UNCLASSIFIED
BOX NUMBER 14
DATE DEC 10 1949
CLASSIFICATION CANCELLED
AUTH: Cir 115-50
CMG

[redacted]

INSTRUCTIONS CONCERNING THE ORGANIZATION OF A LINE OF COMMUNICATION FOR INTENSIVE TRAFFIC

TRANSLATION OF A FRENCH DOCUMENT
EDITED AT THE ARMY WAR COLLEGE

OCTOBER, 1917

REGRADED Unclassified
BY AUTHORITY OF DODDIR 5200.1-R
BY Randy Rakes
ON 18 Aug 2005

WASHINGTON
GOVERNMENT PRINTING OFFICE
1917

42028 UNCLASSIFIED

THE GENERAL SERVICE SCHOOLS

LIBRARY



CLASS NUMBER M 9403-B15

ACCESSION NUMBER 42028

C.

neral.

WAR DEPARTMENT,
THE ADJUTANT GENERAL'S OFFICE,
WASHINGTON, *June 19, 1917.*

To all officers of the Army:

You are advised that this and all subsequent documents of a similar character, which may be furnished to you from this office, are to be regarded as strictly confidential. They are to be kept at all times in your personal possession, and are not to be copied, nor are any parts of their contents to be communicated either directly or indirectly to the press, nor to any persons not in the military or naval service of the United States. In Europe these documents are not to be carried into the front-line trenches, nor farther to the front than the usual post of the officers to whom issued.

Strict compliance with this injunction is enjoined upon every officer into whose hands any of these confidential documents may come.

BY ORDER OF THE SECRETARY OF WAR:

H. P. McCAIN,
The Adjutant General.

WAR DEPARTMENT,
WASHINGTON, *October 1, 1917.*

The following pamphlet, "Instructions Concerning the Organization of a Line of Communication for Intensive Traffic," is published for the information of all concerned.

[062.1, A. G. O.]

BY ORDER OF THE SECRETARY OF WAR:

TASKER H. BLISS,
Major General, Chief of Staff.

OFFICIAL:

H. P. McCAIN,
The Adjutant General.

TABLE OF CONTENTS.

	Page.
Instructions concerning the organization of a line of communication for intensive traffic	9
1. Choice of the road set apart for intensive traffic	9
2. Commission for regulating intensive traffic	10
3. Organization of the road—Operation and maintenance—Telephone system	11
3a. Character of the traffic	11
(*a*) By the use of different roads	12
(*b*) By the use of wagon paths	12
(*c*) By scheduling horse vehicles and motor traffic to move at different hours	12
4. The personnel of an operating block—Duties of the blockmaster	12
(*a*) Supervision of the traffic on the road	12
(*b*) Organization of traffic crossings in the block	13
(*c*) To remedy stoppages of traffic due to poor handling or to accidents	13
Case 1	13
Case 2	14
(*d*) To provide for a current of traffic entering or leaving the reserved road by a branch road	14
(*e*) The policing of the loading centers or unloading sheds in the block	15
5. Traffic rules and traffic police	15
6. Wrecking service	16
(*a*) The importance of the wrecking service	16
(*b*) The wrecking crew	16
(*c*) Organization of the service	16
(*d*) Distribution of the trucks to be repaired	17
7. Organization of the loading and unloading centers—Road sidings	17
(*a*) Guiding principle	17
(*b*) Loading centers	17
(*c*) Unloading centers, road sidings	18

Instruction concerning the organization of a line of communication for intensive traffic—Continued. Page.
8. Traffic capacity of a reserved road..... 20
Appendix 1..... 21
Appendix 2..... 22
Appendix 3..... 23
Schedules (graphic)..... 23
Note..... 24
Example of schedule operation..... 24

INSTRUCTIONS CONCERNING

THE ORGANIZATION OF

A LINE OF COMMUNICATION FOR INTENSIVE TRAFFIC.

Experience has shown that intensive traffic on a highway in the zone of communications can be obtained only by a complete organization of this traffic. It appears that, from the teachings of experience, some principles may be deduced which it would be advantageous to lose no time in applying whenever a fresh situation of this kind arises.

1. CHOICE OF THE ROAD SET APART FOR INTENSIVE TRAFFIC.

The road by which the intensive traffic must move should be exclusively at the orders of the commanding general (administration of the rear). This is the only way by which traffic can be organized to meet the general needs. Such a road is called a "reserved road."

