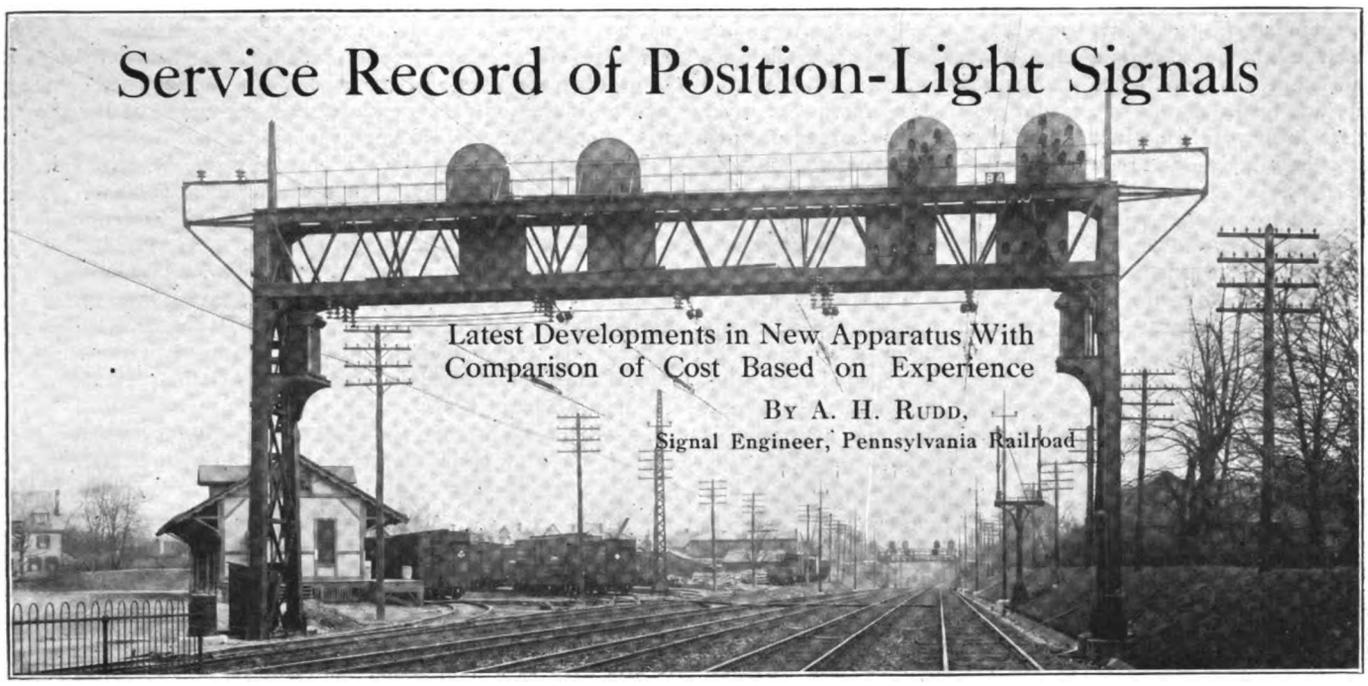
Service Record of Position-Light Signals



Latest Developments in New Apparatus With Comparison of Cost Based on Experience

By A. H. Rudd,
Signal Engineer, Pennsylvania Railroad

In the August and September, 1915, issues of *The Signal Engineer*, C. E. Goings, supervisor of signals, Pennsylvania Railroad, covered very fully the details of the position light signal installation between Broad Street Station, Philadelphia, Pa., and Paoli. Now that these signals have been in service for about fifteen months, a report of their performance will no doubt be of interest to many signal men.

Early in 1914, Dr. Churchill was developing lenses, etc., at the Corning Glass Works, and the Pennsylvania people at Paoli were building a set of wooden boxes for mounting the units. C. E. Goings had general supervision of this construction, with the co-operation of E. L. Watson, supervisor of signals, Philadelphia Division, and his assistant, H. H. Appleton. The Philadelphia Division men doing the experimental work were Wm. Daum, foreman; A. H. Wickenhiser, assistant foreman; Henry Shindle and J. E. Gray, signal fitters, and J. A. G. McAllister, maintainer.

