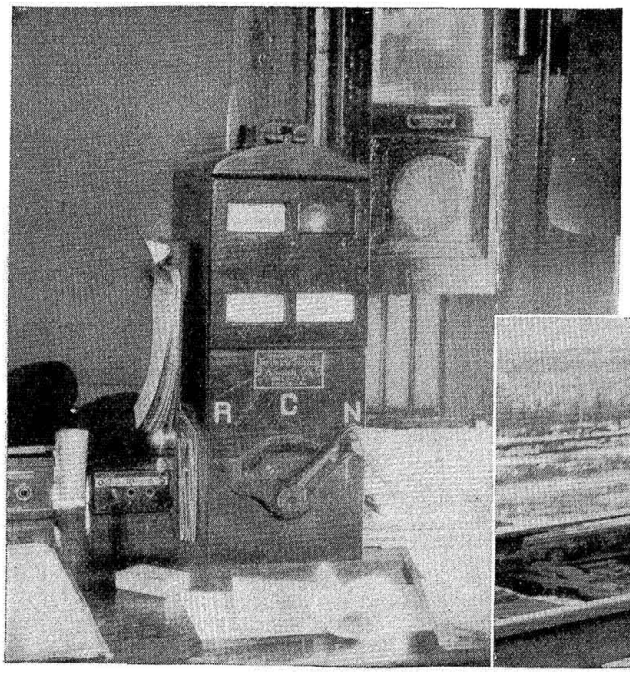
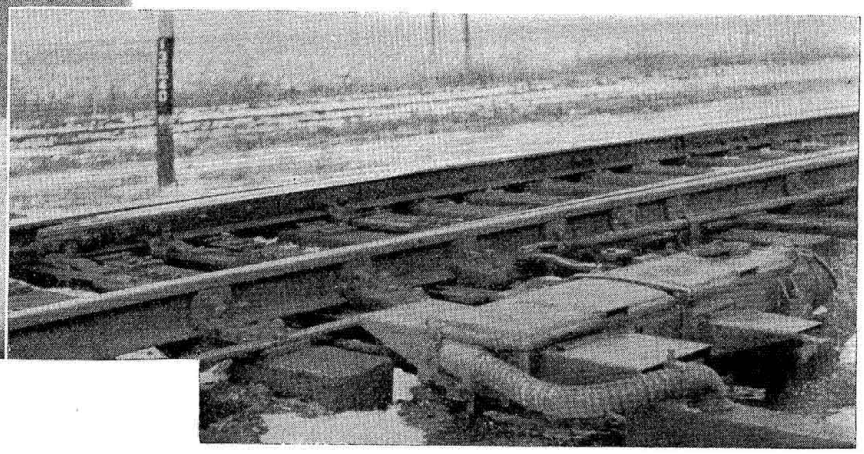
Big Four

Improves Operation

Principal passing tracks on equipped so as to stops at



Desk-lever machine at Gays



Typical power switch machine

By J. H. Westbay

Special Engineer to General Superintendent, Cleveland, Cincinnati, Chicago & St. Louis, Indianapolis, Ind.

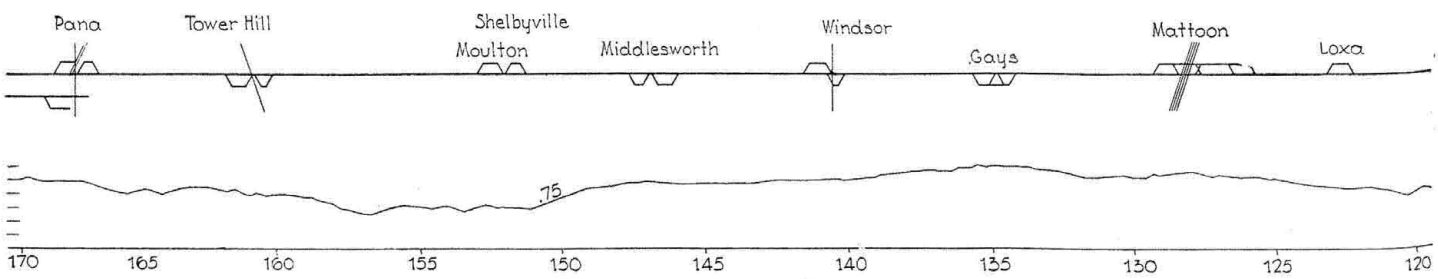
ON the 96 miles of single track extending between Terre Haute, Ind., and Pana, Ill., on the St. Louis division of the Cleveland, Cincinnati, Chicago & St. Louis, nearly all of the passing track switches are now operated either from interlocking plants or by remotely-controlled power-operated switch machines, so that the stopping of trains to handle switches is practically eliminated. Besides the distinct advantage of time-saving, the use of these switches also results in a reduction in wear and tear on equipment, and a saving of fuel.

