarding the "Is line clear?" signal. On receipt of an "Is line clear?" signal in these circumstances, the signalman will either clear the line or, if the train offered is one which he can accept in accordance with Regulation 5 (i.e., line clear to home signal only), he will acknowledge the "Is line clear?" signal by the warning signal, 3-5-5. In this case the block indicator is maintained at the "Train on line" position and only restored to normal when both the blocking back movement and the train accepted under the warning arrangement are clear of the overlap.

It is sometimes necessary to transfer a train or vehicles occupying the overlap to a position outside the first stop signal. Before this is done the signalman at the forward box advises the signalman at the rear box of the circumstances and then sends the cell signal, 2-1, maintaining the block indicator at the "Train on line" position, following this by the signal "Blocking back outside home signal", 3-3. If the signalman at the rear box is in a position to allow the movement to be made he will acknowledge the signal. If for any reason he is unable to acknowledge the signal, the signal "Blocking back inside home signal" must again be sent to the rear box and acknowledged. It will be appreciated that the most important feature of this arrangement is the fact that the block indicator is not moved from the "Train on line" position.

At Junctions.

Where lines diverge at a junction, the "Train out of section" signal may be given and the block indicator restored to the normal position for a through train which has been brought to a stand beyond the junction but within the overlap provided the junction facing points are reset for some other line which is clear. These points must not, however, be again set for the line on which the train is standing (if the block indicator for the rear section is in the normal position) until its presence in the overlap has been recorded by the sending and acknowledgment of the signal "Blocking back inside home signal".

Where lines converge at a junction, should a train require to be drawn over the junction trailing points to stand in the overlap common to the converging lines, the movement must not be made until the signal "Blocking back inside home signal" has been sent to, and acknowledged by, the signalman at the rear box or boxes on the converging line or lines to record the presence of the train in the overlap which as already stated, is applicable to the line on which the train has approached and also any converging line. So far as the line on which the train has approached is concerned, the fact that the "Train out of section" has not been given constitutes the safeguard.

The occupation of the overlap at junctions by other than through trains is dealt with in a similar manner. In the case of a diverging junction, the signal "Blocking back inside home signal" is sent if the facing points are set towards the occupied line and, where lines converge, the signal is sent on each of the converging lines.

(19) Entering an Obstructed Section.

In the normal course of events a train must not be permitted to proceed into an occupied block section. There are occasions, however, when it is necessary for a train to enter an occupied or obstructed block section, as for instance, when a train has failed in the section and requires assistance from the rear, or a breakdown van train or officers' special requires to approach the scene of an accident. Regulation 14 describes the action to be taken in such circumstances.

It will be realised that, as the block section is not clear, it would be incorrect to forward the usual "Is line clear?" signal for the train about to enter the occupied or obstructed section; therefore, the signalman merely advises the signalman at the box in advance by telephone that the train is ready to proceed and then sends the "Train entering section" signal. As the train has not been accepted in the orthodox manner the driver is instructed to pass at danger the signal controlling the entrance into the section ahead.

One of the conditions attached to this method of working is that the guard or fireman of the train already in the section must conduct the second train, but the point from which conducting must commence varies and may be classified as follows:.

(a) During fog or falling snow, the second train must be held at the signal box controlling the entrance to the occupied or obstructed section until the guard or fireman of the train already in the section has joined the engine of the second train.

(b) If there is a tunnel in the obstructed section, the second train may proceed uncondacted as far as the tunnel provided the weather is clear and the guard or fireman is on his way back, but must not enter the tunnel without the conductor unless it has been ascertained that the tunnel is clear.

(c) In clear weather and where there is no tunnel in the section, the second train may proceed provided the signalman at the rear box has assured himself that the guard or fireman is on his way back to meet the second train.

Assuming that the opposite or parallel line is clear, there is one instance where, when a train is proceeding into the section in accordance with Regulation 14, some action must be taken in connection with trains on such line, and that instance is, where a tunnel exists in the section concerned. In this circumstance the driver of each train proceeding on the opposite or parallel line must be instructed to travel through the tunnel at reduced speed.

The foregoing has dealt with an obstruction in the block section. The obstruction may be in the overlap ahead of the first stop signal at the forward box, with the block section clear. In this case the assisting train is accepted in accordance with Regulation 5-"Warning arrangement"-and the driver advised when entering the section of the circumstances existing at the signal box in advance:.

(20) Examination of Line.

CERTAIN emergency regulations permit a signalman to ascertain if an opposite or parallel line is clear by allowing a light engine to proceed over such line for examination purposes as laid down in Regulation 14A.

The conditions attached to this procedure are:.

(a) Speaking communication must exist between the two signal boxes concerned to admit of a proper understanding being arrived at between the signalmen.

(b) The "Train out of section" signal must have been received for the previous train on the line over which the engine will travel.

(c) A stationmaster or other competent person must travel with the engine during darkness or fog or falling snow, or where a tunnel intervenes. When these conditions do not exist the attendance of the stationmaster or other competent person, although not imperative, is desirable.

When the engine is ready to proceed, the "Train entering section" signal only is forwarded as described for a second train in chapter 19 and the driver instructed to pass at danger the signal controlling the entrance into the section ahead.

Assuming that the block section has been reported to be clear, the "Train out of section" signal is given in accordance with Regulation 10 if the engine leaves the section at the forward signal box, but if the engine returns to the rear signal box under the authority of a "wrong line" order, the "Cancelling" signal 3-5 is given by the signalman at that box.

It is interesting to note that, during the time an engine is in the section in accordance with this regulation, the signalman at the forward signal box can occupy the overlap in advance of his first stop signal without giving the signal "Blocking back inside home signal," but if the engine returns to the rear signal box and the obstruction in advance of the first stop signal still exists when the "Cancelling" signal is received, he must immediately give the signal "Blocking back inside home signal."

After the "Stop and examine train," or "Train being stopped for examination" signal has been sent for a train, the line on which such train has travelled may be examined a, provided for in Regulation 14A, as well as the opposite or parallel line.

A train may be utilised to examine an opposite or parallel line following the accidental division of a train in the block section, provided the weather is clear. no tunnel intervenes, and catch points do not exist in the line on which the divided train has travelled. If the train required for the examination is a passenger train the facility is restricted to the hours of daylight. When a train is

employed, the overlap in advance of the first stop signal at the forward signal box must not be occupied unless the train making the examination is one which can be accepted in accordance with the "Warning arrangement" under normal conditions.

On electrified lines, an empty electric train may be used for an examination of the lines in lieu of, and under the same conditions as, a light engine.

(21) Stop and Examine Train.

PART of a signalman's duties is to scrutinise each train as it passes his signal box. If he observes anything wrong with a train, or the guard of a train exhibiting a red hand signal waved slowly from side to side as his train passes the signal box as-described in Rule 148 (b), he must arrange for it to be stopped or otherwise dealt with as the occasion may require.

Special regulations exist to cover the action to be taken should a train pass a signal box without a tail lamp, with a tail side light out when it should be burning, an improper side light exhibited, or when an accidentally divided train is proceeding into the section in advance in two or more portions. These particular irregularities will be dealt with in later chapters.

There are, however, irregularities other than these which necessitate a train being stopped out of course, such as goods falling off, a vehicle on fire or a hot axle. To provide for eventualities in this category a common signal is used, namely, "Stop and examine train," 7 consecutive beats on the block bell given to the signal box towards which the train is travelling.