The first signals were put in service between Overbrook and Bryn Mawr, Pa., on February 14, 1915, and the first patent was issued March 14, 1916. A number of applications are on file in the Patent Office, pending adjudication. As several had a share in the invention of various parts, it was early considered advisable to pool the patents and applications, and the Union Switch & Signal Co., the General Railway Signal Co., the Federal Signal Co. and the Hall Switch & Signal Co. were given licenses under them in the order named. The Union and General companies are now filling orders for these signals and it is understood that the other companies are about to prepare to furnish them, so that wide competition is provided.

DEVELOPMENT.

The experimental signals were crude wooden affairs. The present signals consist of a grid or spider clamped to an upright; from this spider radiate arms of steel tubing to which in turn the units are clamped. A junction box is located back of the grid and the wires lead through the tubes to the units. The background of sheet steel is fastened back of the lamps. In the latest design, the "background" is really a "foreground," the units extending through it for a short distance making everything easier of access. While the development of these features was interesting, and, of course, required good engineering, the greater number of novel features were comprised in the units themselves and their combination into signals.

The first lamps used had a very narrow filament, and were shimmed up with pasteboard. It was found that, after a damp day or night, the lights were all out of focus on account of the pasteboard absorbing moisture and swelling. This showed what a little variation would do. The filament had to be at the exact focal point or the effect was destroyed.

The lamp manufacturers would not guarantee that the distance between base of lamp and filament would be uniform in all lamps; a variation of at least ¼ in. must be allowed for. Further, the axis of the filament must always be parallel with the lens. Therefore, screw sockets were barred, bayonet type being adopted. A slotted brass collar was provided, to be slipped up over the base of the lamp and soldered in place in a jig furnished with a telescopic sight when the filament centered with the cross hairs of the telescope. The collar was also grooved so it could be placed in the socket, slightly turned and locked in place. The lamp finally adopted has a filament with coils of larger diameter than the original. Even with these, much trouble was experienced on account of the filament anchors not holding properly, the resultant sag making refocusing necessary. This defect has recently been remedied, and it is believed these troubles are over.

After the high signals had been ordered and were well under way, the development of the dwarf signal was started. This obviously could not be provided with hoods of any size and, in trying it out, the sun glare was first encountered. Then, by experimenting with the high signals at different angles, it was finally caught so strong that all three positions appeared lighted at the same time. In the first experiments, the signals had been watched at sunrise and sunset, but it happened that this result had never been secured, as it appears to be possible only during periods of two or three weeks twice a year on signals facing east or west when the sun, on its journey north or south, shines directly into the center of the lens. Signals facing north or south are never affected.

Mr. Goings, after several weeks' experimenting, finally took care of the dwarf by the use of chiffon and a frosted cover glass, but this required a 12 or 16 cp. lamp, and at that the signal was short range, that is, 1,200 or 1,500 ft. It was too late, however, to change the arrangements for the high signals. Within ten days after the first lot was put in service a westbound signal caught the glare at sunrise and enginemen could not tell which row was illuminated, all lights on the signal appearing bright. By the middle of April, as the sun climbed north, the trouble had spread.

The first change was to a more convex cover glass with a frosted tip. This helped the indication at a distance but the close indication was "all lit up," that is, a streak of light showed from the center to the bottom of the glass. This portion was

frosted and the trouble was cured, but the light from the lamp itself would not penetrate through the frosting and the close indication was dead. The present design, a cone with frosted tip, was finally developed and did the trick as far as the cover glass itself was concerned. But it was then learned for the first time that no one had known what had been going on back of the cover glass. At last Dr. Churchill removed the lamp and the trouble was reduced; he raised the reflector and it became still less and finally, by painting the steps in the lower-quadrant of the lens, it nearly disappeared.

In the early experiments lunar white, plain glass and no-glare had been tried in the cover glass and the latter shade finally adopted. It is very distinctive and has the great advantage of cutting out the blue rays and enabling the remainder to penetrate a fog better than any other color. Incidentally, the conical shape clears itself of snow in storms when the flat roundels are plastered over. Dr. Churchill's experiments resulted finally in a lamp with a spherical instead of a pear-shaped bulb and with the filament above the center of curvature of the bulb. The design of reflector has not been changed since the early stages, but its means of adjustment have been altered. It must be placed so far above the bulb that no direct sun rays will strike it.