The main line of the St. Louis division of the Big Four extends from Indianapolis, Ind., to East St. Louis, Ill., a distance of 248.7 miles. The line is double tracked from Indianapolis to Terre Haute, Ind., 71.6 miles, and from Pana, Ill., to E. St. Louis, 81.6 miles. The intervening section between Terre Haute and Pana, 95.5 miles, is single track except for 1.5 miles of double track through Mattoon, Ill. This 95.5 miles of single track is, therefore, the "neck of the bottle" for this division. Division headquarters are at Mattoon, 128 miles west of Indianapolis; Mattoon being the terminal for all crews in freight service and for engine crews in passenger service.

Between Terre Haute and Pana the line traverses a rolling prairie country. The ruling grade in the westward direction on the single track is encountered in the ascent from the Wabash River valley, a short distance west of Terre Haute, where a one per cent grade extends for a distance of about two miles, followed by a 0.77 per cent grade of approximately the same distance. Near the top of the one per cent grade is a reverse curve, each section of which is approximately three degrees. The remainder of the grade is on tangent track. The ruling grade in the eastward direction is 0.75 per cent, extending for about two miles east from Shelbyville, Ill., and on this grade are two curves, each of two degrees. The remainder of the single-track district is broken by short grades that offer no serious obstacle to train movements.

Traffic Handled on Fast Schedules

The operation of this section of single track is complicated by the preponderance in the number of passengers as compared with freight trains, both of

