

RAILROAD SIGNALS, How our Steel Monsters are Controlled

By Thomas W. Wilson

OF ALL features in the operation of a railroad none is so important as the system of signals, for to matter to what state of efficiency in other respects the railroad may be, the lives of the passengers and the safety to equipment, to say nothing of the freight, depend upon the proper operation of the signals.

For years the question of signals has been one of perplexity to the officials of every railroad in the country. It has been demonstrated, and with frightful emphasis, that the human element in the operation of signals has been the weakest link, and practically every accident has been due to the neglect or oversight on the part of the men in the signal towers scattered along the roads.

It is true that investigations following accidents have shown conclusively that the signal men have sometimes been subjected to too much strain by reason of long hours, and the same has been found in the case of engine drivers; but, nevertheless, this but brings to the fore that feeling that wherever there are men placed in positions of great responsibility there is a certain percentage of lapses resulting in catastrophes.

The great advances that have been made in the methods of applying electricity to every-day needs have been helpful to railroads, and the leading roads, the Baltimore and Ohio, Pennsylvania, Union Pacific and others, are now equipping their lines with an entirely new system of signaling of an electrical nature that gives promise of being more than 90 per cent. accurate and may prevent entirely that most awful of accidents—the rear-end collision.

The cost of installing the new system is prohibitive, but the cost of accidents, with the settlement of suits and the repairing of equipment, is also enormous, so that, after all, the expenditure is warranted.



Four-arm Interlocking Signal Tower, Most Government Main Track, Shorter Than the Branch Track on Left Clear and Other Blocked



Ordinary Signals used to Govern Straight Blocks and Signals Show Track, Shorter Than the Branch Track on Left Clear and Other Blocked



Signals on a Single Track System

Under a system that has prevailed for several years trains have been despatched one after another at intervals, according to a prearranged schedule, allowing so many minutes between successive trains. This is known as the time interval system. By another system trains are run so that one is allowed to pass a given point only when a preceding train has passed a certain other point a predetermined distance in advance. This is the space interval system, or, as commonly known, the block system.

When rigidly observed the block system is absolutely perfect in theory, but it is in the practice that there is the failure. One of the earliest methods of operating the block system was by telegraph, there being operators at each block signal who were constantly in communication with each other and who noted the passing of trains by their stations, setting their signals accordingly.

Accidents occurring as a result of negligence on the part of signal men caused the installation of the "block and block" system by which the blocks were controlled by electro-magnets with systems

extending over two blocks. Thus it required two operators to work in conjunction or the signals could not be set for a clear track.

Even this system has proved to be unsatisfactory on the large roads on which a fast passenger service is maintained, and now it is believed that a real automatic signal eliminating almost entirely the human element has been found. On the great steel highways between New York and Washington the Pennsylvania, Baltimore and Ohio and Reading roads, have equipped their lines with this new device, which is a most interesting as well as a novel system.

The signals themselves are somewhat different from the old type. They are light painted wooden arms attached to a framework in which are set three glasses of different colors—white, green and red—which show by night the position of the arm indicating "Proceed on schedule time," "Proceed cautiously" and "Stop." By day the arm itself indicates the situation by its position. Standing at right angle to the mast it is the "stop" sig-

nal. At 45 degrees it signifies caution and in a vertical position it shows a clear track.

The new system supersedes the old to the extent that it is virtually a three-block system, for when a train passes the arm goes to the right angle. When the train goes into the block beyond, the arm goes to 45 degrees, and only goes to the vertical position when the train is in the third block.

Probably the best feature of this system is that, unless the road is not only clear, but in practically good condition, the signals will remain at the "stop" position. For instance, if there is a broken rail, the electrical circuit is interrupted, and this will have its effect on the signal. Then, too, should a train be run into a siding and one of the cars left so that it is not clear of the main track, the electrical circuit is held just as though the whole train were on the main track.

Another feature, and one just as important as any of the others, is the device known as the "automatic stop," which is a little lever pivoted on the roadbed and so connected with the signal that when the latter is at "clear" it is depressed, but otherwise it projects above the track.

Attached to the air brake system on the train is a small valve located so as to be in the path of the lever. If, then, an engineer attempts to run past a danger signal, the lever strikes the valve and, automatically, the air brakes are applied and the train comes to a stop.

Another branch of the signal service is that known as the "interlocking," which is used where tracks cross or converge at grade. This is a method by which a number of switches and signals are operated from a central point by means of levers, and all are so connected-interlocked—that in their normal condition the "stop" signal is displayed to every track in every direction. This system is entirely manual, but the operator cannot give a clear track to any one train without locking up the system so that no other "proceed" signals can be shown, all signals remaining at nor-



Interior of Modern Signal Tower, Electrically Operated and Showing Main Control Signals

mal, or stop, until the train that gets the first right of way has passed into the next block.

