

# Signaling In War



## Railroad Signals Go to War

**C.T.C. on main track and car retarders in yards are an effective means for increasing capacity of existing track facilities, locomotives and cars**

**By Joseph B. Eastman**

Director of Defense Transportation  
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WHEN the Axis nations declared war upon the United States, they attempted to reassure their worried peoples by telling them that "A democracy is wasteful, inefficient and bungling. The United States will never be able to strop itself down to the hard cutting edge of war."

Today the railroads of this nation are proving how utterly wrong those Axis mouthpieces were. They are now carrying loads which a year ago, even six months ago, were thought impossible. Freight and passenger business over some lines has increased more than 150 per cent. Gross ton-miles for the first eight months of 1942 rose to approximately 26 per cent over the same period of 1941. For the year 1942, the figure is expected to be 76 per cent greater than the gross ton-miles handled in 1938.

Back in the 1920's, the railroads were faced with a rapidly expanding volume of business. They met it then by construction of additional main tracks and by reducing grades and curves to speed up traffic. Today this method is impossible.

The railroads are being forced to

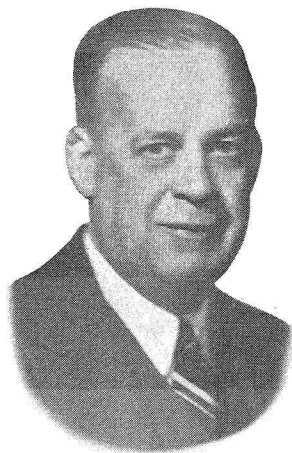
use such facilities as they have already available; to take these facilities and use them better and more efficiently. It is a tribute to the American way of life, which the railroads

traffic control, car retarders, yard train communications and train operation by signal indication without train orders, etc., have played an important role in increasing track capacity and reducing traffic hazards, at a minimum expenditure of critical materials.

### Congestion Relieved by C.T.C.

While local operating conditions have determined the type of signaling most adequate for a particular operating problem, the Office of Defense Transportation has found that traffic congestion on single and multiple-track lines has often been relieved by the installation of centralized traffic control by means of which train movements are authorized and directed by signal indications without the use of train orders or train superiority.

Centralized traffic control practically eliminates the time lag in the transmission of orders, and results in more efficient train dispatching, as the trains are directed by signal indications at the time and place required by traffic conditions. This results in the elimination of one of the main reasons for traffic congestion on single-track lines, or on multiple-track lines where trains are operated in either direction on one or more tracks.



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exemplify, that they have been able to do this so well.

One very important way in which the railroads have increased the efficiency of their equipment is through the use of railway signaling devices. Automatic block signals, centralized

These devices, as well as many others which space does not permit mentioning here, have enabled the railroads of the nation to assume the tremendous transport burden that has been placed upon them. With every

indication that freight and passenger movements will increase, rather than decrease, during the course of the war, the efficiency of railroad operations will be subject to continual and increasing strain. We in the Office of

Defense Transportation have not the slightest doubt but that the railroads, with the help of the government, will be able to meet this challenge as they have met the one placed upon them at the outbreak of the war—successfully.

# Manufacturers' War Problems

**In spite of shortages of materials and workers, the supply companies will continue to aid the railroads**

**By R. H. Weber**

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AMERICAN history is studded with periods during which the nation wrestled with the age-old problem of supply and demand. However, this is probably the first time a prompt, successful solution was so vitally important to the Nation's very existence. No person or group can or has escaped the far-reaching effects of this crisis. That includes members of the Signal Appliance Association.

No one questions the importance of rail transportation to our national economy and to the successful prosecution of the war. The general public and the press are loud in their praise of the magnificent way the American railroads are meeting the current unprecedented demands on their services and facilities. So are government spokesmen and leaders of our armed forces. There is not, to my knowledge, any official of the War Production Board who does not fully recognize that safe and uninterrupted operation of our railroads is a vital part of the war program and that adequate, efficiently maintained signaling systems make possible maximum safety and the maximum utilization of existing railroad facilities.

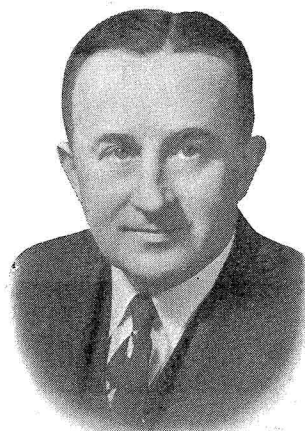
## Materials Must Go Farther And Do More

Notwithstanding this completely favorable attitude towards the railroads and the importance of supplying their needs, the fact still remains there are critical materials and just not enough of these critical materials to go around.