It is better to take a single road with double traffic (vehicles moving in both directions) than two roads forming a circuit with traffic moving in only one direction on each road. The advantages of the single road are:

(*a*) The selection of such a reserved road is a simple matter and can easily be made known to everybody. It is easy to police.

(*b*) It is easier to arrange for systematic maintenance work on a single road if it is well chosen.

(*c*) The organization of traffic (division into blocks, telephone communication, etc.) is equally simplified.

This road, which assumes many characteristics of a railway, is not necessarily perpendicular to the front like a normal line of communications. It is evident that its direction will depend on the situation of the front and of the railways in the rear, but there is every advantage in having it rather oblique to the lines of march of the troop columns, and it may even end parallel to the front. Such an arrangement, as in the case of railways, facilitates the organization of the supply centers or of the points of unloading transported matériel.

18229—17——2

It follows that considerations of the line of march or of retreat of the engaged troops should not be the prime factor in choosing the direction of the road.

2. COMMISSION FOR REGULATING INTENSIVE TRAFFIC.

Whether it is a question of movement on the road of automobiles or horse vehicles, or of policing the road, of road maintenance, of organization of loading and unloading, it will always be profitable to centralize all means of action in the hands of a single authority—the commission for regulating highway communication, subordinate to the commanding general (administration of the rear).

The regulating commission will ordinarily have the following membership: 1 regulating commissioner (field officer or captain), 1 or 2 assistant commissioners, 1 officer representing the road service, and a variable number of officers as assistants.

It receives from the commanding general (operations section and the administration of the rear) its general orders concerning the nature of the traffic to be carried on and what must be done to meet it.

On the basis of these general orders, the commission establishes traffic regulations, lays down plans for the transportation, make schedules, etc.

The commission is in constant touch with the staffs and the directors of communications and services of the armies concerned and with the railway regulating commissions which serve these armies. By agreement with these authorities there are established: (*a*) *The loading centers* where trains get their loads before entering the communications road (these centers generally coincide with the railway stations known as supply stations); (*b*) *the unloading centers* where they discharge personnel and matériel.

It is advisable to place under the direct orders of the regulating commission: First, the details of laborers employed in road maintenance; second, the territorial units charged with supplying the laborers at the loading and unloading centers (in the same way as the railway regulating commissions have at their orders supply station battalions).

This procedure is much preferable to that of delegating these services to details taken from the successive higher units which operate in the sector.

3. ORGANIZATION OF THE ROAD—OPERATION AND MAINTENANCE—TELEPHONE SYSTEM.

The regulating commission divides the reserved road into "operating blocks." These blocks vary in length (depending on the number of crossings and on how much difficulty is experienced at the crossings), but as a rule they should not be more than 10 or 15 kilometers. In each block the commission is represented by an officer, the blockmaster, who is in constant touch with the commission.

As soon as possible a special telephone line should be put in to serve the reserved road. This line runs from the regulating commission station, with a station for each block master and stations at the beginning and end of the reserved road. (These may serve as stations for the block masters of the first and last blocks.) The stations should be mounted on branch circuits, so that all service orders may be heard by all blocks. (See plan of installation in appendices.)

At each station a register is kept and all messages are entered in it.

For every operating block there is a corresponding maintenance block or section. The officer representing the road service on the regulating commission divides his men into section gangs, each under a maintenance-of-way section foreman. The latter is an officer or noncommissioned officer, who must keep in constant touch with the block master and receive any useful suggestions he may make in regard to parts of the road requiring special attention or repairs. An appendix discusses the means to be taken to maintain a road under conditions of intensive traffic, with suggestions as to men, tools, and necessary road material.

The regulating commission requires a daily report from each block master.

3a. CHARACTER OF THE TRAFFIC.

A reserved road devoted to intensive automobile transportation is unfavorable for intensive traffic with horse vehicles. No road is wide enough to allow two lines of vehicles (motor and horse drawn) to pass in both directions, each moving at its natural speed. The two kinds of vehicles get in each other's way.

It follows that, whenever possible, horse and motor traffic should be separated by one of the following expedients:

(*a*) *By the use of different roads.*—This is the best method. If a reserved road is paralleled for all or part of its length by another road, the latter should be used for horse vehicles and columns of troops.

