Manual toll operating methods in the telephone network

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Introduction

For many years after the inception of "long distance" (toll) telephone service in the early 1900s, toll calls were set up by operators working at manual telephone switchboards (generally special ones for use in this service). Various schemes of operation (known as "toll operating methods") were in use over that period. In general, the method of choice changed from time to time, becoming gradually less labor-intensive, as various technical advances came into general use in the telephone network.

This article describes the major toll operating methods of that era and the network changes that permitted forward movement. The descriptions are elaborate and perhaps a bit tedious, but there is no emphasis on details at the electrical circuit level.

1 GENERAL

1.1 About "toll" calls

Generally speaking, "toll" calls in a telephone system are calls for which an explicit charge is made, typically depending both on the distance between the two points and the duration of the call. For most purposes, we can consider "toll" to be a synonym for "long distance", but we will see on odd case in which that does not hold true.

1.2 Succession

For the most part, we can generally think of the various operating methods described here as representing a progression in the time of their introduction. But in most cases, the "earlier" method remained in use, on a diminishing basis, for quite a while after the introduction of its successor.

1.3 About manual toll switching

For many years, even after automatic ("dial") operation became widespread for local calls, toll calls were set up wholly by way of manual switchboards. The operating methods described in this article are totally creatures of that paradigm, although in Section 5 I give a brief discussion of the impact of "dial" operation in the toll network on them.

1.4 About dial local service

At the beginning of the vaguely-defined era covered by this discussion, essentially all local telephone service was handled by manual switching, provided by human operators operating manual telephone switchboards. And of course this paradigm had an influence of the details of handling toll calls.

But, especially from about 1920 on, “automatic” (“dial”) operation of local telephone networks began coming into significant use. This affected many details of the handling of toll calls. But it did not directly provoke the advance from one toll operating method to another (although it might well change some details of how those methods were applied).

In any case, here I will mostly limit the discussion of the various toll operating methods to their application in a context of manual switching of local calls, as their distinctive characteristic are perhaps most apparent there. But I will give a few nods to the implications of dial local operation on each of those methods.

1.5 Symbology

1.5.1 *The switchboard icons*

The illustrations that follow are peppered with icons representing manual switchboards of various types. These are of a “black box” nature: lines and trunks are shown arriving at a switchboard or departing from it, but there is no hint as to whether these terminate on jacks or cords, nor how switchboard cord circuits fit into the journey of a connection.

But those details, although fascinating, do not play pivotal roles in understanding the principles of the operating methods being described, and showing them would clutter up the illustrations, making them less useful for their intended purpose.

1.5.2 *The path lines*

In the illustrations, the heavier path lines are paths that are part of the completed connection. The lighter path line are paths that exist during some phase(s) of the setup of the call, but are not part of the completed connection.

2 TOLL OPERATING METHODS

2.1 Manual local telephone switching

To set the stage for the various operating methods used for toll calls in the context of manual local telephone switching, Figure 1 shows, in simplified form, the handling of a call from a subscriber served by one

central office in a city to one served by a different central office in the same city, a "local intraoffice call".

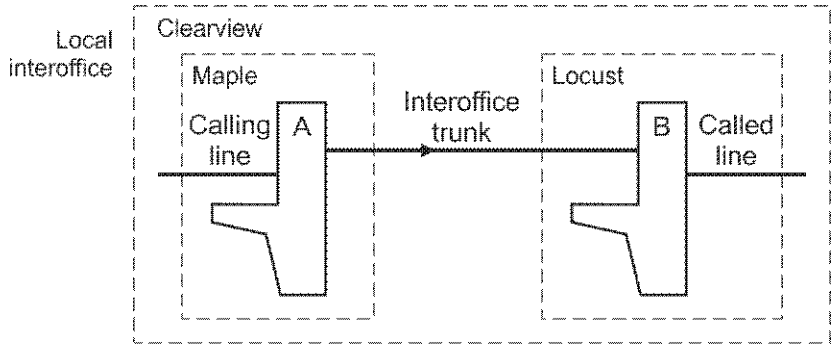

Figure 1. Local interoffice call

When the caller takes the telephone "off hook", this lights an answering jack lamp at a position of the "A" switchboard at the serving central office (here, the Maple office in the city of Clearview). The operator plugs a cord from an idle cord pair into the answering jack and says, "Number, please".