Regulation 17 describes the procedure to be adopted, and the action taken by each of the signalmen concerned in varying circumstances can be tabulated and exemplified as follows for easy reference:.

Signalman sending.

In addition to sending the "Stop and examine train" signal to the box in advance the signalman must, except as provided for in the following paragraph, send to the box in rear the "Train being stopped for examination" signal (3-3-1) and only give the "Train out of section" signal when it has been ascertained that the line over which the train has travelled is not affected, or it is necessary for an engine to enter the section to examine the line in accordance with Regulation 14A, or as described later in this chapter in the paragraph dealing with a door open on a passenger train. He must stop any

train on the opposite line (or parallel line if desirable), allowing such train to proceed if the line concerned is not likely to be obstructed after the driver has been advised of the circumstances. He must also telephone, if possible, to the signalmen to whom the respective signals have been sent the reason for sending such signal.

Should the "Stop and examine train" signal be sent on account of a vehicle having a hot axle and there is no reason to suppose the rear section is affected, the signalman need not send the "Train being stopped for examination" signal or stop trains proceeding in the opposite direction.

Assuming a passenger train passed with a door open, in addition to sending the "Stop and examine train" and "Train being stopped for examination" signals the signalman must, after advising the signalman at the rear box by telephone the circumstances, give the "Train out of section" signal. The first train in each direction between these boxes must be stopped, the drivers advised of the circumstances and instructed to proceed cautiously to the next signal box, keeping a good look-out. Should, however, information be received that a passenger has fallen from the train, no train must be allowed to proceed by either signalman until the lines concerned have been examined. This examination may be carried out from a light engine in accordance with the conditions laid down in Regulation 14A.

If there is a possibility in any irregularity of the line being obstructed the Signalman at the opposite end of the section or sections concerned must be informed and the line or lines affected must be examined before a train is allowed to proceed. The line may be examined with the assistance of a light engine.

Signalman receiving.

The signalman receiving the "Stop and examine train" signal must, if possible, stop the train for which the signal has been given and deal with it as the occasion may require. If, for any reason, he is unable to stop the train at his signal box, he is authorised to pass forward the signal to the signal box in advance, but in these circumstances it is not necessary to send to the box in rear the "Train being stopped for examination" signal and it is sufficient to delay sending the "Train out of section" signal until it has been ascertained that the line is clear or it is necessary to give this signal to allow an engine to enter the section at the box in rear to examine the line concerned.

Trains on the opposite line must also be stopped, and, if expedient to do so, trains on parallel lines.

Should the examination of the train for which the "Stop and examine train" signal has been received reveal that the lines over which the detained trains require to travel have not been obstructed they may be allowed to proceed in the normal manner.

If the examination does not confirm the lines to be clear, but at the same time there is no reason to assume them to be obstructed, the detained trains may proceed but the drivers must be cautioned.

If there is a possibility of the line or lines being obstructed, then they must be examined as previously mentioned before being used for normal working.

The signaller receiving the "Train being stopped for examination" signal must stop any train going towards the signal box from which the signal was received until it has been ascertained that the line is clear. Here again the line may be examined with the assistance of a light engine.

Sections with Intermediate Block Signals.

As will have been realised in reading these comments on the regulations, the presence of intermediate block signals controlled from the Signal box in the rear necessitates slight variation in the method of working, both in the normal operation of traffic and in emergency, and this variation is again evident in Regulation 17.

Where this type of signal is provided, a train does not enter the forward section until it has passed the intermediate block home signal and there is no necessity to send the "Stop and examine train" signal if the train concerned can be stopped at this signal. If, however, the circumstances are such that the opposite line is or may be obstructed, although the train directly concerned is not going to pass the intermediate block home signal, trains must be prevented from approaching on such line. To do this the signaller concerned must send the "Obstruction danger" signal to the Signal box in advance and at the same time advise the signaller at that box by telephone the reason for sending the signal.

In a case of this description the signaller controlling the intermediate block signals must of course prevent any train proceeding on a parallel line if the circumstances demand it.

When the train has been brought to a stand at the intermediate block home signal, the signalman communicates with the trainmen by means of the telephone provided thereat and arranges with them for the train to be examined and dealt with as the occasion may require.

Whether it is necessary to send the "Stop and examine train" or "Obstruction danger" signal or not, the "Train being stopped for examination" signal must be sent to the box in rear, unless of course it is only a case of a vehicle with a hot axle and the rear section is not affected.

(22) Train Passed without Tail Lamp.

IN chapter 12 attention is called to the fact that the presence of a tail lamp attached to the rear of the last vehicle of a train is an indication to the signalman that the train has arrived complete; therefore, should a train pass a signal box without a tail lamp or a signalman be unable to satisfy himself that the tail lamp is there, some action must be taken.

Regulation 19, which deals with such a circumstance, instructs the signalman noticing the irregularity to send the signal "Train passed without tail lamp" 4-5 to the signal box from which the train has arrived instead of the usual "Train out of section" signal, also to advise the signalman at the signal box towards which the train is travelling that it is without a tail lamp by forwarding the bell signal of nine consecutive beats.

The first train travelling in the opposite direction must be stopped by the signalman sending the signals and, except as described below, such train may be allowed to proceed after the driver has been advised of the circumstances and instructed to proceed with caution. The first train on a parallel line must also be stopped if expedient to do so and the driver cautioned.

The signalman receiving the 4-5 signal must stop the first train requiring to proceed to the advance box on a parallel line and, except as described in the following paragraph, may allow such train to proceed after the driver has been advised of what has occurred and instructed to proceed cautiously.

When there are catch points or a tunnel in the section through which the train without a tail lamp has travelled, or during fog or falling snow, no train must be allowed to enter the section concerned in either direction until it has been ascertained that the line on which the train requires to travel is not obstructed, but an engine may be utilised to examine the line in accordance with the conditions laid down in Regulation 14A.

The signalman at the signal box in advance, on receipt of the "Train passed without tail lamp" signal of nine beats, must stop the approaching train unless, owing to the section in rear being a short one, such action would mean that it would be brought to a sudden stand, in which case it is permissible to allow the train to proceed and forward the signal to the box in advance immediately following the "Train entering section" signal.

The signalman sending the signals must be advised whether the train is complete or not. If the train is complete and the signalman ascertaining this is in a position to give the "Train out of section" signal in the normal manner, the sending of this signal will be sufficient to intimate the fact to the signalman at the rear box.

Should the train be complete. the signalman who sent the signals will give the "Train out of section" signal when he is advised of this fact either by telephone or by the receipt of the "Train out of section" signal from the forward signal box.

If an advice is received that the train is not complete, then he must assume that it has become accidentally divided in the section to the rear of his signal box, and in these circumstances the provisions of Regulation 20 (Train divided) must be carried out. This regulation is dealt with in a subsequent chapter.

It will be remembered that when the "Stop and examine train" signal is used and intermediate block section signals controlled from the signal box in rear exist, the train concerned can be stopped at the intermediate block home signal for examination, but where this type of signal is provided and a train passes without a tail lamp, it should not be stopped at the intermediate block home signal.

