erates from both batteries, but in case of failure of the primary battery the signal will operate on the storage battery.

A-C. Floating System Satisfies Average Requirements

By G. H. Dryden
Signal Engineer, Baltimore & Ohio, Baltimore, Ohio

WHERE commercial power is available we install storage battery on a-c. floating charge. For light duty, or at points where flashing lights do not operate to exceed one hour per day, the lamps are lighted direct from the storage battery. The battery is kept completely charged and we have the entire capacity of the cells, usually 80 a.h. as a reserve to bridge the period when the charging current is off. This scheme satisfactorily covers average conditions and we have no record of failure caused by loss of power where flashing-light signals are so operated. For heavy duty, or at points where several lamps are lighted from the same station, a power-failure relay is installed and lamps are lighted normally from a-c. current. In case of a power failure the storage battery carries the lighting load until the a-c. power is restored.

W. J. Eck, assistant to vice-president of the Southern, advises that if it be assumed that "The various schemes for furnishing power are equally reliable, I would choose the one which was least expensive as to installation and maintenance under the given conditions."

The Primary Battery Is Recommended Where Housing Space Is Available

By F. S. Stallknecht
General Sales Engineer, Thomas A. Edison, Inc., Primary Battery Division, Bloomfield, N. J.

THE following table, which has been prepared after careful consideration has been given to the questions of reliability, maintenance, simplicity and cost, shows that under what basic conditions we would recommend the various battery supply power systems for highway crossing signals. Because Edison primary cells furnish accurate, reliable and visible information regarding their condition, we favor their use wherever practicable. Where a lack of available housing space makes the use of primary cells impracticable, we recommend the use of the a-c. floating battery system.

R. D. Moore, assistant signal engineer of the Southern Pacific Lines writes: "Inasmuch as a straight alternating-current supply is subject to interruptions, we consider it to be unsafe and therefore do not use it. Our choice is storage battery on a-c. floating charge when a-c. is available. This system is ideal as it provides a constant voltage reserve supply at minimum cost. Practically all of our crossing signals are wig-wags that operate only on d-c. Therefore alternating-current with a primary battery standby scheme is not applicable. Straight primary battery is used at points where a-c. is not available for changing storage batteries."

What Type of Release at Automatic Interlockers?

"In your opinion is a manually-started clockwork time-release controlled by trains, the most desirable for automatic interlockings at railroad crossings? Why?"

An Automatic Release Increases Cost and Is Difficult to Maintain

By I. A. Uhr
Signal Engineer, St. Louis-San Francisco, Springfield, Mo.

I WOULD prefer a manually-started clockwork time release for an automatic interlocking plant at a railroad crossing. Neither the automatic nor the manual release has any judgment. The purpose of either, among other things, is at times to restore a signal from proceed to stop on one line, and after a predetermined interval to change a signal from stop to proceed on the opposing line. The automatic time release is apt to make this change at an inopportune time, because of lack of judgment, and because of the fact that it is automatic, it performs as intended, when the conditions are set up, regardless of the conditions at the time. The manual release does nothing until a man reaches the crossing and uses his judgment as to what should be

Comparative Data on Power Supply

Wig-Wag Automatic Highway Crossing Signals	Alternate Flashing Light Highway Crossing Signals
Straight Primary Battery System	
(a) In all cases where a-c. power is not available. When a-c. power becomes available, this system can be converted to the primary battery rectifier system without sacrificing any of the original investment.	(a) In all cases where a-c. power is not available. When a-c. power becomes available, this system can be converted to the a-c. primary battery system, without sacrificing any of the original investment.
(b) Where a-c. power and battery housing space is readily available, but where traffic is not heavy enough to warrant the additional initial cost of the primary battery rectifier system.	(b) Where a-c. power and battery housing space is readily available, but where traffic is not heavy enough to warrant the additional initial cost of the a-c. primary battery system.
Primary Battery Rectifier System	**A-C. Primary Battery System**
(a) Where a-c. power and housing space is readily available, and traffic heavy enough to justify its cost as compared to that of the straight primary battery operation.	(a) Where a-c. power and housing space is readily available and traffic heavy enough to justify its cost, as compared to that of straight primary battery operation.
A-C. Floating Storage Battery System	**A-C. Floating Storage Battery System**
(a) Where a-c. power is readily available, traffic is heavy enough to justify its cost, and housing space for the battery is a serious factor.	(a) Where a-c. power is readily available, traffic is heavy enough to justify its cost, and housing space for the battery is a serious factor.

done. Even though poor judgment is used, nothing worse can happen than what an automatic release is apt to do any time it operates.