The first signal was mounted about 25 ft. above the rail. At 175 ft. the light disappeared. Dr. Churchill and Mr. Pascucci first developed what might be described as a tauric bi-focal inverted lens, that is, the lens is distorted, so that the lower quarter deflects the rays downward; afterward he further modified the bullseye portion so as to deflect downward more rays caught from the reflector. This was particularly necessary as the signal bridges in the electric zone are about 29 ft. in the clear and the top light of the vertical row is over 40 ft. above the track. The effect is practically three zones of light; first at a distance of a mile or more up to 200 or 300 ft. the direct rays; second, overlapping these and to within 40 or 50 ft. of the signal the rays deflected down through the lower quarter of the lens, and third, and overlapping the second, the image in the mirror deflected through the bullseye. The reason for painting the steps of the lens black is that some sun rays striking them were reflected up into the mirror and from there back through the lens, giving a close indication when none should be displayed. On curves the same type of lens with the spread-light feature added is installed with very good results.

The signals were installed with three changes of voltage, 11, 6 and 3, for daylight, twilight and dark. It was later found that only two are necessary, 11 and 6, and in fogs at night the 11 volts is used with satisfaction. Cutting the voltage not only makes the signal more distinctive, but protects the engineman's eyes where signals are passed every 30 or 40 seconds. Recent installations at outlying points have shown that a 12-volt lamp, burning day and night at 10 volts, has a range of 3,000 ft. or more by day and is not hard on the eyes at night provided, of course, the signals are located a mile or two apart.

The first signal had five lights in a row, on 12-in. centers, giving the appearance of a 5-ft. signal arm. It was found that four lights, on 18-in. centers, give much better results.

THE ADOPTED ASPECTS.

The installation from Overbrook to Paoli had two rows of lights burning continuously, with the two (diagonal or vertical) low-speed lamps at interlockings displayed, in addition to the two rows horizontal, when they might be passed at low speed, the principle being that at least two rows of lights must be displayed and that one row extinguished constituted an imperfectly displayed signal. It was not considered imperfectly displayed if enough lights were burning to determine the angle of the row. Obviously if it were arranged otherwise, and the top row should be horizontal and the bottom row vertical, and the top row was extinguished, the train would receive one row vertical, that is, a clear signal, when it should receive a medium-speed signal. The scheme has since been simplified, without introducing any dangerous feature, by the simple expedient of inserting a low-resistance relay in series with the top row of lights and controlling the circuit of the second row through its contacts, so that, if the top row is extinguished, the circuit of the second row is opened and it will not light up.

The simplified scheme, as adopted by the Pennsylvania, is shown in the illustration. While there are 26 numbers, it will be seen that indications and aspects 1, 12 and 20 are identical as are 2, 14, 17 and 22; 3, 18 and 25; 4, 15, 19, 21 and 24. Aspects 13 and 23 are identical and in the revised rules will doubtless have the same indication, i. e., that shown under 13, as the action required of the engineman is the same. Only 15 aspects are needed therefore to cover scheme 3 of the Railway Signal Association with its various combinations as shown in the new Standard Code.

It will be noted that aspect 13 may be displayed, when required, on interlocking signals, thus adding three aspects to that type or a total of 14, including dwarfs. The only additional ones, after cutting out duplications, are the Stop-and-Proceed, No. 16, and Take-Siding, No. 26, making the total number of aspects and indications 15, plus the take-siding indicator.

Aspect 16 may be changed at will to aspect 12, that is, a Stop-and-Proceed may be changed to Stop-and-Stay and vice versa and always on the safe side. When an automatic signal is also used as a hold signal for train orders or similar cause, the operator, on throwing his office switch to set the signal, opens the circuit of the single fixed light (which is the mark of a Proceed-after-Stopping signal) and, when he throws his switch back to clear the signal, it automatically becomes an automatic signal. This serves to show the flexibility of the new system. The Pennsylvania is about to install some of these and is also ordering one of the take-siding indicators, which will be mounted on a mast by itself; the lamps will be on 12-in. centers, the background 3 ft. square, and it will be lighted up only when in use.