The accidental division of a train composed of coaching stock is rare, and if such a mishap does take place, the automatic application of the continuous brake which results from the severance of the brake pipe prevents the free running of the divided portions. Freight trains break loose much more frequently and many are not fitted with the continuous brake. For this reason clause (e) of Regulation 19 states that, should a freight train pass without a tail lamp and also without side lights, the signalman must assume that the train has become divided and immediately carry out the provisions of Regulation 20 (Train divided). sending in addition the bell signal 5-2-3, "Train incomplete." to the signal box in rear, but not the "Train passed without tail lamp" signal. The signalman receiving the "Train incomplete" signal must stop any train travelling

on any parallel line towards the signal box from which the signal was received and only allow such train to proceed in accordance with the conditions laid down in the regulation dealing with a divided train. In addition and for the same reason, this clause also tells a signaller at a box where the gradient is a rising one from the signal box in rear to take action in accordance with Regulation 22 (Train or vehicles running away on wrong line) in similar circumstances, but in this case the "Train incomplete" signal is not sent.

Rule 133 instructs the guard of a freight train, which is being assisted in the rear by an engine, to remove the tail lamp from his train and only replace it, if practicable, within sight of the signaller when the assisting engine leaves the train. This rule is amplified to include side lights in an instruction appearing on pages 45 and 46 of the General Appendix, and it will be appreciated that the arrangement is necessary not only to prevent the risk of the "Train out of section" signal being given erroneously, but also to avoid the signaller dealing with the train as having passed without a tail lamp or without a tail lamp and side lights.

(23) Tail or Side Light Out or Improper Side Light Exhibited.

IN the circumstances described in the above heading there is no immediate risk to traffic, and Regulation 19A instructs the signaller in such a case merely to give the bell signal 7-2 to the signal box towards which the train is travelling and at the same time advise him, if possible, of what is wrong.

The signaller receiving the signal must stop the approaching train and arrange with the trainmen for whatever is wrong to be put right. If he is unable to stop the train without bringing it to a sudden stand, he is permitted to forward the signal to the box in advance immediately following the "Train entering section" signal.

Here again, should intermediate block signals as previously described be provided, the train should not be stopped at the intermediate block home for the irregularity to be attended to.

Details of tail and side lights to be carried by freight and mixed trains, and engines with goods brake vans, are given on page 45 of the General Appendix.

(24) Train Divided.

THE first paragraph of Regulation 20 contains the words, "whenever a train which has become divided is entering, or is about to enter, the section in

advance in two or more portions." These words describe exactly, with one exception, the circumstances under which the "Train divided" signal 5-5 must be forwarded to the signal-box in advance.

If the signalman knows that the second portion of the train will not enter the forward section, or has no reason to doubt that the entry of the second portion can be avoided, he forwards the "Stop and examine train" signal and not the "Train divided" signal. As regards the exception mentioned in the previous paragraph, this is referred to in chapter 22 where attention is called to the fact that should a freight train pass without a tail lamp and also without side lights, the "Train divided" signal must be forwarded instead of the "Train passed without tail lamp" signal.

The action to be taken by the signalmen concerned when a train becomes accidentally divided will be better appreciated if described separately and with a definite example. For this purpose, consider that "A," "B" and "C" represent three consecutive signal boxes and the division is noticed as the train passes signal box "A," both portions entering the section in advance in the direction of signal box "B."

Signalman at "A".

Both portions are about to enter the forward section as the division is noticed, therefore, the, only thing to do is to forward the "Train divided" signal to ;the signalman at "B" and stop any train traveling in the opposite direction or on parallel lines.

Signalman at "B".

On receipt of the "Train divided" signal the danger signal must be exhibited to stop any train travelling in the opposite direction and, if expedient in the circumstances, any train travelling in the same direction on any parallel line.

Secondly, a collision between the divided portions must be avoided if at all possible, and where this can be achieved only by allowing the first portion to proceed, various contingencies have to be taken into consideration in deciding whether or not this shall be permitted. The course adopted is governed by the gradient of the line, and the occupation of the forward section and the adjoining lines.

In Regulation 20 will be found the following circumstances in which the first portion may be allowed to proceed into the section in advance when the

conditions existing do not assist the signalman to prevent the risk of collision between the two portions at his signal box.

(a) Provided permission has been received for the train to proceed into the section in advance, in order to avoid the risk of collision between the two portions, the first portion should be allowed to proceed when-

An assistant engine is being employed in the rear.

The gradient of the line on which the train is running is level or falling.

In short sections.

(b) When permission cannot be obtained for the first portion to proceed into the section in advance, and it is necessary that this should be done if the risk of collision is to be avoided, the first portion may be allowed to proceed without this permission provided the following circumstances exist:-

The line rises towards the box in advance and the gradient is sufficiently long or steep to bring the second portion to a stand and any previous train has had sufficient time to travel clear or, if the gradient does not rise.

The weather is clear, there is no tunnel in the section, no passenger train has been accepted in the opposite direction on an adjoining line, and any previous train has had sufficient time to travel clear.

In each of the above-mentioned cases the signalman must exhibit to the driver a green hand signal waved slowly from side to side to advise him of the fact that his train is divided. In the circumstances described in (b) this hand signal will also be the driver's authority to pass at danger the signal controlling the entrance of trains into the section in advance for the purpose of avoiding a collision between the two portions. The method of giving this hand signal and its meaning is also the subject of Rule 182.

In either of the circumstances described in (b) the signalman at "C" must be, advised and the "Train entering section" signal forwarded.

Having dealt with the first portion of the train the signalman at "B" must concentrate on the second portion. He must place or maintain the signals at danger and endeavour to attract the attention of the trainmen by placing detonators on the rail and exhibiting a red hand signal, using all the means at his command to avoid a collision between the two portions.

A signalman receiving the "Train divided" signal is authorised to forward the "Train divided" signal to the next signal box in advance on receipt if the line is on a falling gradient, or in short sections, or if he is in doubt as to whether or not he will be able to stop the rear portion of the divided train, but in order to bring this description of the procedure to a conclusion it can be assumed that only the first portion of the divided train "enters the forward section; therefore the signalman at "B" forwards the "Stop ,and examine train" signal to "C" and advises the signalman at that box of the circumstances, also. if necessary, the signalman at "A:

Signalman at "C".

On receipt of an advice that the first portion of a divided train is being allowed to enter the section the signals must be placed or maintained at danger to prevent any train proceeding towards the signal box from which the advice has been received and arrangements made for the first portion of the divided train to be stopped.

Subsequent precautionary measures.

Any train detained on the opposite or parallel lines, must not be allowed to proceed, except as described in the following paragraph; until it has been ascertained that the line over which it requires to travel is not obstructed.

The examination of the line concerned, may be carried out with the assistance of a light engine as laid down in Regulation 14A, or as authorised by clause (e) of that regulation, with the assistance of a train under certain conditions. These conditions, it will be remembered, are that the weather must be clear, no tunnel intervenes, and no catch points in the line on which the divided train or portion thereof has travelled; the use of a passenger train for the examination being further restricted to the hours of daylight.

When only the first portion of a divided train has entered the section in advance, the next train, or the second portion of the divided train if such is to be worked forward to the box in advance, must not be allowed to enter the section until the signalmen at each end are satisfied that the section is clear. When the train is ready to proceed, the signalman at the signal box in rear must advise the signalman at the signal box in advance by telephone and forward the "Train entering section" signal, and when this signal has been acknowledged the driver must be informed of the circumstances and instructed to pass at danger the signal controlling the entrance of trains into

the section ahead and proceed with caution. When the train passes out of the section at the signal box in advance the "Train out of section" signal is given in accordance with Regulation 10.