The caller gives the "A" operator the number wanted, in this case, a "Locust" number (also in Clearview). The "A" operator extends the connection over an interoffice trunk that leads to a position at the "B" switchboard at the Locust central office. The B operator answers.[1]

The Maple "A" operator gives the answering "B" operator at the Locust office the number wanted. (The "Locust" part is not said, as it is not needed, the connection already having arrived at the Locust office.)

The Locust operator completes the connection to that line and the circuitry applies ringing. We will not worry about what happens next– you can pretty much guess.

2.2 The "two number" toll operating method

2.2.1 *Introduction*

It is suspected that this may have been the first widely-used method of toll operation.

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[1] Actually, the "B" system might just send an *order tone*, in this case likely two quick short beeps, meaning, "pass only the numerical part of the number".

2.2.2 *Operation*

Figure 2 shows the setup for a toll call handled by what was technically called the "two number" operating method, which was relatively popular in the early 1900s.

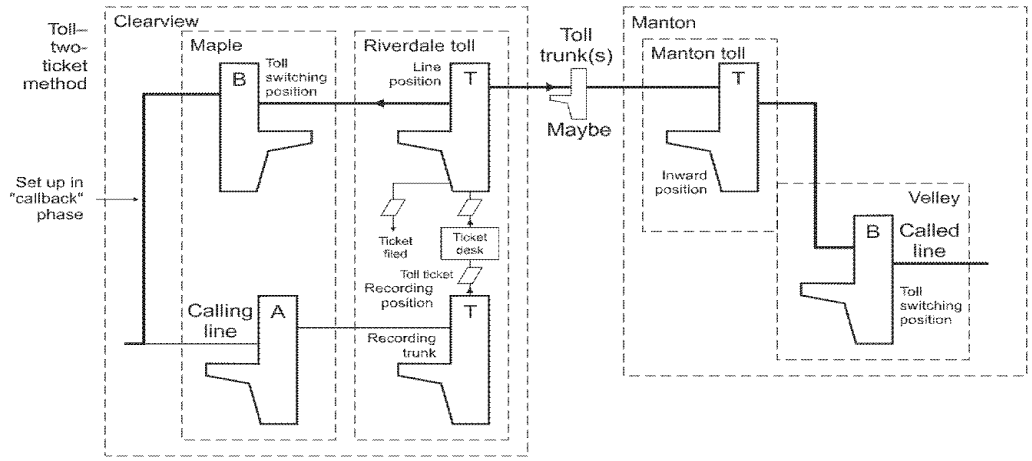

Figure 2. Toll call via the *two number* operating method

Here our caller in the Maple office in Clearview wants to call someone in the city of Manton (which will be a toll call). That person is served by the Valley central office in Manton.

Th caller takes the phone off-hook, and an "A" operator in the Clearview Maple office answers, The caller tells her she want to make a long distance cal, and gives here the city and the number. She asks the caller for his number (which was not earlier known to her–it is not indicated on the answering jack, for various reasons).

The "A" operator extends the connection to the cognizant toll switchboard (perhaps some place in Clearview). When the operator there answers, th "A operator gives her the city and number being called, and as well the number of the caller (so now we can see where the moniker "two number" for this operating method comes from).

> I digress for a moment to point out that various aspects of the connection through the "A" switchboard (originally used only for local connections) were not ideal from a transmission and ringing standpoint control as part of a long distance connection. We need not here be concerned with the details of that, but the concept will prove important..

We note that I identify this toll switchboard position as an *outward toll* position. The term of course refers to the fact that the actual toll connection proceeds "outward" from there.

The Clearview outward toll operator then makes a connection to the "B" switchboard in the Clearview Maple office. Its primary job is to

complete calls to numbers in that office (mostly for local calls, but not so in this case).

It probably comes to one of a few positions in the Maple "B" switchboard that are set up to complete toll calls, and the transmission arrangements there are those that are desirable for a link in a toll connection.

The outward toll operator gives that "B" operator the caller's number, and the "B" operator extends this branch of the connection to that line. No ringing is applied; the caller is already "on the line" (on a connection to the "A" switchboard).