(*b*) *By the use of wagon paths.*—If there are no parallel roads, wagon trails may be made through the fields beside the reserved roads. The wagon trails may be improved with fascines where necessary. Horsemen and empty wagons should always be required to use them, and loaded wagons should use them whenever the condition of the ground permits.

(*c*) *By scheduling horse vehicles and motor traffic to move at different hours.*—If the topography of the region or weather conditions make it impossible to use parallel roads or wagon trails, it may become necessary, over some stretches of road, to make schedules for the movement of horse vehicles and motor traffic at hours when they will not conflict. (See Appendix 3.)

4. THE PERSONNEL OF AN OPERATING BLOCK—DUTIES OF THE BLOCK MASTER.

Besides the block master, who is an officer, each block should have the following personnel: An officer or noncommissioned officer to assist the block master; from 2 to 4 sergeants or corporals; from 10 to 20 traffic regulators or policemen (3 per station).

Mobile supervision of traffic must also be organized, and for this each block master should have at his orders from 2 to 4 touring cars and from 2 to 4 cyclecars or motorcycles.

The principal functions of the block master are to supervise the traffic on the road, to organize traffic crossings, to restore traffic after an accident, to regulate the up and down currents of traffic, and to police the loading and unloading centers.

(*a*) *Supervision of the traffic on the road.*—The block master attends to all permanent elements of supervision of his block and sees that all the general traffic rules (for passing another vehicle, etc., given below) are applied.

For certain difficult points on his block he makes special rules and oversees their application.

He has the road arrowmarked and all the necessary traffic signs installed.

The traffic signs consist of frames of white cloth with inscriptions in black. At night they are illuminated from the inside by candles. For intensive night traffic these illuminated signs are indispensable.

The use of signs with a conventional meaning should be avoided, as the road may be used by vehicles not familiar with them. On the contrary, all signs should be in ordinary language and very explicit, as, for example:

"Slow down to 5 kilometers per hour."

"Curve to right 200 meters ahead."

"The road to X is to the right, 200 meters ahead."

"Road reserved to ambulances, etc., going to X."

One can never put up too many arrows or signs.

(*b*) *Organization of traffic crossings in the block.*—Traffic crossing the road must be organized at each crossing. Two cases must be considered.

The simpler case is when another road crosses the reserved road, like a railway grade crossing. A traffic squad simply regulates the intersecting traffic to the best advantage.

The more complicated case is where the two ends of the cross-road are not opposite each other and a stretch of the reserved road must be used. In this case it becomes necessary to have special rules, such as holding up traffic on the reserved road for a short time at intervals; horse vehicles should never be allowed to pass except in groups of a specified number (5 or 10).

(*c*) *To remedy stoppages of traffic due to poor handling or to accidents—*

Case 1.—The road is partially blocked, so that only one vehicle can pass at a time.

When there is a current moving in each direction, traffic difficulties always follow any obstruction of either current. For a simple obstruction of say 30 meters (for example, a broken-down vehicle), experience shows that traffic remains normal, one current passing in the interval of the other over the few meters of single-file passage.

When a longer stretch is interrupted, pilot service must of necessity be organized. The quickest organization is to take a noncommissioned officer or traffic regulator of the block personnel as pilot. The two currents are stopped above the narrowed section and a group of vehicles is passed through successively in each direction, the pilot always riding on the last

vehicle of the group, and no group being despatched without his presence.

There should never be any hesitation about organizing pilot service at the first moment. Any mishandling of traffic in a narrowed passage leads to a tangle which can only be straightened out with great difficulty and much loss of time.

Case 2.—The road is completely obstructed.

Measures must be taken at once to prevent the accumulation of vehicles. The first step is to close the block entirely or in part. The block master holds up traffic in both directions above the congested point. Local stoppage can be effected by sending agents out along the road to at least 1 kilometer from the critical point with orders to let no vehicle pass (this includes touring cars and sanitary vehicles). He can also telephone the adjoining block masters and have all traffic moving toward him held in the adjoining blocks until he countermands the suspension.

He will next use all available personnel (drivers, section hands, etc.) to clear half the road as soon as possible and at once resume the two currents of traffic, by pilot service if advisable. The rest of the road may then be cleared. There should be no hesitation in throwing disabled vehicles off the road if necessary.