It will be noted that the backgrounds appear unduly large. As a matter of fact, the second and third rows will have their own backgrounds of various shapes depending on the number of positions displayed, thus reducing the wind pressure on the structure. Of course, the ideal height for these signals is on a line with the engineer's eye, and the lower they are kept the better the signal and the less the effect of wind pressure. The fixed light in aspect No. 16 is mounted in front of the mast, and, as only one horizontal row is ever displayed, except on the interlocking signal, it is being arranged to use a short mast, R. S. A. standard. The ground masts for interlocking signals may have to be of a little larger diameter.

On December 12, 1915, two signals were placed in service protecting a single-track tunnel. These are lighted up by the approaching train. For a period of four months no adjustments or repairs were made; there was neither a failure of any kind nor a lamp renewal. The caustic soda batteries were in first-class shape, the plates showing practically no signs of wear and there was only a slight sediment in the bottom of the jar. The maintenance consists of inspection trips which, on account of the distance from headquarters, consume three hours each. Several trips were made in January; two in February and two in March, at a cost in the latter two months of 80 cents per signal per month. It would appear that, as far as the signals and battery are concerned, an inspection once in three months would be sufficient, switch circuit controllers and other similar apparatus possibly requiring more frequent inspection. The first and only failure so far occurred on April 26. Trackmen dragged cinders over the track and caused a short circuit resulting in one signal showing stop when it should have been clear and the other remaining lighted for about three hours, when the normal time which these signals are lighted is one hour in twenty-four.

RESULTS.

A year's experience with the new signals leads to the following conclusions:

First—Safety has been promoted by eliminating colors; by providing sufficient lights so that, if one or two are extinguished, the indication may still be given; and, by doing away with all moving parts except the control relays, so the chance of false clear or misread signals is reduced to the minimum.

Second—Records of actual performance show that the number of failures of all kinds has been greatly reduced, insuring greater accuracy of information and less delays to train movement.

Third—A poll of 254 enginemen on the Philadelphia Division of the Pennsylvania shows them to be practically unanimous in the opinion that these signals can be seen better in fog, at night and generally in snowstorms than any system on the road. Several ask for their universal adoption and 235 prefer them at all times while 19 prefer semaphores. The close indication (within 150 ft. of the signal) is better than that of the semaphore at night, and as good in the daytime as the semaphore is at night.