Intermediate block sections.

Where intermediate block" signals controlled from the signal box in rear are provided, the action to be taken by the signaller who becomes aware of a train running in two or more portions is slightly varied. 1.

The signaller controlling such signals is instructed to place or maintain them at danger against the first portion in the following circumstances: .

If the train is running on a rising gradient.

Is not running in a short section.

Is not assisted in the rear.

There is no risk of the second portion colliding with the first.

Permission has not been received for the train to proceed into the section in advance.

In these circumstances, instead of sending the "Train divided" signal, he must forward the "Obstruction danger" signal, for any line which may possibly be obstructed, to the signal box towards which the divided train is running and at the same time advise the signaller there by telephone.

The intermediate block signals need not be placed, or maintained at danger against the first portion of the divided train in the circumstances stated below, provided permission has been received for the train to proceed into the section in advance.

If the train. is running on a falling gradient or on a level line".

Is running in a short section and there is -a risk of collision between the two portions.

Is assisted in the rear.

In this case the "Train entering section" signal, immediately followed by the "Train divided" signal must be forwarded when the divided train passes the

signal box, and, if practicable, the signalman must exhibit to the driver a green hand signal, waved slowly from side to side.

(25) Train or Vehicles Running Away on Wrong Line.

REGULATION 22 instructs a signalman who observes a train, portion of a train, or a vehicle running back in the wrong direction, or a train proceeding on the wrong line, to advise the signalman at the next box towards which the train or vehicles are proceeding by giving the bell signal 2-5-5 "Train or vehicles running away on wrong line." In addition the signals must be placed or maintained at danger and the block indicator for the line affected at "Train on line," if not already in that position. The first train going in the same direction as the runaway, but on the right line, must be stopped and not allowed to proceed until it has been ascertained that the line is not obstructed. An engine may, however, be used to examine this line in accordance with the conditions laid down in Regulation 14A.

The signalman receiving the 2-5-5 bell signal must stop any train proceeding towards the signal box from which the signal has been received and, if desirable, any train coming from that signal box on the right line.

The action to be taken with the runaway to avoid a mishap must be dictated to a large extent by the layout of the lines. The signalman may decide to turn it into a siding if he has one available, or perhaps turn it through a cross-over road on to the right line. Should the latter course be adopted, the signal, "Train or vehicles running away on right line." will have to be forwarded. This signal will be dealt with in the next chapter.

Should the circumstances be such that the signalman is unable to prevent the train continuing in the wrong direction, he must forward the 2-5-5 signal to the next signal box in rear on receipt and place detonators on the rails.

As regards the return to normal working, if the runaway should come to a stand in the section and assistance be required from the box in rear, the provisions of Regulation 14 be applied. If removed from the block section in any other way, then the block indicator must be maintained at the "Train on line" position and be restored to normal when the next train has passed through the section. The signalman at the rear box will advise the signalman who gave the 2-5-5 signal when this train is ready to leave and forward the "Train entering section" signal without the usual "Is line clear?" signal preceding it, the driver being advised of what has occurred and instructed to

pass at danger the signal controlling the entrance into the section ahead and proceed cautiously.

(26) Train or Vehicles Running Away on Right Line.

REGULATION 23 instructs a signalman who observes a train, portion of a train, or a vehicle running away in the proper direction on the right line, or entering the forward section without authority, to send the bell signal 4-5-5, "Train or vehicles running away on right line," to the signalman at the signal box in advance. In addition, he must also stop any train going in the direction of the signal box towards which the runaway train or vehicles is proceeding and, if desirable, stop any train on the opposite line.

The signalman receiving the signal must place the block indicator for the line concerned at the "Train on line" position, and stop any train going towards the signal box from which the signal has been received until it has been ascertained that the line over which such train requires to run is clear. An engine, however, may be utilised to examine the opposite line in accordance with the conditions laid down in Regulation 14A.

The action to be taken as regards the runaway train or vehicles must, of course, vary according to the circumstances existing at the time and the lines available.

The signals applicable to the line on which the train or vehicles is approaching must be placed or maintained at danger, the line cleared, and the bell signal forwarded immediately to the box in advance unless the runaway train or vehicle can be diverted from the running line. The signalman must also place detonators on the rail to attract the attention of the trainmen and take such other measures as may be expedient in the circumstances.

It may be that there is a train in the section in front of the runaway, in which case this train should be allowed to proceed if the line is clear, and the signals replaced to danger against the runaway; the bell signal 4-5-5 being given immediately following the usual bell signals for the first train if the runaway may follow on the same line.

Where Intermediate Block Signals exist.

Where intermediate block signals controlled from the box in rear are provided, the bell signal 4-5-5 must be forwarded if the signalman at the box controlling the intermediate block signals becomes aware that a train, vehicle, or portion

of a train has entered into the section in advance of the intermediate block home signal without authority.

Should the section between the signal box and the intermediate block home signal be clear and the signaller have reason to believe the runaway train or vehicles will pass at danger the signal controlling the entrance to the intermediate block section he must immediately forward the Train or vehicles running away on right line signal to the box in advance.

It may interest those readers who do not already know, how the signaller is aware of the fact that the train has entered the section in advance of the intermediate block home signal in the manner described above. He can, of course, observe the track circuit indicators, but, in addition, a bell is provided in the signal box which is actuated electrically if the train occupies and clears the track circuits without the lever of the intermediate block home signal having been pulled. If the distance from the overlap track circuit of the intermediate block home signal to the home signal of the box in advance is short, in order to ensure an earlier advice, a treadle fixed a short distance ahead of the intermediate block home signal is used to ring the bell in the event of the signal being passed irregularly, or alternatively the intermediate block home signal track circuit is divided just ahead of that signal and the bell rings when the train bridges this division in the track circuit.

Should the section between the signal box and the intermediate block home signal be occupied by a train when a runaway train or vehicles passes the signal box, the "Obstruction danger" signal must be sent to the signal box in advance irrespective as to whether or not the runaway enters the section in advance.

Resuming Normal Working.

The procedure to be adopted in the return to normal working is governed by the circumstances existing at the time of the runaway and the manner in which the section is cleared.

If, for instance, the 4-5-5 signal is received during the time the section, is unoccupied, it is sufficient to give the "Train out of section" signal, provided the runaway arrives complete with the tail lamp attached.

Should the signal be received when the section is occupied by another train, the "Train out of section" signal can be given provided the train occupying the

section and the runaway both arrive with tail lamps, but the driver of the next train passing through the section must be instructed to proceed cautiously.

If the runaway arrives without a tail lamp, the signalman in the rear must be advised, the block indicator maintained at the "Train on line" position, and when the next train is ready to enter the section the signalman in the rear will advise the signalman in advance by telephone, give the "Train entering section" signal, and instruct the driver to pass at danger the signal controlling the entrance into the section ahead and proceed cautiously. The "Train out of section" signal must be given when this train has passed clear of the section with tail lamp attached.

Should the runaway stop in the section it can be removed in accordance with Regulation 14 or, alternatively, be withdrawn at the rear box.

