giving dryer steam. In this the Belpaire has the advantage. Considering these facts alone, and the fact that our railroads are going into water treatment, the increasing amount of alkali in the water and the tendency to foam, this fact alone should call for Belpaire boilers. In any waters the dryer steam and better engine performance come from the Belpaire. It is a little more expensive in first cost, and this is the only argument against it. The Belpaire is stronger and cheaper in the end, easier and cheaper to maintain, carries water better; in fact, all arguments are in favor of this type of boiler. M. E. WELLS.

Lincoln, Neb., February 18, 1905.

BLOCK SIGNALING ON SINGLE TRACK.

To the Editors:

In your issue of January 20, in commenting upon the letter signed by "A. B. C.," on "Effect on Traffic of Block Signaling a Single Track Railroad," you refer to the 300-mile installation of automatic electric signals on the Queen & Crescent.

It would be interesting to know of just what the automatic block signals on the Queen & Crescent consist, how the tracks and signals are arranged, what circuits are used, what the maintenance costs per signal per year, what the train rules are with respect to the signals, how the time card is arranged, how many trains are fast trains, the tonnage handled, etc. Much has been said from time to time about this installation, but little of it has been valuable as data because of its incompleteness.

At the meeting of the Railway Signal Association referred to by "A. B. C.," the single track block signal installation on the Queen & Crescent was discussed to a limited extent. Mr. Short made the statement that in the dispatching system, the "19" order was used almost exclusively, and that approximately one-half of the passing track switches coming within the territory block signaled was handled either by switch tenders or from interlocking towers.

When the business of a single-track line not block signaled has reached the point where it is impossible to move trains without serious delays, then it would appear to be a serious mistake to install automatic block signals with the idea that the number of train movements would be increased, unless some provision was made along with the signaling to relieve trains of stopping for orders and to move switches to get in and out of sidings.

It is easily understood how, on Mr. Short's road, with a well-arranged schedule, where the "19" order is used almost exclusively and passing track switches are interlocked, that 60 trains, and possibly 100 trains, are handled without delay during 24 hours. But on a busy single-track line, where the "31" order is predominant, the middle order plan is used and the passing track switches are handled by trainmen, it is hard to see where an installation of automatic block signals is going to help matters, unless some hocus pocus arrangement, as allowing train to pass stop signals at a speed of 10 miles an hour, is permitted.

Only those who have investigated the matter know what a complication of circuits and signals is necessary in order to provide proper head-on protection and at the same time minimize the delays to trains meeting at passing sidings. The situation is relieved somewhat where home signals only are used, but without distant signals fast trains become slow trains, for the speed is limited to the distance in which the signal can be plainly seen by the approaching train and a stop made should the signal be at stop.

If automatic block signals on single track are properly installed, operated under the right kind of rules, and their indications rigidly observed, then there is no question but that they afford the very best possible protection for trains.

The art of automatic block signaling has not yet reached that stage where a home signal can always be depended upon to mean either one of two things—stop or proceed—and as a consequence it is customary to cover this inherent weakness by rules which will permit a train to pass a stop signal after having complied with certain conditions.

On single track, where a signal indicates stop, the only apparent safe rule is for a train to wait a certain number of minutes and then, if the signal has not indicated proceed, follow a flagman at slow speed till the obstruction is met or until the next home signal which is in working order is reached.

If the road is a busy one and the traffic is irregular and as heavy in one direction as the other, the delays due to stop block signals at meeting points, and the fact that block signals on single track curtail the rights of trains, are going to be numerous. A.

Chicago, February 18, 1905.

WEAK TRACK AND DERAILMENTS.

To the Editors:

Although the causes to which train wrecks are attributed in newspaper reports often are far removed from the facts, nevertheless usually there is a substratum of truth to be found in a multiplicity of the same sort of occurrences, on the general principle that "where there's smoke, there's fire;" and during the present winter the conclusion is forced upon us that an uncommonly large number of derailments have been caused by broken or spreading rails. This is so, even if we admit that half the reported number really were due to broken flanges, loose wheels or bent axles. The facts, therefore, are sufficiently important to engage the serious consideration of railway engineers, whose particular function it is to design and maintain a structure, not only theoretically strong enough, but, under the circumstances, with a great additional factor of safety. That no such structure exists to-day for the use of American railway trains requires little demonstration beyond the statement of a few plain and elementary facts. We are dealing with a condition and not a theory.

The static effect of a fast train is of small value compared with the dynamic forces which are brought into play by its motion. Yet generous foundations for static loads, as in the case of heavy buildings and machinery, are always provided by the same engineers who are responsible for our railway tracks, while for such stresses as result from a concentrated load of 12 tons (in a recent instance, 15 tons), moving at a rate of 60 miles an hour in frequently changing directions, we pretend to be content with such a flimsy contraption as is found in the contemporary railway track of the United States. Here lies a great and unfathomable mystery: If a building fails, the causes are analyzed and the responsibility is easily placed; if a rail breaks or overturns and derails a train, it is classed, too often, with a shrug and a sigh, as an act of God. But, after a calm review of the facts, one is almost impelled to believe that the derailment was invited, and that the safe arrival of a fast train at the end of its journey can be ascribed only to the direct interposition of a special providence. We do not need a technical discussion on the insufficient balancing of locomotives or the improper chilling of car wheels, because enough derailments take place to prove a failure of the track where no discoverable defect can be found in the equipment after it has run several hundred feet along the ties.

In 1893 the heaviest wheel load was 11 tons; in 1904 it had increased to 15 tons—more than one-third—and the average wheel loads appear to have increased in even greater proportions. Scarcely a railway in the land is unaffected by these figures, and on most of them the strengthening of bridges has become an immediate necessity. But what has been done to strengthen the track? An increase of from 10 to 15 per cent in the weight of rails, and a slight but uncertain improvement in quality. Nothing has been done to strengthen the rail supports, because nothing can be done so long as they consist of crossties. Already they are placed as closely as good tamping permits, and no increase