(*d*) *To provide for a current of traffic entering or leaving the reserved road by a branch road.*—A special station should be put at the mouth of the branch road to regulate traffic in case of need. Ordinarily there is no difficulty and no need of alternately holding up each current, even where the branch current has to cross one of the reserved-road currents. Alternate interruption should be resorted to only exceptionally.

On the other hand, it is essential to be sure that the branch road by which the current is to leave the reserved road *is free.* The block master must therefore know the conditions under which this branch current works, and must act as routing agent for it over part or all of the branch road. Especially where there is a loading or unloading area near the reserved road, the commanding officer or the despatcher in control of loading and unloading should come to an understanding beforehand with the block master for the purpose of harmonizing the details of the movements of the trains of vehicles. It is the province of the regulating commission, when issuing its orders, to give all the information necessary for reaching this understanding.

(*e*) *The policing of the loading centers or unloading sheds in the block.*—The block master establishes and enforces traffic rules for the guidance of the officers commanding the loading and unloading gangs. These rules are made in consultation with the officers in charge of the loading and unloading centers and jointly submitted for the approval of the regulating commission.

5. TRAFFIC RULES AND TRAFFIC POLICE.

The following rules are to be strictly enforced on the reserved road:

(*a*) A truck driver must never pass a motor vehicle in motion ahead of him.

(*b*) Except by orders, no driver shall stop his truck except in case of absolute necessity (a breakdown involving stoppage). Even in the latter case the driver must try to move ahead to a wide part of the road and draw over as far to the right as possible.

(*c*) The maximum speeds at any moment must not exceed: Trucks, 12 kilometers per hour; touring cars, 30 kilometers; ambulances, 20 kilometers.

Touring cars and ambulances (and light trucks, but only exceptionally) are authorized to pass trucks, but this authorization may be withdrawn at any moment by a block master or any other representative of the regulating commission.

(*d*) Drivers must scrupulously obey all directions given on the signs of the regulating commission and all verbal orders of the representatives of the commission (officers, noncommissioned officers, or orderlies). This personnel should wear identifying insignia (white and green arm band).

Besides the above general rules, some special ones may well be adopted, such as the following expedient for facilitating the passage of touring cars and light trucks. Red disks are put on the backs of certain trucks and no other truck following one so marked may approach within 50 meters of it. In general, 2 trucks per section (that is, about 1 vehicle in 10) are given these red disks. Touring cars thus find loopholes in the columns of trucks and progress more easily.

Constant supervision of the traffic on the road is necessary. Besides the block masters, the regulating commission should have at its orders a certain number of officers going over the

reserved road every day to inspect the traffic. The infliction of severe penalties for all proved traffic offenses is absolutely necessary.

6. WRECKING SERVICE.

The number of trucks broken down on the road owing either to accidents, mechanical defects, or general collapse is clearly closely proportional to the intensity of the traffic.

There is but one rule for everybody: *Clear the road.*

If the damaged truck can move, put it in tow of another truck of its section or even of any truck (in either case, the decision is to be made by the block master or his representative). Whoever should decide must decide quickly and should not have recourse to towing unless means for towing are ready at hand and can be used quickly.

In all other cases, it is no part of the duty of units of the moving traffic to bother with wrecking. There is a special service with this duty.

(*a*) *The importance of the wrecking service.*—It may be expected that every day, 1 per cent of the vehicles engaged in traffic over the reserved road will need wrecking service.

How much work a wrecking crew can do depends essentially on the length of the reserved road since the crew always brings the truck to *the park*, which is generally near one end of the road.

On an average, it should not be expected that a crew can bring in more than 2 wrecked trucks a day.

A daily traffic of 3,000 vehicles over a reserved road 70 kilometers long will require at least 15 wrecking crews.

(*b*) *The wrecking crew.*—It comprises a good wrecking master, a truck, preferably of 4 or 5 tons capacity, 3 or 4 strong men, and the necessary equipment (jacks, ropes, blocks, etc.). If possible a hoisting apparatus should be erected at the back of the wrecking truck.

The wrecking master should, of course, be a good mechanic, who can remedy any breakdown which can be put right by immediate repairs. It is always preferable to tow the wrecked car away rather than to undertake any lengthy repairs on the spot.