Should an engineer disregard the "stop" signal and rush past, he would come to a rather sudden stop by leaving the rails, in addition to the displaying of mere signals, the interlocking system provides for the possibility of error on the part of an engine driver by setting a derailing switch by disconnecting the rails about 400 feet from where they emerge or cross the other tracks. This is a rather heroic alternative, but it is calculated that it is better to run the risk of smashing an engine and cars than to permit a sure accident, in which the damage would be far greater.

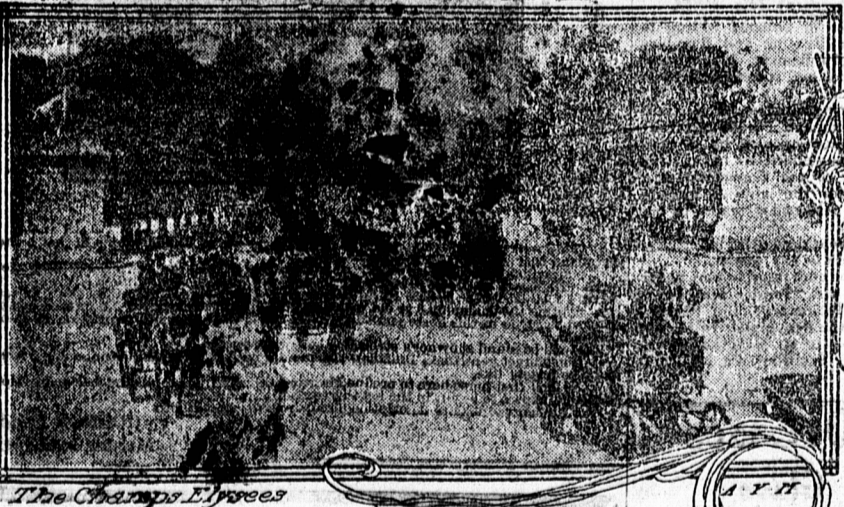
Off in the country, where passenger trains run at high speed, the interlocking system at crossings is absolutely necessary; but the average passenger as he whisks along sees but little of the controlling forces along the route. It is only when the train is approaching a terminal and where steel ribbons seemingly slide under and out from the car and the train wends its way along a most intricate pathway of twin rails, that he begins to take notice of the vast number of tracks interlaced, until the wonder is that the engineer, in charge of the train knows where he is going.

Approaching the new Union Station at Washington one finds a perfect maze of tracks together with crossovers that are of intricate design, making it possible to transfer trains from anyone of the dozen or more tracks to another. In order to govern the movements of the incoming and outgoing trains, as well as the movements of the yard engines that make up the train there is a most elaborate interlocking system and the man in the signal tower who has control of the many levers has a task of great responsibility to govern the network of rails.

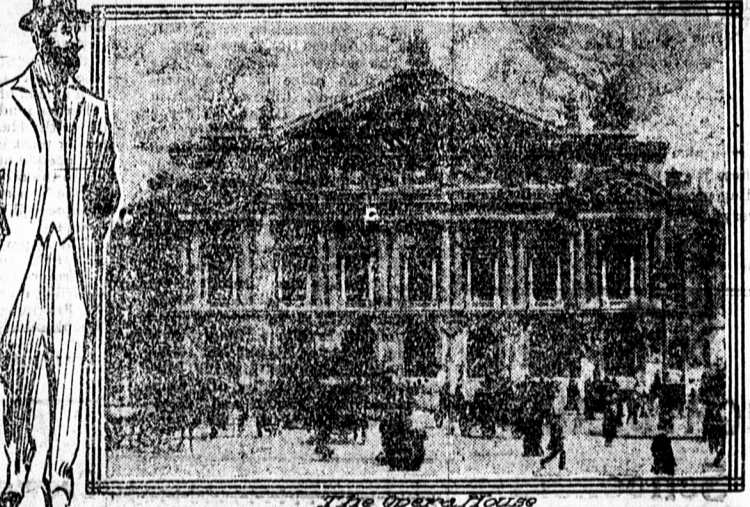
Owing to the number of tracks and the number of combinations, it can be made the crossovers switches it has been found necessary to provide for 42 separate signal arms. These are hung from a bridge spanning all of the tracks and each is capable of being displayed in three positions there are possible 126