Bad as the situation is now, it is certain to get worse, so all of us, suppliers and users alike, have the common problem of making a drastically limited and constantly shrinking supply of materials go further and do more than ever before.

## Some of Our Problems

With respect to operating and operating personnel, our problems are probably no different than those con-



R. H. Weber

fronting all producers today. Many of us have lost experienced key men to the armed forces of our country. Executives, engineers and service men have been requisitioned by Washington to aid in the non-combat prosecution of the war. Many of our draft-age employees have gone to help meet State draft quotas. Those of us whose plants are located in heavily congested "war contract" areas constantly face raids, aimed to relieve us of skilled

and semi-skilled help. Replacements in such areas are practically unobtainable.

Many of us are producing munitions and other war materials. Sometimes this means plant and personnel expansion. Often promised equipment is not delivered, or the raw materials, to meet production quotas, are simply not obtainable regardless of priority ratings. Very often, contract production quotas are doubled or tripled over night, and a few days later explanations for being behind in shipments are in order. These expansions, with resulting influx of new employees, usually lead to additional facilities, thinly spread supervision, transportation jams, and other complications.

Traveling personnel are finding it difficult to get adequate hotel and pullman accommodations. Day coaches are crowded, messages delayed, and average traveling time schedules seriously disrupted.

Some of us have donated the use of available machine-shop equipment for training enlisted personnel of the armed forces twenty-four hours a day. With this arrangement goes the responsibility for housing, feeding and transporting the trainees from quarters to plant and return. Then there are the air-raid drills, provisions for blackouts, armed guards, joint management and labor committees. Also payroll allotment, war bond, salvage, group riding and various other kinds of drives. These are busy times.

## A Personal Challenge

The whole situation presents a challenge which calls for every bit of resourcefulness, ingenuity, skill, pa-

tience, and sacrifice that all concerned can muster. It puts a new intensity on conservation, maintenance, getting the most out of existing facilities, simplification, substitution, salvage, and the limiting of purchases to absolute necessities.

Most of the foregoing has to do with the dark side—shortages of one

kind or another. On the brighter side, there is not now or likely to be, I am sure, any shortage of American genius, imagination, will to work, power of adjustment, and the traditional spirit of the signal fraternity to freely cooperate on mutual problems.

Member companies of the Signal Appliance Association fully recognize

their duty and share in the important task of keeping them rolling safely and on time. Coupled with this, is the always present sincere and earnest desire to serve the railroads faithfully and well, through thick and thin. As long as these combined forces are fully applied, there can be no doubt as to the ultimate outcome.

# Signaling as Considered by W.P.B.

## Suggestions for information needed by the War Production Board when determining the allotments of materials

**By Eugene Moore**

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THE Transportation Branch of the War Production Board appreciates this opportunity to outline some of the problems which come before it in the handling of applications for priority assistance involving materials required for maintenance of signal and communication systems and for the installation of additional devices and systems of this character.

### Use of Signaling In Peace and War

The railroads have been called upon to produce maximum transportation output with a minimum of facilities and equipment. This calls for extreme alertness and ingenuity on the part of railway operating officers. The signal engineer should be in an especially good position to assist in these efforts, inasmuch as the basis of his profession is improvement of the "use factor" or capacity of track facilities, and in expediting the movement of motive power and rolling stock. Intelligent use of signaling in peace time avoids capital expenditures for additional tracks and makes it possible to do the transportation job with fewer units of equipment, thus keeping capital accounts and operating expenses at a minimum.

In time of war, when materials are critically scarce, it is even more essential that an improvement which will use the least critical material should

be given preference. No track expansion program should be advanced today without careful consideration being given to improvement of the capacity of the existing tracks, where this can be done with use of smaller quantities of critical materials, just as



Eugene Moore

no new factory expansion should be made until existing plants and machines are worked on an around-the-clock basis.