(*c*) *Organization of the service.*—One park and only one should be in charge of the wrecking service. The officer commanding this park is responsible for the service and organizes

it with the crews found at his park and with crews sent by neighboring services to reinforce the first.

This park has telephonic connection with the regulating commission, which informs it of trucks requiring wrecking service. Such trucks are immediately reported by the block masters to the regulating commission.

It may be found advisable to have a certain number of crews on the ground in certain blocks, a new crew automatically replacing the old one as soon as there is a wrecking call on the block.

(*d*) *Distribution of the trucks to be repaired.*—It is generally necessary to have several parks share the work of repairing the vehicles. Invariably all wrecked cars are brought to the park, which is in sole charge of the wrecking crews. The distribution for repairs is made later. No organization other than the park responsible for this service has any right to send anyone to handle wrecked vehicles on the reserved road. Another organization may send men but only after a full understanding with the park and in due observance of the instructions of the officer commanding the park.

7. ORGANIZATION OF THE LOADING AND UNLOADING CENTERS—ROAD SIDINGS.

(*a*) *Guiding principle.*—Everything should be subordinated to the single purpose, *never to make trucks wait to load or unload;* every truck which waits represents lost output, and hence a diminution of the available resources.

Trucks are always waiting unless the loading and unloading centers are organized to prevent jams and false motions. The centers must also have a very liberal allotment of labor personnel, so that each truck as it comes in can be loaded or unloaded with no delay.

(*b*) *Loading centers.*—As a rule, matériel transport sections are loaded at railway stations.

The regulating commissions of the railway and automobile services should be in constant touch with each other so that the latter may have the earliest possible information of the hour of arrival of trains and their freight.

The commission must organize connections with its operating officials so that the latter can be advised immediately. The work should be distributed to the large or small units of vehicles. Each of these is organized within itself so that some

units are always ready to start on short notice. They should reach the railway station at the hour to begin loading and not before.

In each loading center an officer of the automobile service is appointed master of the loading center. He is given a sufficient staff of assistants to have one always on duty. He represents the regulating commission, and in that capacity regulates the movement of vehicles in the loading center.

It is extremely advisable for this officer to have under his direct orders the laborers who handle the freight. If they are not under his orders, he should be in constant touch with the officer in charge of the laborers detailed to load trucks. The labor gangs should always be ready to load the moment the trucks come in.

The master of a loading center which is a railway station must be in constant touch with the station agent and reach an agreement with him for regulating traffic in the station.

(*c*) *Unloading centers, road sidings.*—The most important place for systematic organization is at the unloading centers, for it is there, in particular, that delays may be caused, and for the following reasons:

The unloading centers are at the same time points of contact with transport units coming from the front. For a great variety of reasons it is impossible for the latter to have a regular schedule of movement.

The unloading centers are also centers for delivery to the units at the front. At them, therefore, the freight must be classified, sorted, etc.

An unloading center will work properly only under the following conditions:

First. The unloading center must have a *chief*. This officer (who may be detailed from an army or from any service) must be especially well chosen, must have the authority of rank and personal character, and must be forceful.

It must be remembered that the unloading centers (which, for the units at the front, are food and ammunition *supply centers*) represent the most delicate point of the whole supply system. It is therefore important to give it a chief and to put the assignment on a permanent basis and with a sufficient staff of assistants to insure continuity of service.

The chief has *under his orders* the troops detailed as laborers, all the technical personnel and all transport agencies (units of

motor or horse vehicles from the rear or from the front) during all the time in which they are in his center.

Second. The unloading center should comprise several unloading yards.

Since unloading must be continuous and never interrupted by the fact that the units from the front are coming for supplies, it follows that the yard where units from the rear are unloading must be distinct from the yard where units from the front are loading.

This requires several yards (*a*), (*b*), and (*c*), so that while (*a*) is emptying, (*b*) is being refilled and (*c*) is available when needed.

The chief organizes his yards (*a*), (*b*), and (*c*) so that they are conveniently accessible both to automobile units coming from the rear and to motor or horse vehicles coming from the front and regulates vehicle traffic so that there are no blockades.

Third. The unloading center should have a liberal allotment of labor.

As a rule it should be possible for two automobile sections (from 30 to 40 trucks) at a time to unload at each yard, unloading a total of about 80 tons. This requires at least 150 laborers.