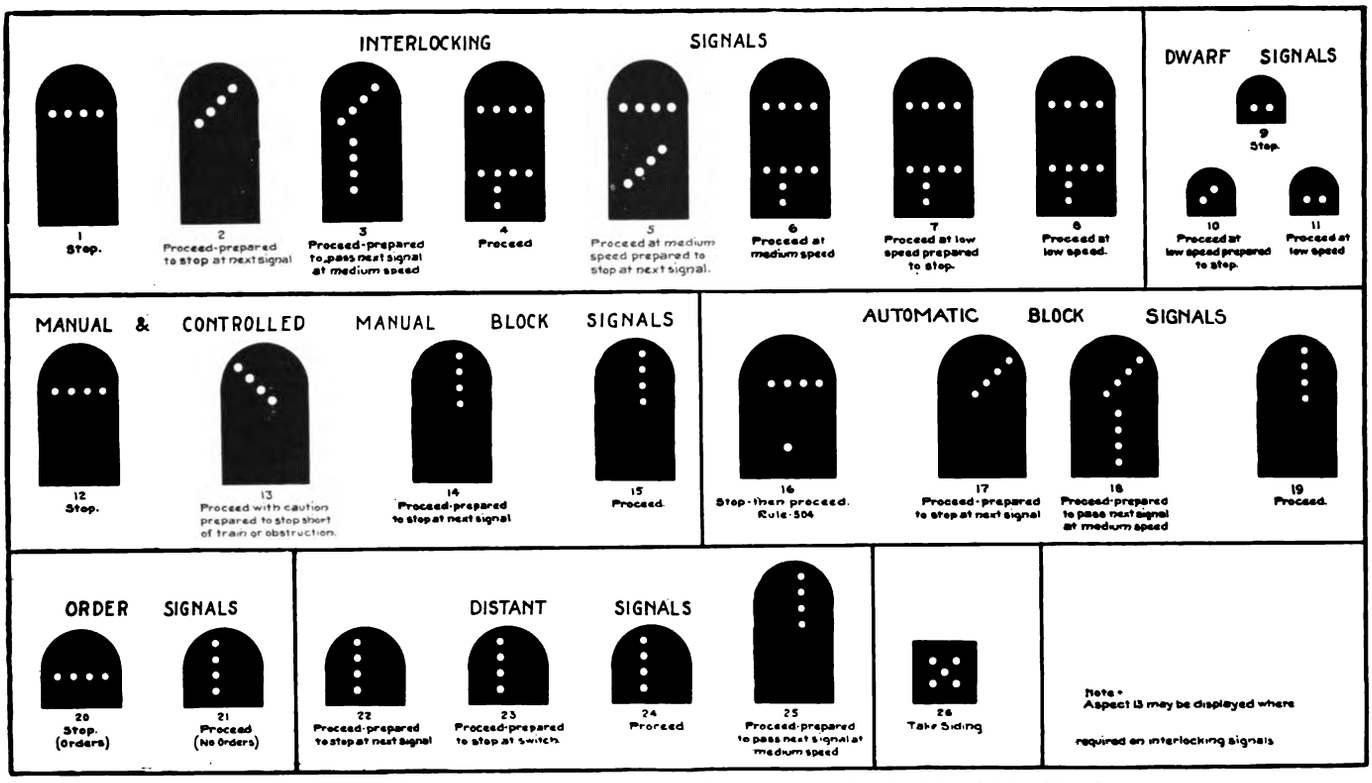
Fourth—Where semaphores are used, the indication is given by position in daylight, by color at night and by both in morning and evening, that is, the system of indications changes twice daily. Colored light signals uniformly give the indication by color only; position-light signals by position only; thus, with these two latter classes of signals, the system is uniform.

Fifth—Because the lamps can be lighted or extinguished at will, the number of aspects is reduced to a minimum.

Sixth—The disc signal is displayed or withdrawn, thus any one signal can give but two indications. The colored light signal may be made to display as many indications as there are colors available. Three indications are all that have been so far attempted. The semaphore is limited to three, viz., horizontal, diagonal and vertical, in one quadrant, because of difficulties of counterweighting and the inability to move an arm from the lower to the upper quadrant without having it momentarily show horizontal (stop). These difficulties are not present in the position-light signal. Therefore, four aspects may be displayed if desired; thus, as noted above, reducing the number of aspects and, in many cases, saving the installation of advance and other signals required (through the limitations of the semaphore) to give the necessary information.

Seventh—The cost of lighting these signals continuously from a primary battery is prohibitive. On single and double track lines of light traffic, however, they can be arranged to light up on the approach of a train and be extinguished as the rear of the train passes. Where the approach circuit is occupied for a considerable time, the main battery consumption is too great. Where power from a central plant is available, as where alternating-current track circuits are installed, these signals have every advantage. They are particularly available for distant switch and block signals on single and double track branches.

Eighth—They are cheaper in first cost. The signal installation from Overbrook to Paoli cost approximately $355,000 exclusive of the new track bonding needed for the electrification. This amount includes power-house charges, putting wires underground, impedance bonds, resonant shunts, one-third of the duct line and an assigned share of the heavy anchor bridges. On steam roads, with the polarized system, no control wires are needed, except for the third-block indication; in electrified territory all positions of the signal are line-controlled. The figures also cover the substitution of an electric for the electro-pneumatic machine at Bryn Mawr and remodeling one at Paoli. All this expense would have been necessary regardless of the type of signal used. By the use of three-block indications the signals were not only respaced to the best advantage, but 90 automatic signals now do the work of 110 formerly used, thus reducing the maintenance.



The Pennsylvania Standard Aspects and Indications Using Position-Light Signals.