### Everyone's Job

The principal job at W.P.B. is to conserve materials and to see that the restricted amounts made available are put to work where they contribute the most to the war effort. This should also be the job of members of the signal engineering profession, because

they are in a position to use critically scarce materials wisely in the light of current requirements or to divert some of them into projects which could well be deferred until the situation improves. The co-operation received from the signal, as well as the telegraph and telephone departments, when the gravity of the situation was fully appreciated, has been heartening. The work of the Conservation Committees of the Signal Section and the T. & T. Section of the A.A.R. have resulted in recommended practice which will bring about substantial savings, particularly in copper and copper alloys, but individual railroads are in a position to do even more by revision of standards, deferment of maintenance which goes beyond absolute minimum requirements, repair and reclamation of materials, and careful check of all new projects in order to cut them to irreducible minimum of material.

### Maintenance as Compared with Extensive Replacements

Generally speaking, the limited amount of material available for railway signaling facilities must first take care of minimum normal maintenance requirements. The importance attached to this is evidenced by the procedure set forth under Preference Rating Order P-88, wherein the railroad is empowered to extend ratings for materials and supplies required. Attention is called to the fact that this order is intended to take care of ordinary maintenance only which, in general, means the replacement in kind at

existing locations of various items of signal equipment. This does not mean that it would be necessary to replace a worn-out device of obsolete design with an identical device if the standard of the railroad has been changed, and if the modern device uses less critical material. However, it is expected that each railroad will examine its requirements to avoid making extensive changes at this time unless it is absolutely imperative that they be made. Any maintenance program which involves changes over an extended area, or out of face replacement amounting to complete rebuilding of a signaling facility should be submitted for a project rating or for ruling as to whether the particular case may be undertaken under the provisions of Order P-88. In other words, P-88 is intended to take care of ordinary maintenance and not maintenance projects which amount to complete renewal of extensive installations.

Each railroad should examine its major maintenance projects with a view to determining if all or part of the project can be deferred or if repairs can be made which will extend the useful life of the installation. This is a patriotic duty which will conserve critical materials at the present time when they are so urgently needed in the production of direct munitions of war. Such an approach to the maintenance situation would ordinarily not be considered economical over a long period of time, but it is a *must* now. Nothing should be retired that can be repaired sufficiently to give reasonably satisfactory service. Careful attention to and supervision of signal and interlocking installations will frequently make it possible to secure a few more years service out of what is in service and release materials for vital expansion programs necessitated by the load of war-time traffic.

### Consideration of New Projects

As to these new projects—probably every reader of *Railway Signaling* has been directly or indirectly involved in the question of whether the War Production Board will approve one or more of these on his particular railroad. What yardstick can be applied to the approval of these expansions of signal systems? The details are many and varied, but the general basic analysis may be stated simply by an answer to the following question: Will the project contribute directly to the successful prosecution of the war to an extent sufficient to warrant allocation of the quantity of material it consumes? If it does not, the project must be deferred even though it would ordinarily be con-

sidered to involve a wise expenditure of funds.

The signal installations reviewed by this branch almost invariably provide a facility which constitutes a permanent improvement which will provide for economical operation after the war, but this reason alone cannot be given weight in the analysis of the project. The branch must consider what the direct and relatively immediate effect in handling of trains will be. We at W.P.B. are dealing primarily with the present and the immediate future, and it is only incidental from our point of view that signal projects ordinarily happen to be of a character that will continue to render valuable service long after the present emergency, which necessitated the installations.

It is appreciated that there is a great temptation for railroad managements to authorize the improvements which have been curtailed in the past for lack of available funds, and that there might, in some cases, be a tendency to apply less exacting standards to requests for new projects because some officials have not as yet become material-minded. Today it is not a question of funds, but a question of expanding vital resources of material, production facilities and skilled labor badly needed in the prosecution of the war. No less rigid standards of establishing the essentiality of a project should be applied by management today, with respect to these materials, than has been applied in the past with regard to the cash resources of the railroad. In fact, the duty to conserve today is more solemn and vital than ever before in the history of our railroads. It is expected that railroad management has given such consideration to every project which comes before this board for review, and that its essentiality has been passed on before the project is submitted.

No project should be submitted for approval unless the management firmly believes it to be urgent for the proper operation of the railroad, undeferrable and cut to barest essentials. If a project has undergone this test, the railroad management should have little difficulty in presenting the data required for analysis of the project by this Branch of the War Production Board.

