Electric Switch Lamp Lightin

In the never ending search to reduce operating expenses, railroads have found switch lamp lighting well worth investigating. Conversion from oil to electric lighting or new installations of electric switch lamps can produce returns on the investment ranging from a low of 5-10% to as high as 40-50%. These figures are just part of the information obtained from railroads in a Railway Signaling and Communications survey on the subject of switch lamp lighting. Answers were received from 11 representative railroads, that is, those with extensive experience in converting oil lamps to electric or installing new electric lamps on switches. Herewith are the results of the survey along with the questions asked:

How many electric switch lamp lighting installations do you have in service?

At yards: E-L— 8
L&N— 7
Union— 17
WP— 1
At terminals: L&N— 3
Line of road: E-L— 7
L&N— 5
CTC line of road: E-L— 3
L&N— 2

Four other railroads reported having electric switch lamp lighting installations at yards only, while one road indicated it also had such switch lighting along line of road. Two other railroads reported such installations at yards, terminals and along line of road. One of these two roads qualified the response by stating that the line of road installations were in CTC or APB territory.

How many of the above switch lamp installations are conversion from oil burning lamps to electric lamps?

At yards: E-L— 8
L&N— 5
Union— 1
At terminals: L&N— 3
Line of road: E-L— 3
L&N— 4
CTC line of road: E-L— 3
L&N— 1

Three railroads reported that installations at yards had been converted to electric lighting. Conversion from oil burning to electric switch lamps was reported by one railroad at terminals and along line of road in CTC and APB territory. Another railroad reported conversion projects at all three types of locations, namely yards, terminals and along line of road. And still another road converted oil to electric lamps on switches only at yards and along line of road. Western Pacific installed new electric lamps on switches at its Milpitas, Cal., yard.

Approximately how many electric switch lamps do you have in service?

At yards: C&O— 4,752
E-L— 759
LV— 550
L&N— 533
MP— 500
NYC— 200
PRR— 3,500
TP&W— 45
RDG— 415
Union— 563
WP— 46
At terminals: L&N— 151
MP— 1,100
NYC— 40
Line of road: E-L— 434
L&N— 102
NYC— 160
PRR— 500
CTC line of road: E-L— 41
L&N— 244
(also APB) MP— 500

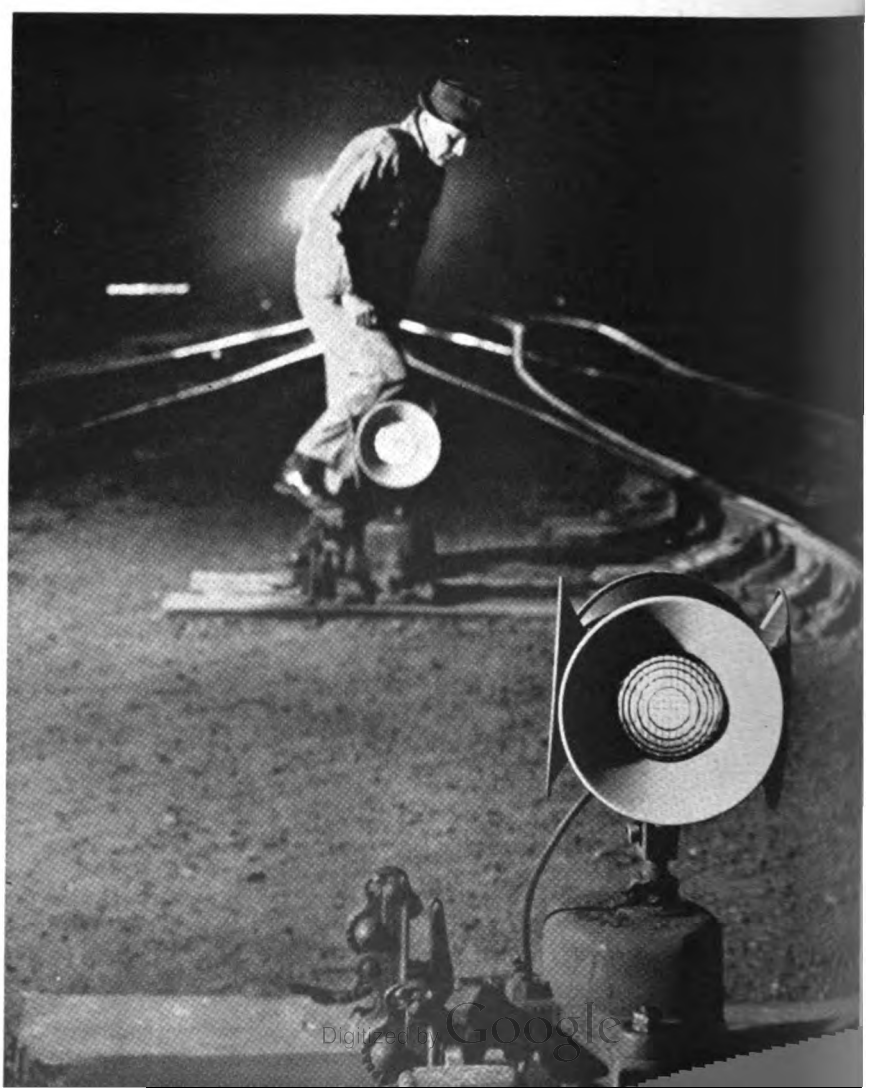
What power source have you used for electric switch lamp lighting installations?