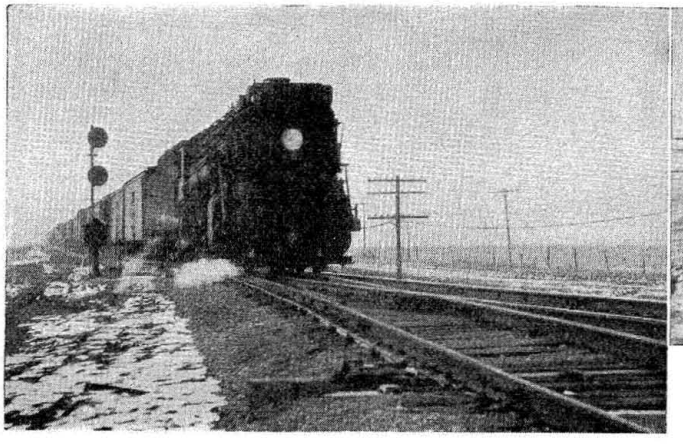


Track plan showing the location of the stations and the passing

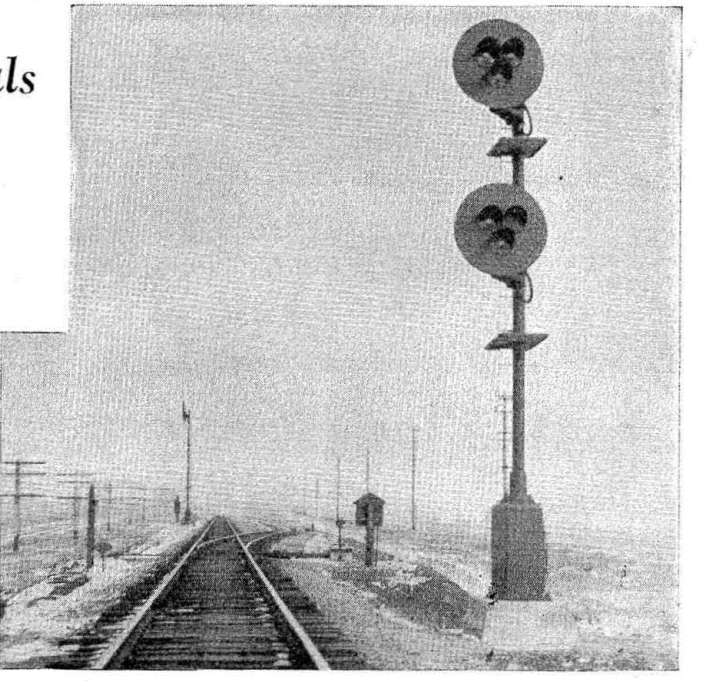
by Remote Control

of Switches and Signals

96 miles of single track eliminate train switches



Train heading in at west end of Gays



Signaling at typical siding

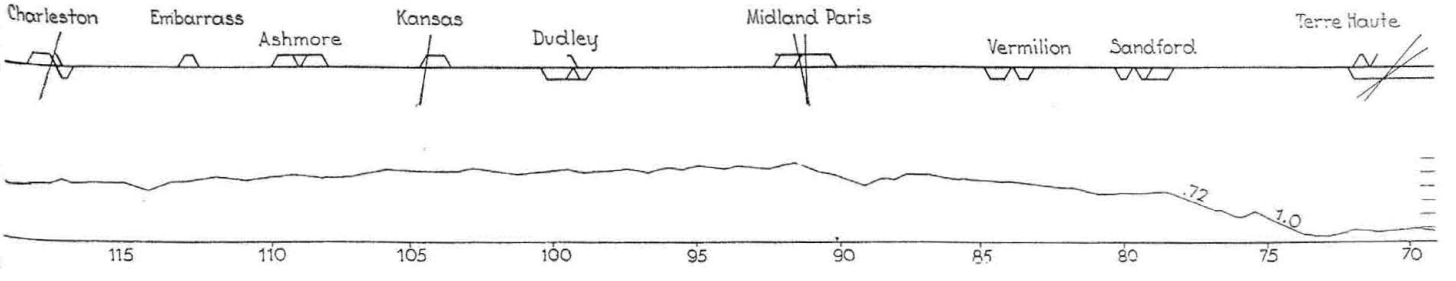
which are operated on high-speed schedules. Thirty scheduled trains are operated over this district daily; including nine passenger, five through freight and one local freight in each direction. In addition to these trains, extras are run whenever traffic warrants. With the exception of one local train daily in each direction, the passenger trains are operated on fast schedules with few stops. The freight traffic consists largely of merchandise, manufactured products, meats, livestock and agricultural products and is moved for the most part in trains which are run on fast schedules that do not permit the handling of the maximum tonnage. The preponderance of this traffic is eastbound.

Fast freight trains are hauled by heavy locomotives of the 4-8-2 type, and heavy 2-8-2 type engines are used on the other through freight trains. Pacific-type locomotives are regularly used on all except local passenger trains. The through passenger trains consist ordinarily of from 10 to 12 cars, but during periods of heavy travel they may consist of as many as 16 cars.

In this 96-mile territory between Terre Haute and Pana, other railroads cross the Big Four at grade at Midland (Paris), Kansas, Charleston, Karl (Mattoon), Windsor, Tower Hill and Pana. At each of these crossings, interlocking plants have been in service for years, and except at Karl, one end of a passing track was connected into and operated by each plant. Likewise at Sandford, Vermilion, Dudley, Ashmore, Gays, Middlesworth and Moulton small interlocking plants have been in service for years to handle one end of each passing track.

Automatic block signals operating on the A. P. B. principle were installed between Terre Haute and Pana in 1926. Coincident with this signal installation, an electric switch machine was installed at the west switch of the passing track at Charleston, the control being located in the tower at that point, and similar switch machines were provided for the two switches at the west ends of the two passing tracks at Tower Hill, with the control in the tower. These locations were chosen for the initial installation of remote control power switch machines, on account of the adverse grades encountered by trains entering or leaving these sidings.

The advantages afforded to train operation by the three remote control switches were at once apparent. For example, it was found that eastbound freight



tracks as well as the grades between Terre Haute and Pana

trains could be advanced from the end of the double track at Pana into the passing track at Tower Hill in about 10 min. less time than was required when the train had to be brought to a stop and the switch operated by hand. This fact made it possible frequently to advance a meeting point, and was of material assistance in shortening the average time it took freight trains to move over the division.

Increased Difficulties of Schedules

Since 1925, traffic on the St. Louis division of the Big Four has undergone a material change. During that year and the year following, coal tonnage produced in Indiana and Illinois fields decreased materially, and has never returned to its former volume. But as this decrease continued, there came a pronounced increase in higher class freight which had to be moved on relatively faster schedules, and this change in the character of the freight traffic brought with it a corresponding change in the character of freight trains on the St. Louis division. Where formerly the bulk of freight traffic moved in tonnage trains on relatively slow schedules, it is now moving in symbol trains on fast schedules and the efforts of the operating staff are directed to the maintaining of these schedules.