In the event of the runaway being withdrawn at the rear box, the signalman there must send the signal "Cancelling train or vehicles running away on right line," (3-1-4), and the signalman at the box in advance will then restore the block indicator to the normal position, provided, of course, the section is not occupied by another train. The circumstances must be recorded in the train register books at both signal boxes, and the driver of the next train instructed to travel through the section cautiously.

If the runaway stops in the section and is removed at the box in advance other than under Regulation 14, the subsequent action is in accordance with that described above for an instance of the runaway arriving without a tail lamp.

(27) Opening and Closing of Signal-Boxes where Switches are Provided.

SOME signal-boxes are provided merely with the object of reducing in length the space intervals required for the operation of the Absolute Block System, while others exist because there are junction or siding points to be operated.

As the occupation of the line varies and the necessity for the operation of junction and siding points is dependent upon the traffic to be dealt with, there are times when efficient working can be maintained without certain signal-boxes being open.

If, however, the signal-box concerned requires to close, and trains continue to pass over that section of line, arrangements must be made to connect the block telegraph so that the boxes which remain open can continue to signal such trains. This is done by means of a switch in the signal-box to be closed,

and Regulation 24 lays down the procedure to be adopted by the signalman at such box.

To commence with, it will be assumed that a signal-box is closed, with the signal-boxes on either side in through communication, and it is desired to open such box.

Opening a Signal-Box.

The first thing to be done by a signalman requiring to open the box is to telephone, if possible, to the signal-boxes to which he normally works, and ascertain the state of the line, and whether the instruments are in working order. Should there be telephone facilities to the signal-box on one side only, the signalman must obtain the information required respecting both block sections from the signalman at that box.

If the information he receives is to the effect that there is no train in the section or that no train has been signalled, the signals must be placed at caution or danger. Should the section be occupied, care must be taken not to place the signals at caution or danger except, of course, in an emergency, until he has observed the train pass or has received information from the box in advance that the train has arrived there.

The next operation is to bring the block instruments into use. The method of doing this is varied slightly by the type of switch, and the action to be taken also depends on whether or not locking exists between the block instruments and the home signals.

Where the simple type of switch with only the alternative positions "Open" and "Closed" is provided, the switch is turned direct from the "Closed" to the "Open" position, and the bell signal 5-5-5, "Opening of signal-box," given to the signal-box on each side. When this has been done the block indicator for the forward section will record the position of the block indicator at the forward box for that section, and the signalman at the box switching in must turn, if necessary, the commutator of the block instrument for the rear section, so that a similar indication is shown on that instrument.

The switch known as the "Three-position" switch has an "Intermediate" position in addition to the usual "Open" and "Closed" positions. In this case the switch is turned from the "Closed" to the "Intermediate" position. If, when this is done, all the block indicators remain in the normal position, then the switch can be placed to "Open," and the "Opening of signal-box" signal given. Should

any of the block indicators show "Line clear" or "Train on line", the commutators must be turned to correspond with the indicators before the switch is turned to "Open," and the opening signal sent.

There is an exception to this procedure, however, where locking exists between the block instrument and the home signal lever or levers, and such locking prevents the block indicator being placed to the "Line clear" position with the home signal in the clear position.

In an instance of this description the signalman switching in must first ascertain either by speaking instrument, or observation where a switch with all intermediate position is provided, whether the block indicator for the section in advance is at the "Line clear" position, and if so he must not turn his switch to "Open" until the circumstances are such that this block indicator can be moved to the "Train on line" or normal position, otherwise he will not be in a position to set the block instrument for the rear section to a corresponding position as, owing to a train being signalled, he is not permitted to place his home signal at danger. It is permissible, if some time is likely to elapse before the train signalled will enter the section, to arrange for the "Is line clear?" signal to be cancelled to enable the signal-box to be switched in.

A signalman opening a box with the block indicator at the "Line clear" position knows that the train signalled has not left the signal-box in the rear. If the indicator is at the "Train on line" position, however, he has no definite information as to why the indicator is there, and, if it is for a train proceeding in the normal manner, may not know where such train is. The action to be taken when the block indicator is at the "Train on line" position is as follows:.

(a) The "Train out of section" signal must not be given in accordance with Regulation 10 (or in the manner described in Regulation 5, clause (f) until he observes the train pass his box; or, if the train has already passed, not until he receives the "Train out of section" signal from the forward box.

(b) Should the signalman at the forward box give the bell signal 2-1 in accordance with Regulation 5, clause (f), leaving the indicator at the "Train on line" position as provided for in this clause, the "Train out of section" signal being given to the box in the rear in accordance with Regulation 10.

(c) The signalman at the forward box may have given the bell signal 2-1 as described under (b) prior to the box being switched in. In this case, he will advise the signalman switching in and repeat the bell signal, and all that requires to be done is to restore the block indicator for the rear section to the normal position, and give one beat on the bell.

(d) The block indicator may be at the "Train on line" position for a blocking back movement ; here again the signalman at the forward box will repeat the signal previously given so that the rear block indicator can be restored in the manner stated in (c).

Closing of Signal-box.

When a signalman is ready to close a signal-box, the bell signal 7-5-5 "Closing of signal-box" has to be sent to the next signal-box open on each side with which block working is in operation.

The signal can only be given provided there are no trains in the section, or, if permission has been given for a train to approach from the signal-box in the rear, the "Is line clear?" signal for such train has been passed forward to, and acknowledged by, the signalman at the signal-box in advance. Should the "Train entering section" signal be received before the Closing signal is given, this signal also must be passed forward.

On the Closing signal being acknowledged the switch must be turned to the "Closed" position and all the block instruments placed to normal, if not already in that position.

It may be that, at the time a signal-box requires to be closed, the block indicator for the rear section is at the normal position, but that for the forward section on the same line at the "Train on line" position owing to the "Train out of section" signal not having been received for the previous train, or because permission has been given for a blocking back movement to be made either outside or inside the home signal at the forward signal-box.

In such an instance, it is necessary to record the occupation of the line for the benefit of the signalman at the signal-box in the rear, and the method of doing this is as follows:.

(a) In the case of a previous train for which the "Train out of section" signal has not been received, or when the signal "Blocking back outside

home signal" has been acknowledged, the bell signal 5-1 is sent to the rear signal-box.

(b) When the bell signal 2-1 has been received for a previous train in accordance with Regulation 5, clause (f), or the signal "Blocking back inside home signal" has been acknowledged, the bell signal 1-5 must be given to the rear signal-box.

On the bell signal 5-1 or 1-5, as the case may be, being acknowledged by the signaller at the signal-box in the rear, the rear section block indicator for the line concerned must be placed to the "Train on line" position, the Closing signal given, and on acknowledgment, the switch turned to "Closed" and the block instruments again placed to normal.

The occupation of the block section or the station limits, as the case may be, at the forward box is in this way indicated to the signaller at the box in rear which remains open and he therefore knows what type of movement is waiting to be cleared and whether or not he is entitled to forward the "Is line clear?" signal for a following train. It will be remembered that the "Is line clear?" signal may be forwarded, although the block indicator is at the "Train on line" position, when the bell signal 2-1 has been received in accordance with Regulation 5, clause (f). or when the signal "Blocking back inside home signal" has been acknowledged.

After the closing has been completed, the signallers at the signal-boxes on each side of the closed box give to each other the Testing signal 3-2-1 to confirm that through communication has been established.