BEAUTIFUL PARIS

By Della Australia



The Champs Elysees



The Opera House

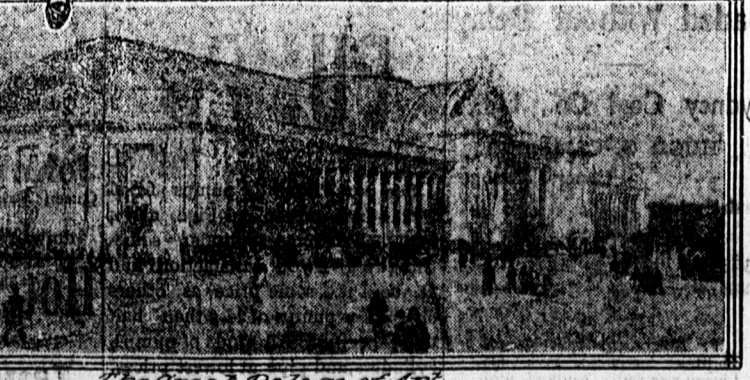


The Park of Monnaie

THERE is a beauty, a magic fascination about Paris. In no other city do physical charms and variety of interests blend in such perfect harmony. The cult of the French is beauty and this finds expression in the French capital. This, civic beauty is a natural development born through centuries. No city has been built only to be remodeled and built again as often as Paris.

The principal island in the Seine was the foundation of the French capital. Its soon became so crowded with people that other islands in the river had to be inhabited and the river was soon spanned by many bridges. One of the handiwork of the most attractive is the Pont Neuf, built in the reign of Henry III. It was in those days that the bridge was most gaily thronged. A well-known adage says: "After watching three days of a man has not crossed the bridge he must have left Paris."

Even more splendid was the palace built for St. Louis on the spot where the Palace of Justice now stands. All that remains of the castle is the famous double chapel. The tourists looking in admiration of the broad boulevards and magnificent open squares of Paris has little idea of the labor and money spent in remodeling and rebuilding to make the city attractive and beautiful. Hundreds of old buildings were condemned so that



The Great Palace of Art

landscapes and spacious structures might be reared. Millions of dollars have been spent in adorning large squares with fountains and statues, many of the loveliest and most dangerous parts have been changed into splendid parks. Though most of the French Kings' names are associated with the building of palaces and royal parks, such names as Napoleon III and Baron Haussmann are credited to much of the credit of having made Paris attractive and beautiful. All cities have some handsome streets, but none of them has such a continuous series of splendid boulevards. The most noteworthy are those extending from the Madeleine to the Bois de Boulogne. The work that Emperor Napoleon undertook related not so much to the inner Paris of the old-time bounds as to the great town that spread beyond the boulevard. Baron Haussmann held his post from 1833 to 1870, and during that time he created boulevards and avenues by the hundreds. He laid out great numbers of large areas, and open squares, parks and pleasure grounds, and created public buildings in all parts of Paris. Devotees of other European capitals have tried to force a comparison between the Champs Elysees in Paris and Unter den Linden in Berlin, but, however splendid the latter street is, it cannot be compared with the Parisian boulevard, with its broad avenues, allees, gar-

squares, adorned with statues and fountains. These squares were to enhance the beauty of the city and to act as points of safety should it be attacked from without or within. It was his efforts which secured the beautiful Place de la Concorde and the Champs Elysees, as it is known to-day.

Beyond the intrinsic beauty of the streets there is a picturesque awakened by the maze of victories and automobiles, thronging crowds moving to wards and seated before restaurants. "From all sides," as Zola says, "comes a sound and clinking of glasses and silver on the dinner tables, served in the sight of all. The air is soft and warm, filled with the perfume of Havana cigars and a penetrating odor of absinthe, mingled with the sweet fragrance of the flower stalls." The bridges, fountains and statues that adorn the city contribute much to the beauty of the streets. The islands are joined by a splendid network of bridges. Especially attractive is the Pont St. Michael. It is the principal bridge joining the island to the southern side. In the Place St. Michael is a famous fountain designed on a colossal scale. Under the niche in the center of a corinthian facade, is a bronze group of the Archangel crushing Satan. From the rock rises a sheet of water which pours down into five basins, flanked by two dragons spouting water into the lowermost cistern. This splendid square was designed by Jules Mansard.

In the middle once stood a figure of Louis XIV., but in its stead has been placed a column to commemorate the victories of the French Army in Germany. It is in imitation of the Pillar of Trajan, in Rome, and was built of stone, covered with leaves of bronze. Bronze where in public squares are placed statues erected to the memory of great heroes and victories. In the Avenue des Observatoire, half way between Observatoire and the Luxembourg Gardens, is certainly the handsomest fountain in the world. The eight prancing sea horses which guard the fountain breathe with life and action. The fountain is crowned by a group of Genii, representing the four quarters of the globe supporting the world. In the Place de Cléber is a beautiful statue erected to the memory of Marshal Moncey. The monument shows the Marshal defending the flag which France holds, while at the feet is a wounded soldier.

The many handsome buildings, galleries and museums contribute much to enhancing the city. A very attractive building the palace of the Legion of Honor. The principal entrance to the court is through a triumphal arch, supported on each side by a colonnade in the Ionic order. The apartments of Louis XIV. are remarkable for their elegance and simplicity of ornamentation. The Pont Neuf commands another of the magnificent view points in Paris. It is difficult to surpass the beauty and splendor