At the time of the change in character of freight traffic, there came a somewhat similar but far less pronounced change in the character of passenger traffic. The hard roads which parallel the division attracted away almost all of the local passenger and express traffic, leaving relatively little to be handled by rail. But while the line was losing its local business there was an increase in through passenger traffic, to meet the demands of this service, through service between St. Louis and New York was extended in 1925 and in 1927 there was a further extension of this service by the addition of another extra-fare train in each direction. This increase in passenger train movements naturally added to the problems in moving the traffic over the 96 miles of single track.

The benefits which had been realized from the use of the remote control switches at Charleston and Tower Hill, together with the need for speeding up the movement over the single track were responsible for a study to determine some means whereby traffic might be further expedited. Some consideration was given to the idea of using the centralized dispatcher-controlled system of this division, but in view of the fact that there are so many interlocking plants at railroad crossings where it would be necessary to maintain operators, it was decided to extend the use of remote control switches instead. Thereupon, 13 more passing track switches were equipped with remote-control switch machines, so installed that they could be controlled from existing block stations. The last of these was placed in service in May, 1928.

Train Movements Directed Locally by Signals

By means of annunciators located in block offices, the operators are advised of the approach of each train. They, in turn, notify the dispatcher immediately, and in the case of meets, he issues instructions to the operator that specify which train should take siding. The switches are then lined up accordingly. Thus, although train movements are governed in general by train orders, each individual meet is executed in accordance with local conditions which obtain at the moment and is directed largely by signal indication. By use of the remote-control switches, together with take-siding and starting signals, non-stop meets are everyday occurrences.

A Time-Distance Train Check

In order to determine the time saved to a tonnage train by the use of remote-control switches in heading into or out of a siding, a series of tests was made which showed that the train could be headed into a siding in from 4 min. 8 sec. to 6 min. 45 sec. sooner by the use of the switch machine than by manual switch operation. The time saved in heading out ranged from 6 min. 45 sec. to 9 min. The average time saved in heading in was 5 min. 36 sec. and in heading out was 7 min. 53 sec. These savings cannot be taken as a criterion for estimating the benefits to be derived from remote-control switch installations at every location. They apply only at the particular points where the tests were made. The grade over which the train moves while pulling into or away from the siding is the governing factor in determining the time that can be saved by a switch machine.

In order to arrive at the foregoing estimates of time saved, a check was made of the time consumed by a number of tonnage trains in heading into and out of sidings. The observations were made when the switch machines were used, and at the same points later by stopping the train before heading in or after heading out of the siding to simulate manual switch operation. A time-distance curve was made for each observation, the time noted being the time a given part of the train passed each permanent structure, such as a bridge, culvert, mile post, station, etc., which could be located accurately on the profile. When a train was to be headed into a siding these observations were plotted from about a mile before steam was shut off until the train was in the clear. And when a train was heading out, the observations were plotted from the instant the train started to move until normal speed was attained.

Table Showing Comparison of Train Operation

	Week Dec. 1927	Week Dec. 1928
No. of westbound passenger trains	64	65
No. of eastbound passenger trains	63	66
No. of through freight trains eastbound	36	43
Average time per through freight train from departure at Pana to arrival at Mattoon	2 hr. 14 min.	1 hr. 56 min.
Average gross tons per train	2,713	2,560
No. of through freight trains westbound	37	38
Average time per through freight train from departure at Mattoon to arrival at Pana	1 hr. 54 min.	1 hr. 48 min.
Average gross tons per train	1,656	1,751
No. of through freight trains on overtime—eastbound	16	12
No. of through freight trains on overtime—westbound	4	2
Average speed between Mattoon and Pana		
Through freight trains—eastbound	17.6 m.p.h.	20.3 m.p.h.
Through freight trains—westbound	20.7 m.p.h.	21.8 m.p.h.
Reduction in time per through freight train between Mattoon and Pana, (38.9 mi.)—eastbound	18 min.	
Reduction in time per through freight train between Mattoon and Pana, (38.9 mi.)—westbound	6 min.	
On the above basis the reduction in time per 100 miles run—eastbound	46 min.	
—westbound	15 min.	

In order to determine what further benefits were realized in every-day operation of the switch machines, a daily memorandum was maintained by the dispatchers for a period of approximately a week, showing the time saved to freight trains by the ability to use the remote control switches to advance through freight trains quickly from one siding to another, either preceding or following other trains. The daily average saving to these freight trains amounted to 53 min. between Terre Haute and Mat-

toon, and 58 min. between Mattoon and Pana. These savings reduced to 100 miles of line, would amount between Terre Haute and Mattoon to 1 hr. 35 min. per day, and between Mattoon and Pana to 2 hr. 29 min. per day. Again it must be borne in mind that these figures are not in any sense a criterion of what might be expected to result from any remote-control switch installation. The savings shown, obtain for this particular combination of grades adjacent to sidings, and for this particular volume and spacing of traffic.