The signaller at the signal-box which has been closed must also ascertain by speaking instrument, where practicable, that through communication has been established and then take off the signals applicable to the lines which have been switched through.

Except where special instructions to the contrary are issued, a signal-box should not be switched out of circuit when any failure exists in connection with the block instruments, bells, signals, points or interlocking apparatus, nor if a failure has just been rectified until the last train allowed to proceed cautiously has passed through the section and the driver of this train has handed to the signaller at the forward signal-box the notice given to him, in accordance with Regulation 25, clause (b), intimating that this is the last train to be cautioned through the section.

Closing where Line-clear Releases are Provided.

Where the signal controlling the entrance of trains into the section ahead can only be taken off when the block indicator is at the "Line clear" position, it will be appreciated that it will not be possible to switch with a train in the forward section or when a blocking back movement has been authorised. Therefore, at a signal-box where this type of locking exists it is necessary to wait until the "Train out of section" or "Obstruction removed" signal has been received.

When the section is clear, in order to enable the signal to be taken off in accordance with the closing regulations, the signaller at the signal-box about to be closed forwards the bell signal 3-3-3 "Place block indicator to line clear to release lock on signal for closing purposes," the signaller at the forward box places the block indicator to "Line clear" and the signaller in the rear, after taking the signal off, gives the bell signal 4-1-3 "Signal taken off, replace block indicator to normal position" and the block indicator is then replaced to normal by the signaller at the forward signal-box.

These bell signals must be exchanged and the signal concerned taken off before the Closing signal is given.

In connection with the review of this regulation, consideration has not been given to the Rotary type of block instrument in use at certain Midland Division signal-boxes, nor to the Tyer's instruments in use on the Northern Division, nor to the one-wire three position instruments used at certain Western Division boxes, all of which embody apparatus necessitating modifications and additions to the standard regulation.

General.

Before terminating the comments on Regulation 24 there are some points of general interest in connection with the opening and closing of signalboxes to which attention should be called.

Clause (d) of the regulation states that, when a signal-box which is only switched in when required is opened without notice to drivers, the signaller at such signal-box must not acknowledge the "Is line clear?" signal for a train until this signal has been passed forward to, and acknowledged by, the signaller at the signal-box in advance. If it is not possible to obtain an acknowledgment from the forward signal-box, the signaller at the box open specially is permitted to allow the train to approach by acknowledging the "Is line clear?" signal in accordance with Regulation 5 (Warning arrangement), but

the line must be clear in accordance with the clearances given in Regulation 4. In the event of the train from the signal-box in rear being one which is going to render assistance in the manner described in Regulation 14, the necessity for an overlap is not enforced and in these circumstances the train may approach with the line clear to the outermost home signal only, in accordance with the conditions laid down in clause (b) of Regulation 14. When the Warning arrangement is used the train is always stopped at the rear signal-box and the driver informed that the signal-box in advance, which is usually switched out, is open.

As has already been stated, the overlap which Regulation 4 provides is a safeguard in the event of a driver inadvertently passing the home signal at danger, and Regulation 24 clause (d) is another example of the care taken to ensure an adequate margin of safety.

It is sometimes necessary to keep a signal-box open in connection with engineering work, and described on pages 55 and 56 of the General Appendix are the arrangements agreed between the Chief Engineer and the Chief Operating Manager respecting this aspect of the case.

In Rule 73 (b) it is laid down that when a signal box is closed during the night, the signal lamps should be extinguished after the signal-box has been closed (unless they are of the long-burning type or instructions to the contrary are issued) and relighted, if necessary, when the signal-box is opened again.

Rule 75 instructs the signaller opening a signal box to satisfy himself as soon as possible that the apparatus is functioning correctly.

(28) Failure of Instruments and Bells.

WHERE the Absolute Block System is in operation the block bells are the means by which signalmen communicate with each other and the block instruments the means by which they authorise and record movements. In the event of a failure of either or both of these some other arrangement must be made to provide, as near as possible, the same facilities and safeguards, and Regulation 25 describes the method of working to be adopted.

In the first place, no train (except the first portion of a divided train where such portion has to be allowed to proceed to avoid a collision with the second) must be permitted to proceed into the section in advance when any failure of the block instruments or bells for that section exists until the train has been brought to a stand and the driver and guard (also the driver of an assisting

engine if one is provided in rear) have been advised of the circumstances : driver or drivers being at the same time instructed to proceed with caution towards the signal-box in advance. At this point attention, might be called to Rule 127 clause [xxiii) in which the driver is told that when he has been warned in this way he must not assume on approaching the signal-box ahead that the fact of the signals being in the clear position is an indication that the line is clear for his train.

To enable the guard, and the driver of any assisting engine provided in rear, to be informed of the circumstances, the train engine driver, after being advised to proceed with caution; will bring the train to a stand again in a suitable position and await a green hand signal from the signaller intimating that he has advised the rear men.

In the event of a failure occurring where an intermediate block section controlled from the signal-box in rear is concerned after a train has been allowed to proceed to the intermediate block home signal, the train must be brought to a stand at the intermediate block home signal and the driver informed of the failure by means of the telephone fixed at the signal. In these circumstances the signaller must instruct the driver to send his fireman to advise the guard, and the driver of the assisting engine if one is provided, of the circumstances.

As regards advising the signaller at the box in advance of the failure, this must be done by means of the speaking instrument, but if no speaking instrument is available the driver of the first train must be instructed to stop at the signal-box in advance and advise the signaller there of the circumstances.

Signalling when Speaking Instrument Available.

When a speaking instrument is available, the signaller must, unless instructions to the contrary are given, send the necessary bell signals as messages, operating the block instrument in the normal manner should the block bells only have failed leaving the block instruments in working order.

If this method of signalling trains is carried out it is most important that the signaller sending the messages should satisfy himself that he is speaking to the signaller for whom the communication is intended.

When the signalling of trains by speaking instrument, either with or without the block instrument, is being carried out on one line only, the first train on the next adjoining line or lines, although normal working is in operation on such

line or lines, must be stopped and the driver advised of the circumstances and instructed to proceed cautiously through the section.

During the time bell signals are being transmitted by speaking instrument, also when the bells are in working order and the bell signals are being sent in the normal manner but the block instrument is out of order, all the signals sent or received on the bell or speaking instrument must be recorded in the train register book although the recording of signals may not be a requirement at the particular box concerned at any other time.

Signalling when speaking instrument not available.

Where speaking instruments are not available and the bells have failed the method of working generally referred to as the "Time interval system" has to be carried out.

In such circumstances a train must not be permitted to another train through the section in which the failure exists until the time usually taken by the preceding train to clear the section, after allowing for the train having been stopped, has elapsed, but in no case must this time interval be less than three minutes.. If a tunnel intervenes in the block section concerned, this minimum time interval must be extended to ten minutes unless the signalman can satisfy himself that the tunnel is clear.

To minimise any risk of a train proceeding into the section in advance before the required time limit has expired during a period of fog or falling snow, it will be found by referring to Regulation 4 clause (e) paragraph (iii) that, unless a fog-signalman is on duty at the distant signal, the signalman admitting trains into the section in which the failure exists authorises them to approach his signal box under Regulation 5 (Warning arrangement). When Regulation 5 is used in this case, however, instead of the line only requiring to be clear to the home signal, it must be clear for at least a quarter of a mile beyond this signal, or beyond the inner home at a signal box where an additional home signal is provided.

