pany, 9 mechanisms on the Buffalo division n which we previously had had trouble from frost were sealed with car seals on February 15, 1915, and the numbers recorded. Before sealing, the mechanisms were thoroughly cleaned and oiled and all sliding contacts, including commutators, were carefully cleaned and adjusted. On April 9, 1915, these mechanisms were opened and inspected and found to be in such good condition that we determined on a more extended test during the following winter. During January, 1916, 29 mechanisms on the Buffalo division and the same number on the Middle division were sealed. Those on the Buffalo division were opened on March 1 and those on the Middle division on April 7. It had been necessary to open one of the signals under test on the Buffalo division and five on the Middle division; none of the cases of trouble were due to frost. We were now satisfied that: First, *frost troubles can be greatly reduced by keeping the mechanism cases closed,* and second, *that it is practical repeatedly to operate automatic signals for a period of months without inspection or repair.*

The following winter all the signal mechanisms on the road were sealed throughout the winter with such good results that the practice has since been followed with varying success, depending on the care used in cleaning, adjusting and oiling before the sealing was done. This is now our standard practice. Five years' experience has convinced us that a less number of failures occur while the mechanisms are sealed than when they are opened frequently.

Following is a statement showing the number of signals sealed, the length of time they were sealed and the number it was found necessary to open during each winter. It would be interesting to know whether others have had a similar experience:

Winter.	Div.	Total No. of mechanisms in service.	Date sealing of mechanisms was completed.	Date opening of mechanisms was completed.	Opened during winter account frost trouble only.	Total opened during winter.	Total No. of mechanisms sealed.
1914–1915	Roch.		None sealed				
	Buffalo	478	Feb. 15, 1915	Apr. 9, 1915	..	..	..
	M & Pgh.		None sealed		..	..	9
1915–1916	Roch.		None sealed		..	..	..
	Buffalo	478	Jan. 10, 1916	Mar. 1, 1916	..	..	..
	M. & Pgh.		Jan. 31, 1916	Apr. 7, 1916	..	1	29
			2nd half Nov. & 1st half Dec.	1st half Apr.	..	5	29
1916–1917	Roch.		1st half Dec.				
	Buffalo	478	Dec. 5, 1916	Apr. 20, 1917	4	5	..
	M. & Pgh.		2nd half Nov. & 1st half Dec.	2nd half Apr.	4	4	All
1917–1918	Roch.		1st half Nov.	2nd half Apr	8	11	..
	Buffalo	520	Feb. 2, 1918	Apr. 25, 1918	..	9	All
	M. & Pgh.		2nd half Nov.	2nd half Apr.	..	..	..
1918–1919	Roch.		Dec. 15, 1918	*1st half May	7	12	..
	Buffalo	536	Dec. 30, 1918	1st half Apr.	0	14	All
	M. & Pgh.		Nov. 30, 1918	Apr. 15 to May 5	3	10	..
1919–1920	Roch.		1st half Nov.	1st half Apr.	12	14	..
	Buffalo	538	2nd half Nov.	1st half Apr.	6	9	All
	M. & Pgh.		2nd half Nov.	1st half Apr.	6	16	..
1920–1921	Roch.		Nov. 13, 1920	Apr. 27, 1921	3	8	..
	Buffalo	538	Nov. 8, 1920	Apr. 30, 1921	5	11	All
	M. & Pgh.		†Nov. 20, 1920	Apr. 30, 1921	1	3	..

*Mechanisms all sealed last half of November; all opened between December 10 and 15 to see if there was any water in them, resealed same day. On January 6 they were nearly all opened account frost.

†Stambaugh Tunnel signals opened December 9, 1920, to replace H. C. armatures and resealed same day.

It was our former practice to inspect the apparatus twice each month and records are kept showing the date of each inspection. Since it became necessary to reduce forces the beginning of this year, inspections are made only once a month, giving a little more time to each inspection. It is found that reduced frequency of inspection has not lessened the efficiency of the signals or increased the number of interruptions, and it is probable that longer intervals between inspections would not result in a decreased efficiency. It has been our experience that more trouble has been caused than cured by frequent inspections.

The fact that signals operate satisfactorily throughout the winter without opening the mechanism cases show that they will go long periods without attention if the entire mechanisms are thoroughly inspected, cleaned, adjusted and repaired at the time of the inspection.