Numerous Siding Movements

In order to show the number of trains using a siding, a study was made of the train operation for December, 1928, the section from Mattoon to Pana, 39 miles, being taken as a unit for comparison. During this month there were 287 eastbound and 297 westbound passenger trains, and 164 eastbound and 162 westbound through freight trains or a total of 912 trains in addition to the local freights. Twenty-one of the eastbound freight trains and 7 of the westbound freight trains were on overtime. The passing tracks were used, as shown in the table, a total of 423 times.

Number of Times Passing Tracks Were Used

	Gays	Windsor	Middles-worth	Moulton	Tower Hill	Total
Passenger	14	57	85	14	36	206
Freight	32	19	58	39	69	217
Total	46	76	143	53	105	423

An analysis of train sheets for any period will not reveal all of the advantages which result from the use of remote-control switches. However, such an analysis was made of all movements between Mattoon and Pana, 39 miles, during a week in December, 1927, and a corresponding week in December, 1928. The comparison of the operation is shown in the table.

Iowa Commission Summarizes Crossing Accident Statistics

By H. A. Franklin

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A SUMMARY of highway grade crossing accidents in the state of Iowa for the year 1928, discloses that there were 159 highway grade crossing accidents in which 72 persons were killed and 188 persons were injured. Seven of these accidents involved pedestrians, of which five were killed and two injured. This summary of accidents is taken from the monthly railroad reports which eliminate minor accidents and give only the class of accidents involving the death of a person, or an injury sufficient to incapacitate the injured person to such an extent that he cannot follow his customary vocation, for a period of more than one day.

In all cases reported, where protected crossings were involved, the apparatus protecting the crossing was in operation, but was not obeyed by the driver of the vehicle. The comparison throughout these reports nearly agrees with the national statistics for this class of accidents, in that the accidents occurring at crossings protected by flagmen exceed those of other classes. The national survey shows about the same number of accidents occurring at crossings protected by gates and automatic apparatus. These figures will gradually change and have changed in the last two or three years, owing to the fact that at a great number of crossings protected by gates and flagmen, this protection has or will be superseded with automatic apparatus.

It should be noted that 29 accidents occurred where automobile trucks were involved. This situation seems to have come about within the last year, and constitutes a considerable hazard to train operation. Some serious accidents have occurred where trains, after striking trucks, have been derailed, resulting in death or injury, besides a considerable damage to property and equipment of the railroad.

A brief statement, relating to the more important points, may tend to throw light as to where and when these accidents are occurring. The greater portion of accidents can be attributed to carelessness on the part of the driver of the vehicle. An intersection of a railway with a highway is a point of potential danger at any moment of the day, and should be considered as such by the operators of vehicles. Considerable is being done in Iowa to eliminate the more important grade crossings by straightening roads and separating grades. The primary roads are also well marked by approach and warning signs near the highway grade crossings. Both of these programs should be carried into the secondary road system. Where it is inadvisable to separate grades on the more important crossings, automatic apparatus should be installed. In a considerable number of accidents, automobiles run into the sides of trains. The number of such accidents is gradually increasing from year to year.

The total of highway grade crossing casualties in Iowa for the past nine years is shown in Table A. The accidents for the years 1924 to 1928 are summarized as to nature and local conditions at the crossing in Table B.

Table A—Casualties at Grade Crossings During the Nine-Year Period 1920-1928

Year	Killed	Injured
1920	60	160
1921	66	178
1922	50	190
1923	64	174
1924	46	152
1925	43	148
1926	62	149
1927	33	161
1928	72	188
	496	1,480

Table B—Summary of Accidents at Grade Crossings For the Years 1924 to 1928

		1924	1925	1926	1927	1928
(1)	Accidents which occurred during daylight	85	89	102	93	107
(2)	Accidents which occurred during hours of darkness	37	37	36	38	52
(3)	Accidents which occurred at protected crossings	19	9	20	18	23
(4)	Accidents occurring at unprotected crossings	103	117	118	113	131
(5)	Accidents where switch movements were involved	11	10	16	17	12
(6)	Accidents occurring where view was obstructed	18	19	29	27	35
(7)	Accidents occurring where automobile trucks were involved	....	....	....	....	29
(8)	Accidents occurring where vehicle ran into side of train	16	20	27	27	34