Detail figures carefully kept show that a typical four-track automatic signal bridge, with signals and all fittings complete and including track circuits costs in place $10,071.22

While, if motor signals (the least expensive semaphore available) had been used, it would have cost..... 10,633.07

Saving per bridge.....	$ 561.85
Per signal	140.46
For 90 signals.....	12,641.40

Some of the bridges have only two signals each, but it is safe to say that $12,000 was saved by the use of position-light signals. Further, voltage-changing relays costing $85.00 were used

in order to get three voltages. As it has been found that two changes are sufficient, on the Chestnut Hill installation relays costing less than $50.00 will be used. Had this been done between Overbrook and Paoli, another $1,000 would have been saved. The new standard aspects described above would have eliminated 300 or more lamps and other fittings totaling $4,500 more. These lamps will eventually be removed and used elsewhere at the expense of the labor of removing. In short, had the system been developed to its present status 18 months ago, $17,500 would represent the difference between the position-light and the motor signals, or practically $1,100 per mile.

The prices for these signals were, of necessity, based on estimates, as no signals had been previously manufactured. Recent revisions of these costs, based on present conditions of the material and labor market, show very decided increases. Motor signals are made in large quantities. The demand for position-light signals to date does not justify their being made up in advance of actual orders, so that the costs must be based on small lots and be proportionately higher than if manufactured in quantities. The above figures are, for this reason, furnished as information regarding the actual results accomplished in this particular installation and not as a basis for future work. The initial cost must be based on prices furnished by the signal companies for each particular installation. These should be somewhat less than prices for motor signals and, if the market for the position-light signals warrants their manufacture in quantities, their cost will naturally be reduced for that reason and on account of competition. For distant-switch signals lighted by approaching trains, no voltage change is necessary, but a preliminary track circuit for lighting the signal is required.

Ninth—The cost of maintenance and operation is also less. There are four principal items in these costs for position-light signals: Cost of current, cost of lamp renewals, cost of inspection and maintenance, and cost of miscellaneous repairs.

As to the cost of current, tests show the following values per year:

Position-light signals, three-block indications	473 kw. hr.
A. c. motor signals, three-block indications	368 kw. hr.
Position-light signals, two-block indications	298 kw. hr.
A. c. motor signals, two-block indications	280 kw. hr.
A. c. track circuits, steam, three-block indications	657 kw. hr.
A. c. track circuits, steam, two-block indications	322 kw. hr.

For example, with two-block indications on a steam road, the track circuits would require the same amount of current and position-light signals would take 18 kw. hr. per annum more than motor signals. At 1 cent per kw. hr. this would mean 18 cents per year, and at 10 cents per kw. hr., $1.80 per year.

The cost of lamp renewals will vary considerably. A bad lot will run up the cost, of course, and a good lot will cut it down. During the past three months, the following renewals have been made on high signals between Overbrook and Paoli: December, 172; January, 127; February, 237; total, 536; average, 179 per month. There are 1,882 lamps in service. Each high signal has two rows of four each, or eight lamps *constantly* burning (in one position or another). Each dwarf has two lamps burning. In addition, the low-speed lamps are lighted for a few minutes each day when used. They are not taken into account here. With 88 automatic and 22 interlocking signals, a total of 110, there are 880 lamps constantly burning. The average life of lamps, therefore, is 880 divided by 179 or 4.9 months. This means 2.45 renewals per lamp per year, or 20 lamps per signal per year. Or counting 179 lamps per month, the total renewals are 2,148 per year for 1,882 lamps, or 18 renewals per signal with an average number of lamps per signal of 17. The one-arm, three-position signal with marker, has only 11 lamps. Allowing 15 per cent excess over the corresponding number of renewals per year for this signal, we have 15 lamps per year at 40 cents equals $6.00.

Material for ordinary repairs of motor signals runs, according to records on this road, $6.00 per year, making the cost of ordinary material for repairs on position-light signals the same as for motor signals.

The general inspection is, of course, the same with any type of signal. The detailed inspection for the new system consists of a weekly examination, setting the signal in its various positions and renewing any lights which may have been overlooked in the general inspection. The maintenance consists in an occasional adjustment and the renewal of these lamps. No oiling, cleaning, etc., is required as with motors. The records show for the motor signal $26 per year and the light signal $12.75, a saving for the position-light signal of $13.25.