No type of release should be required to operate so long as there is only one train within the clearing limits. When a second train approaches, the judgment of a leverman is particularly desirable, and in the absence of a leverman, the next agent available is a member of the train crew who should act in accordance with instructions. He can act through the medium of a clockwork time release and flagging equipment. He should remain at the crossing until his train reaches it, and if a trainman on the opposing line walks to the crossing the two can confer as to what should be done and which train should move first over the crossing. An automatic release increases the cost and introduces apparatus more difficult to maintain than the clockwork release.

Favors Manually-Started Clockwork Time Release

By J. H. Molloy

Office Engineer, Chicago, Rock Island & Pacific, Chicago

THE manually-started clockwork time release is more desirable than the automatic time release controlled by the approach of a train, for the following reasons: With an automatic time release, it is possible that a train, after having made a stop in the approach section, might start up, increasing its speed as it approached the home signal, and then, because the time interval had elapsed, have its clear signal change to a stop indication, causing the engineman to apply the brakes quickly to avoid overrunning the signal and on to the crossing.

The train on the opposing road which is approaching a stop signal receives a change from the stop to the clear indication and immediately prepares to accept the signal and move over the crossing. The signal for the latter train may change to stop again, if the first train should not be able to stop in advance of the signal. This method of operation appears objectionable in that it has the possibility of a change of indication in the face of a moving train.

With the manually-started clockwork release, or the push circuit controller, it is necessary for a trainman, of the last train entering the approach clearing section to proceed to the crossing in order to operate the release. He will then be put in position to observe whether the train on the opposing road is ready to accept its clear signal, or whether the train is moving. The release may then be operated if it is safe to do so, and after the time interval has elapsed, a clear signal indication will be displayed for the second train. This method of operation appears more desirable, in that there is no possibility of a clear signal being taken away from a train moving at considerable speed.

Only Time Will Tell Which Type of Release Is Best Suited to Automatic Interlockers

By Thos. S. Stevens

Signal Engineer System, Atchison, Topeka & Santa Fe, Topeka, Kan.

AUTOMATIC interlockings are so new that it seems impossible for any one to state definitely his opinion, based purely on analysis, about the value of the different types of releases which have been suggested and to some extent placed in service. There are certain things, however, which must be accepted as facts. A manually-started time release makes it possible for trainmen of one road to interfere with the operation of trains on the crossing road. Whenever signals have been cleared on one road and the passage of a train over the crossing is delayed it will aways be necessary for the trains on the other road to stop and operate the manually-started time release. If track circuit failures occur on the clearing section of one railroad it will be necessary for all trains on the other railroad to stop in order to operate the manually-started clockwork time release.

All of the above facts, which really are the doubtful things in connection with a manually-started clockwork time release, are taken care of by an automatic device, which has been criticized only because there seems to be a possibility that if the time interval runs out after the signals have been cleared, stop signals may be displayed after the proceed signals have been observed.

The primary purpose of any interlocking is to prevent as far as possible the stopping of trains at level crossings with a device which is reasonably safe. At one Santa Fe crossing under consideration the "Chief" is scheduled to arrive a few minutes ahead of a mixed train on the other railroad, which is the only regular train operated over that line. The mixed train does a great deal of switching. If the "Chief" was a few minutes late and the train on the other railroad on time, the "Chief" would have to stop to operate a manually-controlled release. It might still have to stop if an automatic time release is provided, but the chances would be reduced.

Various types of releases have been installed on the Santa Fe or are under consideration. One plant has no release; two will have automatic time releases. At others it is proposed to use manually-controlled releases. I do not believe anyone can definitely state as his opinion that either one of these is better than the other, until time has provided enough data which will permit of a true comparison based on actual operating results.

Rear-End Flagging

"To what extent has rear-end flagging been eliminated or modified in automatic signal territory?"

Rule 99 Modified on Northern Pacific

ON the Northern Pacific, Rule 99 is modified so that a flagman is not required to go back to protect his train, if he can see an automatic signal at danger at least one-half mile to the rear of his train. In commenting on this modification of the flagging rule, C. A. Christofferson, signal engineer of the Northern Pacific states, "I cannot say to what extent the modification is eliminating flagging. It is in force in semaphore signal territory, but it cannot be used in color-light signal territory because the back light is not visible a half-mile away in daylight. I am not aware that any road relies upon the back light of the color-light signal for the purpose of modifying the rear end-flagging rule. Our operating rules require that the flagman make sure that the signal is plainly seen to be at stop. In our electrically-lighted signals, the approach system is employed and on heavy grades it is frequently the practice to use a control section of not more than 1,000 ft. in advance of the signal. Hence, there has not been a very great elimination of rear-end flagging on this road, if all these factors are given consideration."

F. H. Bagley, signal engineer of the Seaboard Air Line, replies that, "It has not been considered advisable on the Seaboard Air Line to modify the rules with respect to rear-end flagging in automatic signal territory. Our practice still is to flag rear-end in