### Information Needed by W.P.B.

It should be remembered that basically the information needed for the analysis of a project by this branch is not much different from the statement ordinarily presented to management to secure approval of the improvement. The difference, in this instance, is that a little more detail

should be furnished, because local facts or circumstances surrounding the need for the project many not be known to this branch of the W.P.B. In addition to the information required on the project application Form PD-200, a sufficient description and summary of the merits of the proposed project should be furnished the branch to give the analysts the full picture. In analyzing a project, it is first necessary to determine its essentiality, after which a detailed analysis of the material list is made. The supporting data should include plans, description of project, details of traffic, train charts, data outlining expected benefits, and any other information which would tend to show the importance of the project to the war effort.

With regard to materials and specifications, the branch analysts will review the railroad's requirements along the following lines:

(1) To bring them into conformity with the recommendations of the Conservation Committees, Signal Section and T. & T. Section of the A.A.R.

(2) To suggest substitutions where practicable.

(3) To suggest reductions possible through use of fit or second-hand materials.

(4) To inquire if any reductions in quantities can be made by furnishing materials from stock on hand, salvage or transfer of equipment from other points on the system.

The list submitted with an application can show all of these things, which will expedite handling.

### Every Man Is His Own Game Warden

To repeat, each officer and employee engaged in signal work has a personal responsibility for the efficient use of material. It is obviously impossible for the War Production Board to do more than set the general policies regarding the utilization of materials, the details of such policies being carried out into the field. Only by the active co-operation of all concerned can the limited quantities of materials available be made to do the work which in ordinary times would require much larger amounts.

Every reader of this magazine, engaged in the railway signal field, can do his part to conserve material. The maintainer can avoid wasteful practices, and refrain from requisitioning materials he can possibly get along without. Circuit designers can exercise their ingenuity to avoid use of excessive quantities of material. Estimators can sharpen their pencils to avoid ordering more than is needed. Signal shop employees can use ma-

materials formerly scrapped. Storekeepers can control materials better.

Too much emphasis cannot be laid on the conservation of materials. We can all try to do our jobs just a little better, and remember that everything we waste, whether it be in maintenance or expansion not vitally necessary, is taking something away from an essential war activity. Nothing is more important than the conservation of vital materials today. It is im-

portant to take no more than is actually needed, and to tighten our belts so that we do not need so much. It is up to the individual who has to do with authorization, design, installation or maintenance, regardless of how lofty or humble his position may be, to determine whether he is doing his job in conserving material and using it wisely. To a large extent, every man is his own game warden.

In closing, attention is called to a

poster of the A.A.R. which sets forth the following slogans:

- (1) Conserve
- (2) Convert
- (3) Use it up
- (4) Make it do
- (5) Save the pieces

That about tells the story which should be constantly on display not only in every maintainer's shanty but in the shop or office of all those who use or authorize the use of materials.

# Utilization of Signaling In War

## A discussion of the manner in which modern signal facilities save train time under war conditions

In 1918, under the stress of war, the excessive time required to move freight shipment between shippers and consignees was due not so much to the fact that the maximum train speeds were less than they are today, but rather to the fact that delays en route increased the road time of trains between terminals to such an extent that the overall speed *including delays* was much lower than the maximum running speed. Furthermore, delays in yards were excessive, as measured by today's operations. Obviously, a most practical means for reducing the time required by freight shipments or passengers to move between points of origin and destination is to minimize these delays; in other words, to increase the average overall speed more nearly to that for which the locomotives and tracks are designed. This is the function now being performed by the numerous extensive installations of modern signaling that have been placed in service since 1918, with the result that trains are now being operated at higher speeds for a greater percentage of the time when in motion, many stops previously re-

quired are eliminated, and standing delays are minimized. Throughout the discussion which follows, information is presented concerning the time saved by specific signaling projects, this information having been furnished recently by the railroads. The discussion does not, however, disclose the names of the roads or the locations of the projects, although this information can be secured by writing to the editor.

### Locomotives, Cars, and Tracks Decrease

With approximately 63,890 locomotives in service during 1918, this total was reduced about 30 per cent,

to approximately 40,275 locomotives as of January 1, 1942. The new locomotives have more power, so that the average tractive effort increased from about 35,000 lb. to approximately 52,000 lb. The total tractive effort of all locomotives increased from 2,024,118,700 lb. in 1918 to 2,611,273,975 lb. in 1926, and then gradually decreased so that at the present time the total is approximately 2,121,000,000 lb. As shown in the accompanying table, the revenue ton miles per freight locomotive mile increased from 6,102,998, during the first six months of 1918, to 13,242,837 for the corresponding period of 1942.

The railroads owned 2,397,943

Since 1925, centralized traffic control has been installed on a total of 2,703 track miles in the U.S.A.