During the time trains are being worked on the "Time interval system" all trains on the next adjoining line or lines must be stopped and the driver of each instructed to proceed cautiously. The signalman must also record in his train register book the time of the departure of each train on the line on which the failure exists, although in normal working the recording of such information may be exempt.

With regard to the action to be taken by the signalman at the forward box whilst trains are arriving there without their approach being intimated by the signalman in the rear, it will be appreciated that during the time these conditions apply it is important that the line should be cleared, at least to the home signal, with as little delay as possible. Clause (e) of Regulation 25 instructs the signalman to bring all trains within the protection of the home signal as promptly as possible. If it is absolutely necessary that the trains should stand outside the home signal, then a hand-signalman must be appointed and stationed with detonators and hand signals at a sufficient distance to the rear of the train to afford protection. Work such as attaching or detaching traffic from the train should not be commenced until the hand-signalman is in position.

When level crossings intervene.

Where a level crossing which is not a block post exists in the section for which the block instruments or bells have failed and there are block indicators or bells at such crossing to intimate to the person in charge of the level crossing gates the approach of trains, it is the responsibility of the signalman, if telephone facilities are available, to advise the crossing keeper of the failure.

Should it not be possible for the signalman to communicate with the crossing keeper by telephone, the driver of each train proceeding in the direction of the level crossing must be instructed to approach the crossing cautiously, sound the engine whistle and be prepared to stop short of any obstruction at the crossing.

When trains have to travel cautiously for this reason and the "Time interval system" is being worked to, care must be taken to make an allowance for the additional time which will be taken up.

Opening an Intermediate Signal Box during Failure.

In the event of an intermediate signal box which has been closed being switched in during a failure, or before normal working has been resumed after a failure has been rectified, the signalman on either side must advise the signalman at the box switching in of the circumstances so that he can carry out whatever method of working may be necessary.

If the "Time interval system" is being worked when the intermediate box switches in the time interval between trains must not be reduced until the

signalman working this system has assured himself that the intermediate signal box has been opened.

Resuming Normal Working.

When the block apparatus is again in working order the driver of the next train allowed to proceed through the section over the line on which the failure existed must be cautioned and supplied with a notice to hand to the signalman at the signal box in advance intimating that such train is the last train to be cautioned through the section.

On receipt of this notice the signalman at the advance box must give the "Train out of section" signal in accordance with Regulation 10 and normal working may then be resumed.

When there is more than one engine attached to the train which conveys this notice, the notice must be shown to the driver of each engine and carried by the driver of the rearmost engine.

General.

Rules 55A, 120 (a.) and 217 (b) concern the signalman at a signal box where the block instruments or bells have failed.

Rule 55A describes the protective measures to be adopted by trainmen on lines used by passenger trains when their train is detained in a block section through which the "Time interval system" is being worked, and clause (d) of this rule instructs the signalman to advise the trainmen when informing them of the block failure that there is also no speaking communication available to the box in advance so that they will know that this particular rule is applicable.

Rule 120 (a) instructs the trainmen of a train proceeding into a section where a failure of the block apparatus has taken place to see that the tail lamp is lit if there is a tunnel in the section.

Rule 217 (b) which deals with the positioning of hand-signalmen protecting obstructions, lays down that if the conditions are such that this hand-signalman would normally be stationed at the home signal, the signalman must send him out at least one mile to the rear of the obstruction if owing to the failure of the block apparatus Regulation 13A, "Blocking back inside home signal," cannot be carried out.

(29) Shunting into Forward Section.

It is necessary at times to allow: a train to draw forward past the signal controlling the entrance of trains into the section ahead for shunting purposes. In many cases this is permitted without any advice being given to the signalman at the signal box in advance but there are circumstances where an advice is desirable and to cater for such instances the use of the signal "Shunting into forward section" (3-3-2), described in Regulation 35, is specially authorised on the card of special instructions exhibited in the signal boxes concerned.

There are two main reasons for the authorisation of the "Shunting into forward section" signal.

The one most frequently met with is because of the close proximity of the forward signal box. Where signal boxes are only a short distance apart it is only right that the signalman at the forward box should know what is taking place, especially if the train shunting forward is within his sight.

The second reason, and one which is becoming more frequent, is when the train shunting forward occupies a track circuit and by so doing places the block indicator to the "Train on line" position. The use of the signal in a case of this description forestalls this unheralded movement of the block indicator and the consequent query raised in the mind of the signalman at the forward box when he observes the change.

The operation of the regulation is simple: The signalman who wishes to make the shunting movement forwards the bell signal 3-3-2 and if the line is clear to the home signal at the signal box in advance, the signalman there acknowledges the signal by repetition and places the block indicator to the "Train on line" position, if not already in that position. It will be appreciated that the -words "if not already in that position" are a confirmation of the fact that the "Shunting into forward section" can be forwarded although the block indicator is at "Train on" line."

On receipt of the acknowledgment of the signal, the signalman at the signal box in rear must verbally instruct the driver as to what requires to be done, "unless there is a shunt-ahead signal provided as a lower arm on the post of the signal controlling the entrance of trains into the section ahead, in which case the taking off of this signal for the movement dispenses with the necessity for the verbal instructions.

When the shunting movement has been again brought within the section signal, the "Shunt withdrawn" signal, 8 consecutive beat, is given and the signalman at the signal box in advance then restores the block indicator to the normal position, provided the line is clear in accordance with the regulations.

(30) Setting back through Section in Wrong Direction.

CONSIDERATION has already been given in chapter 17 to the action to be taken when a shunting movement requires to be made outside the home signal. When a movement requires to be made through the section in the wrong direction to the signal box in the rear this working must be specially authorised in the Sectional Appendices to the Working Time Tables and the use of Regulation 36, "Setting back through section in wrong direction" (2-3-3), also authorised on the card of special instructions exhibited in the signal boxes concerned.

When the setting back movement requires to be made, the signalman at the forward box must send to the signalman at the signal box in rear the bell signal 2-3-3, and until this signal is acknowledged (and where a fixed signal is provided this has been taken off), the movement must not be allowed to commence. The occupation of the block section is recorded by the signalman sending the setting back signal placing the block indicator to the "Train on line" position.

As regards the conditions governing the acknowledgment of the bell signal 2-3-3, in the first place the line on which the setting back movement requires to be made has, of course, to be clear. Furthermore, permission must not have been given for a train to approach from the signal box in the rear of the box to which the setting back movement is being made, unless the setting back movement can be diverted to another line which is clear without encroaching upon the overlap required for the train approaching in the right direction, or the setting back movement has come to a stand and is clear of such overlap. Conversely, if permission has been given for a train to approach in the right direction the setting back signal must not be acknowledged until such train has passed, has been brought to a stand clear of the point to which the setting back movement requires to be made, or the Cancelling signal has been received, unless the movement being made in the wrong direction can be diverted so that the overlap available when the approaching train was accepted can be maintained.

When the train setting back has passed through the block section, the signalman at the signal box in the rear gives the signal "Train set back in wrong

direction clear of section" (5-2), and the signalman at the forward signal box acknowledges this signal and restores the block indicator to the normal position.