All 11 railroads replying to the sur vey reported using battery power fo all or part of their switch lamp lightin installations. The roads are: Ches peake & Ohio; Erie-Lackawanna; L high Valley; Louisville & Nashvi (also uses AC); Missouri Pacific (2 and 2.6-volt battery, and 110 volts 10-volts AC); New York Central (al uses AC); Pennsylvania (also uses A and has an atomic lamp on trial Reading; Toledo, Peoria & Weste Union Railroad (78 lamps are on A and 485 operate off batteries); an Western Pacific.

When converting from oil to electri lighting did you convert to AC, ba tery or other power sources?

The answers to the previous questio also apply to this question, except th WP which did not convert but installe new electric switch lamps at its Mi pitas, Cal., yard.

If AC power is used for switch lam lighting, what voltage do you use fo distribution to each lamp and what i the voltage of each switch lamp? If lower lamp voltage is used than tha



elps Reduce Operating Expenses

distribution, what size transformer ised? Is there a transformer at each ip, and if not, how many lamps d off one transformer? Related to se questions on AC power is one: **iat size bulbs are used in your elec- switch lamps?**

Only five railroads reported using power for electric switch lamp ting. L&N distributes either 10 or)-volts AC to switch lamps, using bs operating off these voltages. Var- s size kva distribution transformers used with voltage ratings of either)/110 or 440/110 volts. Where 10- t lamps are installed, a transformer used with each lamp. The 10-volt ips are rated at 5 watts, and the)-volt lamps are rated at 10 watts. ? distributes 110-volts AC to each itch lamp. Each lamp is rated at 10 lts, .25 amp. At outlying locations, ransformer is used with each switch np, but in yards as many as 20 nps will feed off one transformer. here NYC uses AC for switch lamp hting, it distributes 112 volts which stepped down through a transformer at each switch to feed a 12-volt AC lamp. While the PRR distributes 110 or 220 volts AC and steps it down to 12 volts AC, 10 to 20 lamps are fed off one transformer. The PRR uses a 12-volt, 2.5 watt bulb for AC lighting. Union supplies 110-volts AC, which is stepped down through a transformer at each switch to feed the electric light bulb.

Where battery power is used for switch lamp lighting, what size and kind (type) of batteries are you using?

E-L listed four battery types used for switch lighting: Edison Carbonaire 2-S-J-1, Edison 500, National Carbon AC500, and National Carbon CG212. L&N, MP and Union also use the CG-212 and the 2-S-J-1. Five other roads listed the Edison Carbonaire as the battery used for switch lamp lighting: LV, NYC, RDG, TP&W and WP. C&O reported using a 2.5 volt primary air-depolarized 1,000-1,200 ah battery but did not specify the manufacturer. Similarly, the PRR reported using a 1,000 ah primary battery.

If using battery power for switch lamp lighting, do you have a battery for each lamp or for several lamps? What size light bulbs are being used?

All roads reported using a battery for each switch lamp. The most popular light bulb (six railroads reported using it) is rated at 2.9 volts, 0.15 amp. Two roads, the E-L and L&N, both use a 2.5 volt, 0.15-amp bulb and a 13.5-volt, 2.5-amp bulb. Union and MP favor a 3.5-volt, 0.12-amp light bulb, while the WP uses a frosted 2.7-volt, 0.15-amp lamp. Reading indicated that its light bulbs are inside frosted.

Are you using any device to turn electric switch lamps on or off?

Only positive answer was from the Union, which said it is using a photo cell. NYC and TP&W are testing photo cells for such use, but gave no results of such tests. LV reported that tests using photo cells showed them to be unsatisfactory.

With battery power, what type of battery box is used: wood, concrete, steel, plastic or other? Are glass or

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Economics of Electric Switch Lamp Lighting

	C&O	L&N	NYC	Union
1) Cost of installation:			(134 units)	
(a) Capital investment	$110,099	$ 6,002	$ 7,308	$23,000*
(b) Operating expenses	29,777	1,093	1,640	22,000
(c) Total	139,876	7,095	8,948	45,000
2) Gross saving per annum	68,136	7,232	—	25,000
3) Increased annual operating expenses	21,115	4,234	—	17,000
4) Net reduction in annual operating expenses	47,021	2,998	1,712	8,000
5) Deduction for interest charges	@ 6% 8,393	@— 270	@6% 438	@5% 2,250
6) Net saving per annum	38,628	2,278	1,274	5,750
7) Annual return over interest:	(6%)	(—)	(6%)	(5%)
(a) On capital investment	35.1%	45.4%	11%	25%
(b) On total cost	27.6%	38.4%	8%	13%

*Typical replacement for 450 kerosene switch lamps with battery-powered switch lamps.