The yard is never idle (either filling or emptying) and requires three 8-hour shifts. This gives a total of 450 men, *an irreducible minimum.* Allowing for those temporarily unavailable, those absent on leave, and clerks, this represents a minimum personnel of 600 men per yard, 2,000 men per center. It is extremely advisable to detail these laborers to the center on a permanent basis rather than to send a succession of detachments to handle freight.

A center thus manned can unload 80 tons every 2 hours (after liberal allowance for necessary loss of time while trucks are changing position, etc., or 1,000 tons per day.

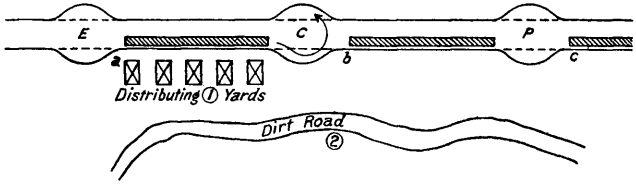
Such a center can easily be organized, even under the most unfavorable conditions where none but earth roads are available off the reserved road.

This may be done as follows: Place the three yards side by side at the edge of the road. In each yard the near side of the road is simply improved so that it is wide enough for three vehicles. This makes three sidings where 30 or 40 trucks can stand without interfering with traffic. The length of the siding is 400 meters.

Trucks unload from the very edge of the road into the fields (yard sites are chosen where the ground is most suitable).

Of vehicles coming from the front for supplies, horse vehicles use the earth roads, motor vehicles the road sidings.

To provide for the movements of trucks there must be made above and below each unloading center and between each two sidings a turning space (*m*), (*n*), (*p*), i. e., the road must be widened so that a truck can make a half-turn.



1. Classification of the freight.
2. Earth road.

A center like this may be put anywhere and often to better advantage where there are several roads coming together forming a junction.

The only addition needed to complete this organization is laborers' quarters (which need not be in the immediate vicinity, as each gang works only one continuous 8-hour shift in 24 hours).

One might be tempted to put the unloading centers in towns. The objections are many—certainty of traffic blockades, risk of fire, large target afforded airplanes, etc.

8. TRAFFIC CAPACITY OF A RESERVED ROAD.

Experience has shown that from 3,000 to 4,000 vehicles in each direction can easily move on a road 60 kilometers long, or from 100 to 120 vehicles in both directions per kilometer of road. Under these conditions the average number of vehicles passing a given point in each direction is about 10 per minute.

APPENDIX 1.

MEANS TO BE USED FOR MAINTENANCE OF ROADS UNDER INTENSIVE TRAFFIC.

First. So far as possible the principal two-way traffic artery should be 7 meters wide, and secondary arteries for traffic in one direction only should be 4.5 meters wide. The edges should be strongly braced, the surface very flat.

Second. The surface of a road under intensive traffic can be maintained only by constantly spreading broken stones wherever holes or ruts are formed and as soon as they appear. This stone spreading requires:

(*a*) A section gang constantly scattered along the road; it must be expected that an average of 20 men per kilometer will be required for breaking and spreading stones.

(*b*) A constant supply of stones; an average requirement of 10 cubic meters per day per kilometer must be expected.

Third. There is every advantage in opening and using quarries very close to the road. The average number of laborers to be assigned to working this kind of quarries must be estimated as 12 per kilometer of road. Stone which work easily, i. e., limestone, is preferable.

Fourth. The number of vehicles required for hauling stone depends on the distance of the quarries or of the railway stations from which it is supplied. If this distance is not more than 20 kilometers, the probable requirement is one road automobile section (16 trucks) and 30 dumpcarts for each block of the road under intensive traffic (average length 15 kilometers).

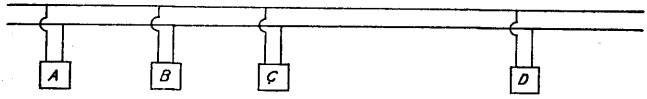
Fifth. Regular operation of very heavy road rollers for surface dressing is difficult. Light road rollers can be used, but they only crush from 25 to 30 cubic meters per day.

Advantage should be taken of every slackening of traffic to dress the surface. This is sure to diminish the wear of truck tires.

APPENDIX 2.

ORGANIZATION OF TELEPHONE SERVICE.