Miscellaneous repairs cover incidentals, small parts for renewals, painting, etc. The records show a cost for both position-light signals and motor signals of $3. Exclusive of track circuits, the total cost of maintenance and operation of the two types is:

	Position-light.	Motor.
Current at 10 cents	$29.80	$28.00
Material	6.00	6.00
Inspection and maintenance	12.75	26.00
Miscellaneous	3.00	3.00
Total	$51.55	$63.00

The records for track circuits are as follows:

Labor	$34.54
Material	5.22
Curren: 322 kw. hr. at 10 cents	32.20
	$71.96

Adding this to the totals above gives $123.51 for position-light signals and $134.96 for motors.

As a matter of fact, current costs 1 cent in the electric zone and 2 cents in steam territory. At the latter rate the signals cost:

	Position-light.	A. C. motor.
Current at 2 cents	$ 5.96	$ 5.60
Material	6.00	6.00
Inspection and maintenance	12.75	26.00
Miscellaneous	3.00	3.00
Current for track circuit	6.44	6.44
Labor	34.54	34.54
Material	5.22	5.22
Total	$73.91	$86.80

The records for d. c. motor signals, exclusive of track circuit, are as follows:

Inspection	$23.40
Material for repairs	5.00
Local battery, 18 cells renewed every seven months	36.40
Two kerosene lamps	18.00
Cleaning and oiling	3.00
Total	$85.80

The dwarf position-light signals using 16 c.p. lamps burn out proportionately quicker. With 114 total lamps and 76 constantly burning, the average renewals are 44 per month, or 528 per year, for 38 signals, or 14 lamps per year at 40 cents equals $5.60, so the cost of lamp renewals is about the same for a dwarf as for a high signal. With a distant switch signal, however, when the lamps burn, for example, an hour a day, being lighted on the approach of the train, the renewals should be less than 25 cents per year.

As stated above under cost of current, a position-light signal with two-block indications, five lights constantly burning, takes 298 kw. hr. per year, for four lights this would be 240 kw. hr., but, burning only one hour per day, this would be 10 kw. hr. per year. It is estimated that a d. c. motor takes 15 kw. hr. At $4 per kw. hr., with primary battery, there is a saving of $20 per year in current and a further saving of one or two

oil lamps less the approach track circuit. It must be figured also that there are no adjustments to be made, no cleaning and oiling, no extra patrolling in sleet and ice storms, making the use of the position-light signal for outlying signals an attractive proposition even at $45 excess first cost, interest on which at 5 per cent is $2.25 per year.

My own opinion, prejudiced perhaps, but nevertheless concurred in by many of our people who have had to do with the new signals, is that, unless a speed-control device is developed, so reliable and dependable as to preclude the necessity of fixed signals, the power-operated signals of the future will be light signals (either position or color) and perhaps of several types, superseding gradually the movable arms now in use. If any of the readers of the *Railway Signal Engineer* desire additional information I shall be glad to give it through these columns if available.

The Sixth of the Confessions of a Signal Maintainer

About two weeks after my return from the March meeting of the old signal club, I received a telegram from the signal engineer, telling me to "Be in office Mon. A. M." The "old man" had also attended the Chicago talkfest and while I had not purposely dodged him, he always seemed to be dovetailed into a crowd in which old Hardscrabble and the rest of us budding hopes failed to fit. My associations with him after the meeting had adjourned had been particularly conspicuous by not happening at all.

Somehow, when I pulled that message from my private hook in the telegraph office, I began to wonder if I had offended the dignity of the department and been too frolicsome in trying to imitate the childish capers of the other harmless lunatics and loop hounds, who lend local color to the night life of the Windy City. I was never a suspicious cuss, but for some reason I could conjure up a mental photograph of being personally decorated with one of the products of the American Can Company, about thirty minutes after I lit on the carpet.

Bye and bye, Monday morning rolled around. I was leaning against the door when the chief clerk arrived. We exchanged a few merry quips and I tried to be particularly funny so as to get myself all keyed up for the coming ordeal. When his majesty arrived, he looked me over, started for his private office and said, "Come on in here." I know I must have involuntarily imitated that hopeless walk of a convicted murderer on his way to the chair. Then, to make the situation all the more excruciatingly acute, he closed the door before asking me to be seated.