This having been done, the outward toll operator releases the connection through the "A" switchboard, and the "A" operator takes it down.

Now the outward toll operator extends the connection (in various ways, perhaps involving an intermediate toll switchboard) to the *inward toll switchboard* for the called city, Manton. When that inward toll operator answers[2], the outward toll operator in Clearview gives her the wanted number (including the central office name, here "Valley"). The Manton inward toll operator makes a note of the number on a toll ticket, for future reference.

The inward toll operator the extends the connection to the "B" board at the Valley office (again likely to one of a few positions there equipped to complete toll calls). When the Valley "B" operator answers, the inward toll operator tells her the wanted number. (The "Valley" part is not said; it is not needed, the connection having already arrived at the Valley office.)

The Valley "B" operator completes the connection to the wanted line, and ringing is applied. You can guess the rest.

The outward toll operator prepares a paper toll ticket with the call details (eventually including th time of answer and the time of disconnect), which will be used to bill the caller for the call.

2.2.3 *Why this "two step" call setup?*

There are two major reasons:

- As mentioned earlier, the connection through the "A" board is not ideal for use in a toll connection from a transmission and ringing control standpoint. Thus a "toll-worthy" connection must be established with the caller's line.

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[2] Perhaps by way of an *order tone*.

- "In the day", the "thinness" of the toll network meant that, especially in the busy parts of the day, it might not be possible to set up the needed connection for a while. It was considered impolite for the caller to have to stay on the line for any substantial time waiting for a success in establishing the connection. So "calling back" when the connection could be made became the order of the day.

2.2.4 *The name of the method*

The name of this method supposedly came from the fact that the "A" operator passes two numbers (the called and calling numbers) to the toll operator.

I note that other methods, described shortly, equally depend on the outward toll operator getting both those numbers. So, as is so often the case, the name is not inherently unambiguous.

2.2.5 *The name of the switchboard and its operator*

In some "official" writing about this method (and there isn't much available to me today), the switchboard is spoken of as a "two-number" switchboard (not any sort of "toll" switchboard"), and its operator as the "two-number" operator (not, for example, as the "outward toll" operator.

But in the description above I have used terms that are consistent with those used for other operating methods.

2.2.6 *In a "dial" setting*

I have no actual information on this, but I suspect that this operating method did not work well in a dial local service setting.

2.3 The "two-ticket" toll operating method

2.3.1 *Introduction*

A disadvantage of the two-number toll operating method was the need for the "A" operator to receive the desired city and number from the caller and then pass it to the toll recording operator.

That effort was eliminated by a toll operating methods that was technically called the "two-ticket" operating method once there was an even later method from which it had to be distinguished. It was relatively popular in the early 1900s.

2.3.2 *Operation*

Figure 3 shows the setup for this operating method. The fictitious cities and offices are the same as before.