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plastics lenses being used?

Steel battery boxes are used by nine railroads. Concrete and plastic are each used by four railroads. Some roads use several kinds of battery boxes. The PRR, for example, uses both wood and concrete boxes, while the E-L has battery boxes made of cast iron, concrete, plastic or steel.

All 11 railroads reported using glass lenses, and eight of these also are using plastic lenses as well. Of the plastic users, MP reports using some, and NYC and WP report having plastic lenses on a test or experimental basis.

Regarding the economics of switch lamp lighting, the survey asked each railroad to supply information concerning a typical installation. Nine roads supplied economic statements: (1) C&O, L&N, NYC and Union reported on installations covering several switch lamps; (2) E-L, LV, RDG and WP supplied information on the basis of an individual switch lamp installation; and (3) MP furnished data concerning the economics of 50 switch lamps lighted with either AC or battery. The accompanying tables give the details.

Western Pacific's economic statement concerns the installation of 46 electric switch lamps in a yard at Milpitas, Cal. Figures given here are on a per lamp basis. The cost to install an electric switch lamp is $86.21 compared to $22.40 to install an oil lamp. Actual cost to maintain and operate an oil lamp is $29.16, while the similar cost for an electric lamp is $15.62, producing a saving of $13.54 annually by using an electric switch lamp. A 15.7% return on gross investment is obtained by using an electric switch lamp. The return on the increased cost of an electric over an oil lamp is 21.2%. WP reported that during the first year of operation a careful record of the electric switch lamp installation was maintained. The 14 outages were all due to lamp failure. It was also necessary to replace a few lamp banners which were knocked off lamps at one or two points in the yard. Edison 2-S-J-1 primary batteries are used and replaced at a 10-month expected service life.

Although not included in the survey, two subjects have a definite bearing on electric switch lamp lighting and the extent to which its growth continues on the railroads. The two subjects are: (1) atomic switch lamps; and (2) reflectorized targets in [illegible] switch lamp lighting. Discussi[illegible] latter subject first, the widespre[illegible] of reflectorized materials for [illegible] signs, freight car markings, etc., created some interest among r[illegible] as to the possibility and advi[illegible] of using such material instead of [illegible] lamps to identify switch positions.

In its new Symington retarder [illegible] sification yard at Winnipeg, Man., Canadian National has employed [illegible] flectorized markers to show the d[illegible] tion in which a switch is lined in[illegible] of traditional switch lamps. The ta[illegible] (or markers) are diamond-shaped g[illegible] and yellow plates which rotate d[illegible] switch movement. These markers reported to be very effective d[illegible] night as well as during the day. course, the yard is extensively lig[illegible] with mecury vapor floodlights d[illegible] dusk and night hours.

Atomic switch lamps have f[illegible] rather limited use, and most [illegible] lamps are still in service on a test b[illegible] Pennsylvania installed nuclear-pow[illegible] lamps on two main track switche[illegible] 1959. Each lamp has two red and green lenses similar to the conventi[illegible] switch stand lamp. Behind the le[illegible] is a small glass bulb, about ¾"

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Economics of Electric Switch Lamp Lighting on a Unit Basis (Per Lamp)

	E-L*	LV	RDG
1) Cost of installation:			
(a) Capital investment	$100.00	$80.00	$74.66
(b) Operating expenses	4.00	5.00	6.54
(c) Total	104.00	85.00	81.20
2) Gross saving per annum	46.00	15.75	46.36
3) Increased annual operating expenses	34.00	—	—
4) Net reduction in annual operating expenses	12.00	15.75	46.36
5) Deduction for interest charges	@ 4½% 4.50	@ 4% .63	@ 4¼% 3.17
6) Net savings per annum	7.50	15.12	42.19
7) Annual return over interest	(4½%)	(4%)	(4¼%)
(a) On capital investment	7.5%	14%	56.5%
(b) On total cost	7.2%	13%	51.9%

*1958 prices per lamp, Hornell, N.Y. yard.