STOP *or* PROCEED vs. STOP *and* PROCEED

By A. H. Rudd

Chief Signal Engineer, Pennsylvania System, Philadelphia, Pa.

THE campaign to eliminate the unnecessary stopping of trains is on. The campaign to automatically stop trains is on. The pendulum swings to and fro. At first glance it would seem that the two movements represent diametrically opposed forces, tending to bring the pendulum to rest.

Nothing is so easily overlooked as the obvious. Perhaps the presentation of a few scrambled axioms may lead some card-index mind to arrange them in logical sequence and help the solution of the problems. At all events, a review of the development of signaling and the changing ideas as to its value and its functions may be of interest:

1. Travel by railroad is safer, in spite of its dangers, than almost any other method of locomotion.
2. If no trains moved, no trains could collide, but there would be no travel.
3. The danger element is introduced as soon as a train starts.
4. Having necessarily introduced this danger, it is obvious if all trains moved in the same direction at the same speed no collisions would result.
5. With a number of trains moving in the same direction, each stoy may endanger the movement. Therefore, unnecessary stops should be eliminated.
6. Signals were originally installed to indicate "stop" *and for no other purpose.*
7. Later, they were erected to give warning of danger ahead, or "Prepare to stop."
8. For years they were regarded as a luxury or a necessary evil.
9. Later they admittedly "safeguarded traffic," but it took years of work to convince "practical" old school railroad operating officials that signals could be used for *expediting* and *facilitating* traffic.
10. Even yet education along these lines is apparently necessary, and the publicity departments of the signal companies are advocating the installation of interlockings at grade crossings and junctions, and the shortening of blocks by providing automatic signals for the purpose, *not* of safeguarding traffic by *stopping* trains, but of *safeguarding, expediting and facilitating traffic by the elimination of unnecessary stops.*

A great many inventors, still clinging to the original conception as to the functions of signals, are attempting to develop devices whose sole function is to stop trains (in at least 50 per cent of their actions unnecessarily), while perhaps one-tenth of one per cent are working to *safeguard, expedite* and *facilitate* traffic.

Obviously, therefore, a device which will prevent excessive speed on curves, over crossovers and at other points where speed should be restricted, and which will, as a *last resort,* stop the train short of the danger point, a device which will only function when the engineman fails, leaving him free control while he does function, and permitting him to cut out the stop, but, in such event, to run only at slow speed, would, theoretically at least, not only safeguard but expedite traffic, and would supplement rather than nullify a signal system designed to keep trains moving.

Collisions resulting in fatalities rarely occur in terminals or in the congested districts; but they most frequently occur in the open where fast running for long distances is the rule. This is the field for speed control, but not for automatic stops, as such, which would not only cause acci-

dents but which would force us to violate the Esch-Cummins law, which requires that the roads should be economically and efficiently operated.

The progress of signaling has been so rapid that every signal engineer in the country, worthy of the name, knows where he can earn a big percentage on his investment (much of it, unfortunately, intangible earnings and savings) if he could fully equip his busy lines with modern signals and interlockings, and replace a large part of what he has in service, just as manufacturers replace their machinery with more efficient apparatus. It is doubtful if, under the present conditions, he can do much to hasten the advent of this signal millennium, but, instead of waiting with his hands folded he may be able to ameliorate existing conditions by assuming the role of the reformer and telling others what to do.

Several signal engineers, and even some practical operating men, firmly believe better and safer operation could and would be attained if the Stop-and-Proceed Signal were eliminated, substituting the signal provided in the A. R. A. Standard Code Rule No. 501-G, which does not require the stop. This is an operating matter and the signal engineers have no jurisdiction, but they may express their opinion.

The A. R. A. Standard Code (Automatic Block Signals), Rule 504, April 15, 1895, read: "When train is stopped by a block signal it may proceed when the signal is cleared or after waiting .... minutes, and then running under caution or preceded by a flagman to the next clear signal." This rule as revised April 25, 1900, reads: "* * * it may proceed when the signal is cleared, or: *A,* After waiting .... minutes and then running under caution; *B,* preceded by a flagman to the next clear signal," either being considered good practice, *B* being generally used on single track. The edition of February, 1911, Rule No. 504, reads: "When a train is stopped by a block signal, it may proceed when the signal is cleared; if not immediately cleared it may proceed; *A,* on single track preceded by a flagman to the next clear signal; *B,* on double track *at once* with caution."