It is sometimes necessary to remove the setting back movement at the signal box at which the movement commenced. In these circumstances, when the section is clear, the signalman at the forward box gives the signal "Setting back withdrawn" (2-5) to the signal box in rear and after this signal has been acknowledged restores the block indicator to the normal position. This bell signal is also used to cancel a setting back movement which has been signalled but does not take place.

A second movement toward, the signal box in rear must not be permitted until the block section has been cleared and the second movement signalled in accordance with this regulation.

Where the use of Regulation 36 has been authorised in recent years it has been the practice not to permit the movement to be made in accordance with this regulation during the time there is a failure of the block instruments or bells for the block section through which the set back requires to take place; nor if a failure exists between the signal box to which it requires to be made and the signal box in rear of that box when trains are approaching through such rear section under the "Time interval system".

(31) The Permissive Block System.

THE Permissive Block System is designed to permit more than one train being in the same block section between two signal boxes on the same line at the same time; in other words, it is the reverse of the Absolute Block System.

On lines over which passenger trains travel the authority of the Minister of Transport has to be obtained before the Permissive Block System of working can be introduced. The authority obtained from the Ministry is divided into two categories, namely, total exemption from Absolute Block Working which provides for the: working of both passenger and freight trains on the on the Permissive Block System known as "Station Yard Working," and exemption for freight trains only, the passenger trains being worked in accordance with the Absolute Block System.

The exemption granted has a distinct bearing on the method of signalling, and the differences which apply between an authority for total exemption (Station

Yard Working) and exemption for freight trains on passenger lines (Permissive Block Working) are emphasised in this chapter.

Occupation of the Block Section.

If the authority only exists for freight trains on a passenger line, then it follows that a passenger train must not be allowed to enter a block section occupied by any other train, nor must another train be allowed to enter a section occupied by a passenger train.

Where Station Yard Working is authorised. if more than one train is to occupy the block section, the trains concerned must be of a similar type, that is, all passenger trains or all freight trains, and must not be mixed, For the purpose of this instruction the following may be considered as passenger trains .:

A train conveying special horse or pigeon traffic and composed of coaching stock.

A parcels, newspaper, fish, meat, fruit, milk. horse, or perishable train, composed of coaching stock.

An empty coaching stock train.

A light engine.

Acceptance of Trains.

Where Station Yard Working is in operation and also where Permissive Block Working is in operation for trains other than passenger trains on a passenger line, if the "Is line clear?" signal for a train is to be acknowledged by repetition, then the line must be clear in accordance with the conditions laid down in Absolute Block Regulation 4.

When this clearance is not available but the line is clear to the home signal and Station Yard Working is authorised, the "Is line clear?" signal for any train may be acknowledged by the bell signal 4-3.

If the line is only clear to the home signal, and instead of Station Yard Working being in operation Permissive Block Working is in operation, the "Is line clear?" signal for a train not conveying passengers only may be acknowledged by the bell signal 4-3, but with this important difference: the line in advance of the home signal must not be occupied by a train or vehicle containing passengers,

nor must permission have been given for a train conveying passengers to approach in a conflicting direction.

The next stage is when the block section is occupied. In this case the "Is line clear?" signal for the train is acknowledged by the bell signal 4-2, and it should be remembered that where Station Yard Working is in operation the train permitted to enter the occupied section should be of the same type as the train or trains already in the section. When Permissive Block Working is in force it will be understood, of course, that only trains not conveying passengers can be concerned.

When goods lines are worked in accordance with the Permissive Block System, the "Is line clear?" signal for a train not conveying passengers on such line may be acknowledged by repetition when the line is clear to the home signal only; therefore, there is no necessity to use the bell signal 4-3 on these lines, and the occupation of the line or junction ahead is not concerned as trap points are provided in goods lines where these lines connect with passenger lines. The bell signal 4-2 is, of course, used in the same manner as on a passenger line where Permissive Block Working is in operation.

Cautioning of Trains.

When the "Is line clear?" signal for a train is acknowledged by the bell signal 4-3 or 4-2, an intimation has to be given to the driver that the forward section is only clear to the home signal at the signal box in advance, or that the block section itself is already occupied.

Where a subsidiary signal is provided on the post of the signal controlling the entrance of trains into the section ahead, the taking off of this signal is sufficient intimation to the driver, but, if a subsidiary signal is not provided, the driver must be verbally instructed by the signalman as to the state of the line ahead.

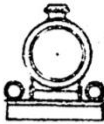


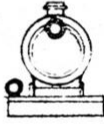
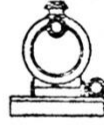
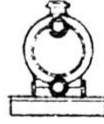
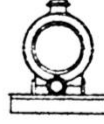
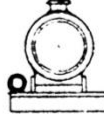

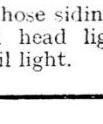
The signalman who has to warn drivers verbally, must place a metal link or lever clip on the lever of the home or starting signal as a reminder that the signal must not be taken off without this warning being given.

To cover the case of a train having to enter a section worked on the Permissive Block System at some point in advance of the signal box, thereby making it impossible for the verbal warning to be given where a subsidiary signal is not provided, an instruction is included on page 1, of the General Appendix advising a driver that in such circumstances the train will be brought to a stand

at the signal controlling the entrance to the section ahead, and that when this signal is taken off he must proceed cautiously and be prepared to stop short of any obstruction.

ENGINE HEAD LAMPS.

Rule 119 states that head lamps, or some other authorised method of indication, must be carried on engines to denote the class of train. The following diagrams illustrate the standard head lamp positions in operation on the L.M.S. The lamps when illuminated show a white light.

Description of train.	Bell Signal.	Head lamp. (White light).
1.—Express passenger train, or breakdown van train going to clear the line, or light engine going to assist disabled train, or fire brigade train	4	
2.—Ordinary passenger train, or breakdown van train not going to clear the line	3—1	
Branch passenger train (where authorised)	1—3	
Rail motor or motor train with engine leading (When running with driving compartment leading rail motors or motor trains will carry the headlamp on the same bracket as used for the tail lamp.)	3—1—2	
<i>NOTE.—For arrangements in regard to electric trains see the various electric line instruction books.</i>		
3.—Train conveying special horse or pigeon traffic and composed of coaching stock (where authorised)	3—1—1	
Parcels, newspaper, fish, meat, fruit, milk, horse, or perishable train, composed of coaching stock	1—1—3	
4.—Empty coaching stock train	2—2—1	
Fitted freight, fish or cattle train with the continuous brake in use on NOT LESS than one-third the vehicles	5	
5.—Express freight or cattle train with the continuous brake on less than one-third the vehicles, but in use on four vehicles connected to the engine indicated by \times in the Working Time Tables	2—2—3	
Express freight or cattle train not fitted with the continuous brake, or with the continuous brake in use on LESS than four vehicles	3—2	
6.—Through freight train, or ballast train conveying workmen and running not less than 15 miles without stopping	1—4	
7.—Light engine, or light engines coupled together	2—3	
Engine with one or two brake vans	1—3—1	
8.—Through mineral or empty wagon train	4—1	
9.—Freight train stopping at intermediate stations, or ballast train running short distance	3	
Branch freight train (where authorised)	1—2	
Ballast train, freight train, or inspection train requiring to stop in section	1—2—2	
10.—Shunting engines working exclusively in station yards and sidings.	Must, whilst in those sidings, carry one red head light and one red tail light.	

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