(*a*) *Installation.*—The telephone circuit of the automobile regulating commission is an ordinary circuit on which the stations are branched as shown below. The stations are of the ordinary magneto type.



A system like that shown in the above drawing, with seven stations branched on a length of 60 kilometers, may be put in (circuit of No. 2½ copper wire). For the maintenance of the system a personnel must be provided who do nothing else (at least two telephone construction men, provided with transportation by the regulating commission).

(*b*) *Operating rules.*—The calling station must turn the magneto *rapidly for about 30 seconds.* Before taking down the receiver, each station which takes the call must give *five or six turns of the magneto.* The receiver is then taken down.

The station which is calling says: "Hello, hello, station No. —— is calling station No. ——." The station which is called answers: "Station No. —— present." The other stations say nothing, but listen.

All messages are copied by everybody, conversations in shortened form, service orders word by word. Service orders must be pronounced slowly by the station which gives them and must be introduced by the words "Service order."

At the end of the conversation, the calling station says, "Complete," and everybody hangs up the receiver without ringing off.

When the regulating commission calls, the procedure is the same as for any station. When it issues a service order it calls all the stations successively and begins, as the case may be, either: "Service order for all stations," or, "Service order for station No. ——." It then has the order read back by any one of the stations and then asks, "Has station No. 1 anything to say?" "Has station No. 2?" etc.

When all stations have given their "O. K." the commission gives "Complete."

APPENDIX 3.

SEPARATION OF HORSE AND MOTOR VEHICLE TRAFFIC.

When a piece of road is regularly used for intensive traffic of both horse and motor vehicles, and the latter can not be routed by another road, it will be advantageous to separate the two kinds of traffic by scheduling them at different hours. The common instance of this is where a reserved road near the front must be used by an army corps at the same time for its supply road.

In such a situation the automobile trains must not be allowed to run during the hours assigned for hauling supplies (but a limited motor traffic, such as touring cars, ambulances, and isolated trucks, may move without interfering with the horse traffic), and during other hours periods may be reserved for the automobile trains, and no horse vehicles allowed on the road. To get the maximum possible results and regularity, automobile trains will be required to move *by schedule.*

SCHEDULES (GRAPHIC).

The schedule system consists essentially in giving an automobile train the characteristics of a railway train departing at a certain hour and reaching its terminus at a certain hour. This system applies to simple and regular freight movement (ammunition lots, logs, etc.) from parks where the freight is stored.

For the schedule to be practical its basic rate of speed must be slow (11 kilometers on good road, from 7 to 8 kilometers on fair road) so that trains by varying their actual speed can make up delays or slow down to arrive at the scheduled hour at the entrance of the road which is called the *initial point.*

Operation by schedule requires: Arrival at the loading point at the appointed hour, never later; a regular and invariable time allowance for each loading (this requires that the loading gangs always have full membership); departure from the loading point practically on schedule time; regular progress at the specified speed to arrive at the initial point exactly on time.

When these requirements are enforced a train with 65 tons of freight may be run every seven minutes without difficulty and with perfect regularity, rolling 8 or 10 kilometers per hour.

Note.—There is necessarily a loss of time between the passage of the last horse vehicle and the passage of the first automobile train at the initial point. To avoid passing on the road sufficient interval is allowed between the reserved periods to let the horse-vehicle column leave the operating block. This would be a disadvantage in increasing the number of periods reserved for each kind of traffic. The number of reserved periods should therefore be as small as possible.

Example of schedule operation.—The Bray-Maricourt road is an example of schedule operation.

Owing to the narrowness of the road (only 6 meters) it was first operated only in the direction from Bray to Maricourt. In spite of this restriction, which made it possible for the motor trucks to pass the columns of horse vehicles, stoppages were frequent owing to breakdowns, shell holes, etc., which narrowed traffic at certain points to single file.

Schedule operation was then introduced and horse vehicles barred off the road from 4.40 to 6 and from 9 to 11 o'clock. It then became possible with very fair regularity to run every day during these periods 17 trains, each comprising a lot (66 tons) of 75 mm. ammunition, or an equal tonnage of engineer matériel, besides all other motor vehicles using the road and besides the motors carrying troops. On certain days there was no difficulty in doubling the number of these trains, which is equivalent to a movement of 66 tons every six minutes.

PROPERTY OF U. S. ARMY