The Standard Code, November 17, 1915, differentiates between the stop signal and the stop-and-proceed signal, and Rule 509 provides: "When a train is stopped by a stop-and-proceed signal, it may proceed—*A,* on single track ....; *B,* on two or more tracks at once, at slow speed, expecting to find a train in the block, broken rail, obstruction or switch not properly set."

The rules started out with a time interval. Then the absolute manual block system was introduced, spacing trains perhaps four or five miles apart. Next we installed automatic signals with shorter blocks and held trains .... minutes (on one road originally this time limit was five minutes, then cut to two, and later to one minute, and finally no time was required, simply to stop), and the Standard Code, as noted above, now provides a signal, Rule 501-G: "Proceed at slow speed prepared to stop short of train or obstruction." The name of the signal which eliminates the stop is: "Permissive signal." The requisites of installation are: "Block is occupied or switch is set to diverge." This indication is used on some roads to govern heavy tonnage trains on up grades, other trains being required to stop and proceed, although this aspect is different from the stop-and-proceed signal, and the anomalous condition exists of two aspects indicating *stop-and-proceed* for certain trains and one aspect indicating *stop-and-proceed* for some trains and *proceed* without stopping for other trains. On other roads this signal permits all trains to proceed without stopping. Many roads run freights "permissive with freights" in manual block territory, either by signal indication or by card or order, without stopping, and yet we cling to the antiquated *stop-and-proceed* signal with the idea that in some way it tends to safer operation.

Recently on a busy line where all automatic signals are either *stop* or *stop and proceed,* the proposition of an extension of automatic signals was discussed and objected to, because, while it would facilitate passenger traffic, the frequent additional stops required on account of the automatic signals (with shorter blocks) would tie up freight trains on up grades which were being safely moved under the manual permissive without stops. And the objection was good. "Cutting off his tail an inch at a time does not really make it any easier or better for the dog." Why not cut out the stop everywhere?

There are two component parts of Rule 509 (old Rule 504):

1st—The stop.

2d—The slow speed after stopping.

Advocates of the stop insist that the first part enforces the second and makes for better discipline. This may be the case on heavy up grades with heavy trains, which cannot get up speed for a long distance, if at all, after stopping, but this is just the condition under which, by the use of grade signals, the first requirement is eliminated. On lever track, a light train, and on descending grades, any train, can attain considerable speed after stopping, while passing through blocks 4,000 ft. or 5,000 ft. long or longer. Therefore, the second requirement must for safe operation be enforced independently of the first.

Some of us believe that the automatic block signal governing following movements should give *information* as to the occupancy or non-occupancy of the block, and when three-position or home and distant signals are used should also advise of the indication displayed by the next signal; the *Stop-and-Proceed* signals should be eliminated; and *Stop Signals* displayed *only where stops are required;* i. e., when protection is needed against opposing movements and at grade crossings, junctions and crossovers where side collisions might otherwise occur.

By eliminating stops which are unnecessary and are known by the enginemen to be unnecessary, we would strengthen the significance of the stop signal *as such.*

We now have signals which indicate in effect:

(a) Proceed at slow speed, prepared to stop short of train or obstruction. (b) Stop and then proceed at slow speed, prepared to stop short of train or obstruction. (c) Stop and stay till signal clears or specific authority is given to pass. The situation should be clarified.

Let us give the engineman the best information possible of conditions ahead, consistent with a system of signals whose indications he can instantly grasp, and tell him to stop only where necessary and when we say stop let us mean it always.

Let us eliminate *B* or add a few more variations, such as *"You may stop,"* "You *should* stop," "You *must* stop," and then wind up with that effulgence of splendor, that exuberance of verbiage, so dear to many, "Trains must *come* to a *full stop.*"

"Eggs, Fresh Eggs, Strictly Fresh Eggs." Let's have less eggs and all fresh. Less variations in stops and all real stops—Stop-and-Stay because it is *necessary.*

A careful unprejudiced study of the problem, undertaken with an open and active mind, will, we believe, by the unassailable logic of the situation, lead eventually to only one result.

The State Supreme Court of Minnesota, on July 22, held that the United States Railroad Administration is liable for damages resulting from a fire which started on the Great Northern tracks near Cloquet, Minn., and swept into that city in October, 1918, causing a loss of many hundred thousand dollars.