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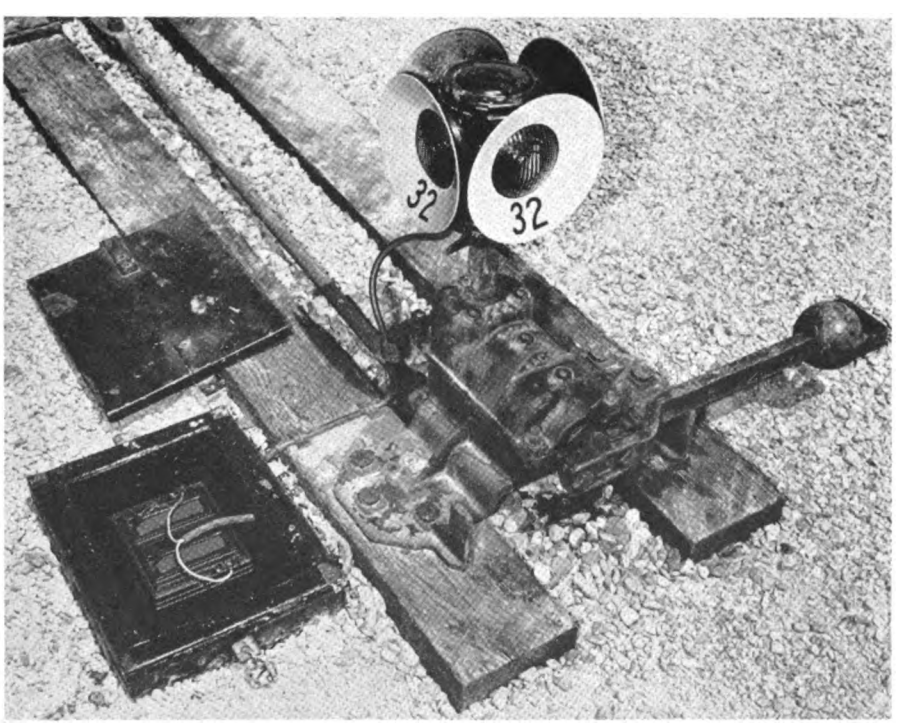
diameter which contains radioactive Krypton 85 gas, an isotope that is constantly giving off beta particles. The bulb is coated inside with a zinc sulphide phosphor and this glows as the beta particles strike it. The lamp is visible at night at a distance of 500 yards. The lamp will lose its intensity gradually over the years as the beta particles in the Krypton are dissipated, but it should be about 10 years before an appreciable difference takes place. Only maintenance required of the lamp, the railroad reports, is an occasional cleaning to remove dust from the lenses.

Until recently individual railroads were required to obtain a specific license from the U.S. Atomic Energy Commission for atomic switch lamps. However, U.S. Radium Corp., a manufacturer of nuclear-powered switch lamps using Krypton 85 gas, has obtained a general license (GL-124) authorizing the manufacture and distribution of these lamps so that individual railroad licenses are no longer required.

As for the radiation hazard, the U.S. Atomic Energy Commission reports that the atomic switch lamp could be used without endangering public health and safety. This determination is based upon design, low radiation levels from the equipment, the characteristics of Krypton 85 and the fact that the lamp is locked to the mount to prevent unauthorized removal. If such a lamp were destroyed by vandals, the AEC states, they would not receive any appreciable radiation exposure. Destruction of the equipment would release the gaseous Krypton to the atmosphere where it would be dispersed without harm.

Economics of Electric Switch Lamps on the Missouri Pacific

	AC	Battery
1) Cost of installation of 50 lamps:		
(a) Capital investment	$7,500	$4,000
(b) Operating expenses	850	85
(c) Total	8,350	4,85
2) Gross saving per annum	3,000	3,000
3) Increased annual operating expenses	1,150	2,000
4) Net reduction in annual operating expenses	1,850	1,000
5) Deduction for interest charges at 4½%	338	18
6) Net saving per annum	1,512	82
7) Annual return over 4½% interest:		
(a) On capital investment	20.2%	20.5%
(b) On total cost	18.1%	16.9%



New York Central has 50 atom switch lamps in service at its Robe R. Young automatic retarder classi cation yard at Elkhart, Ind., and re ports that these lamps are satisfactor

Briefly, this electric switch lam lighting survey indicated that the ma jority of such installations are in yard batteries as a power source are mos widely used, with roads preferring t use an air-depolarized cell for eac switch lamp. Only one railroad is usin an automatic device to turn lamps "on and "off". Such a device apparently worth more investigation as it would appear to contribute to longer batter life. Steel battery boxes and glass lense were preferred by survey respondents

In summary, here are the number o electric switch lamps in service on th railroads reporting in this survey: C&O —4,752; E-L—1,234; LV—550; L&N— 1,030; MP—2,100; NYC—400; PRR— 4,000; TP&W—45; RDG—415; Union— 563; and WP—46. These 11 railroads have a total of 15,135 electric switch lamps in service.

The accompanying tables with this article show that electric switch lamps are economical, and can bring about a return on their investment ranging from a low of 7% to a high of 56%.