"Jimmy," he said, "you've now been with me for several years. Outside of a few bonehead plays, you have gotten along pretty well. You have shown an interest in the signal business by taking up a course in a correspondence school, and from the amount of tracing cloth the office has been sending you, I presume you have made some progress in drafting. The general manager has just issued an authority to put on a signal inspector, so after looking over the personnel, I've decided to give you the first chance. It's all up to you to make good. You will have to move in here, and I'll want you to spend at least half your time draped over the extra drafting table. This change will take place the fifteenth of the month, so in the remaining ten days I want you to put your successor next to all the little curley-cues on your district."

I tried to frame up a nice reply, but somehow the words stuck in my throat, so I merely gurgled, "Yessir," swallowed my Adam's apple a couple of times, and thought of that ancient and bewhiskered gag that tells us a guilty conscience needs no accuser. When I finally emerged from that private office I had resolved to be perfectly good all the rest of my life, regardless of its alleged lonesomeness. However, when I went to lunch with the "old man" some two hours later, I put my hoof on the third rail, next to his, without any worry. It's funny how certain things cease to be a crime when you are out with the boss.

The next morning found me bobbing around in the "Ioway" burdock. The station agent, the pumper, the towerman and the night operator were all separately and confidentially told of my promotion and each came back with that very appropriate line of talk which outwardly says, "Glad to hear of your promotion and sorry to see you go," but which inwardly means, "Heavens, what a blessing!"

That night the relief came in. He was a protege of Big Ben Bowers and sported the fancy name of Highpockets II. He was a long, lean, cadaverous youth, who at one time had owned a shirt tail full of type and edited a Weekly War Cry in some burg that was hidden in the upper tier of Iowa counties. Several years before this, Fate had handed Highpockets a backhanded wollop and made him go to work. He had wished the Ben Franklin press, the type and the office cat onto some horny-handed boob with literary aspirations, and cut in with Big Ben Bowers as a battery man. The reason was that this was the only loose job in that section of the country at that time.

After the longest ten days on record I had Highpockets next to the work and the gang all next to Highpockets, so I began to get ready for the grand exodus on the fourteenth. When I stuffed my twenty-eight years' scrapings into the faithful old telescope, they looked pitifully small, so I made a new edition of those periodical resolutions; to wit, that I'd save something from now on, even if it was only the increase in salary the new position carried with it. After burning a pile of old letters and other incriminating evidence, I gave the night operator my bull pup, the pumper my buckskin mittens and the agent my share of the phonograph records we had bought in partnership. The next morning I quietly slipped out on the early train, feeling ready to tackle anything on earth.

In the city I found I had to do a number of things that had not been seriously anticipated. Room rent, laundry and clothes were more expensive, and carfare was a new item. The $3.50 commutation ticket that used to feed me for a week in the Iowa village faded into an indistinct mirage when the soup-spattered waiters began to extract about half that amount for one session around the table. Within two weeks it had soaked into me that unless one has the income of Jawn Dee, one has a fat chance of saving anything when a regular resident of the city. I rented a room 'way out on the South Side, and having a desire to herd my few remaining nickels, I hurried home each evening and stayed there. After passing through two weeks of office work and one pay-day, I sallied forth on my first inspection trip.

Before starting out, the "old man" exuded some fatherly advice, the principal points, as I remember them now, being not to get too officious, not to overlook anything as to the condition of the apparatus and not to take myself too doggone seriously. Through a natural instinct, I first gravitated down to my old "Deestrict," where I found Highpockets trying to add an improved friction clutch to an old Taylor switch machine. It was alternately raining and sleeting, and one of those Iowa zephyrs was in evidence. Old High had all the tools, from the claw bar to the voltmeter, laying around that switch and the whole landscape mussed up with his particular brand of profanity.

I could not keep out of the mess, so we collectively inserted the clutch. Any old timers who were in the harness in the winter of 1903-4 can easily remember what a nice time they had with the first one. When we had finished, I had grease on either knee and a smear on my collar, and afterwards when "trying out" the movement, the tail of my new overcoat was chewed off in the gearing.

Speaking of overcoats reminds me. Before it was warm enough