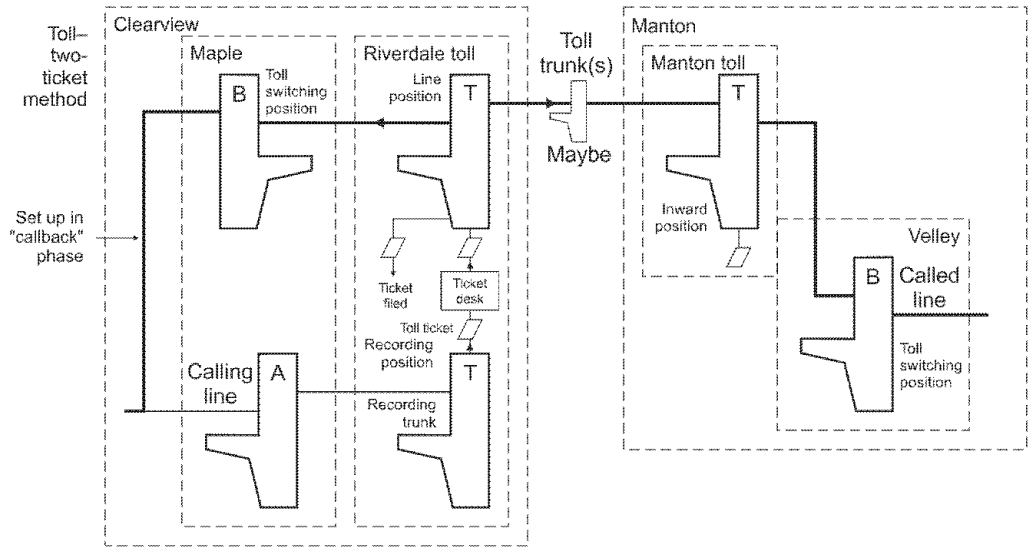

Figure 3. Toll call via the *two-ticket* operating method

As before, we start with the caller (here served by the Maple office in Clearview) taking his phone off hook. An "A" operator answers. The caller tells her he wants to make a long distance call. The "A operator extends the connection (over a *recording trunk*) to a position in the *recording* section of the Clearview toll switchboard.

When the "Long Distance" operator there answers, the caller gives her the wanted city and number (here a "Valley" number in the city of Manton). She asks the caller for his number. She starts a paper "toll ticket" with the call details. She thanks him and tells him to hang up; he will be called back when the connection is ready.

The partially-completed toll ticket is sent by various ways to a *ticket desk*. The clerk there will, perhaps right away, but not always, send the ticket to a position in the *line* section of the toll switchboard (also spoken of as the *completing* section).

That will be a position in that section of the switchboard that is equipped to access toll trunks ("lines") to the destination city (or to the proper next intermediate city in the route to the destination city).

This completing operator becomes the *outward toll operator* for this call.

Typically, when she receives the ticket, she will attempt to establish a connection to an inward toll position in the called city..

She might at first not be able to establish the connection, as the toll network of the time was rather "thin" and there might not be any trunk available in some critical part of the route.

But right away, or maybe on a later try, the inward toll position is reached.

The outward toll operator passes to the inward operator the number wanted (office name and all). The inward operator notes that on a toll ticket, which she will use for reference during her handling of the call.

The outward toll operator then, just as we saw earlier in the process of the prior example, sets up a connection to the caller, via the "B switchboard in the caller's office (again, probably one of only a few positions equipped for toll connection completion). In this case, the caller's line is rung right away.

That call is answered (hopefully by the original caller). She tells the caller that she will soon have the called party on the line.

Mean while, the inward operator (in Manton) makes a connection with the called number's line by way of the "B" switchboard in the Manton Valley office (again, presumably via a position of that switchboard that is equipped to complete toll calls).

When the line is answered, the Manton inward operator advises the outward operator in Clearview. That operator notes the time on he toll ticket for this call.

If this is a "person-to person" call, so there will have to be a conversation with the person answering about what person the call is for, that is done by the Manton inward toll operator. If the call is on a "collect" basis, and the called party, in "accepting the charges", has asked to be advised, when the call is completed, of the amount that will be charged, the Manton inward toll operator does that.

When the call is ended, the Clearview outward toll operator receives a disconnect signal. She pulls down the connection there, notes the time of disconnect on the toll ticket, and sends her toll ticket on, to be used for billing.

The Manton inward toll operator gets a forward disconnect signal on the trunk and pulls down the connection there. The Manton Valley "B" operator gets a forward disconnect signal on the trunk.

I'm not sure what happens to the ticket used by the Manton inward operator.

2.3.3 *As to the name*

I call attention to the fact that in the "two-number" operating method, in the form described earlier, there are also two tickets used.

2.3.4 *In a dial local switching setting*

In a dial local switching setting, there were no "A" switchboards to play the role described above. But there was something close: the "local operator" that was typically reached by dialing "0"[3].

There were also no "B" switchboards to play the roles described above. Instead the outward/inward toll operator would make the connection to the calling/called line by dialing into a special part of the dial switching systems. The details of this are beyond the scope of this article.

2.4 The "single ticket" toll operating method

2.4.1 *Introduction*

A further simplification involved consolidating all call handling maneuvers with the outward toll operator, with the work of the inward toll operator now mostly limited to her most basic task, competing the connection to the called line. The new operating method based on this concept was called the "single-ticket" method, since under it only the outward toll operator made a toll ticket.

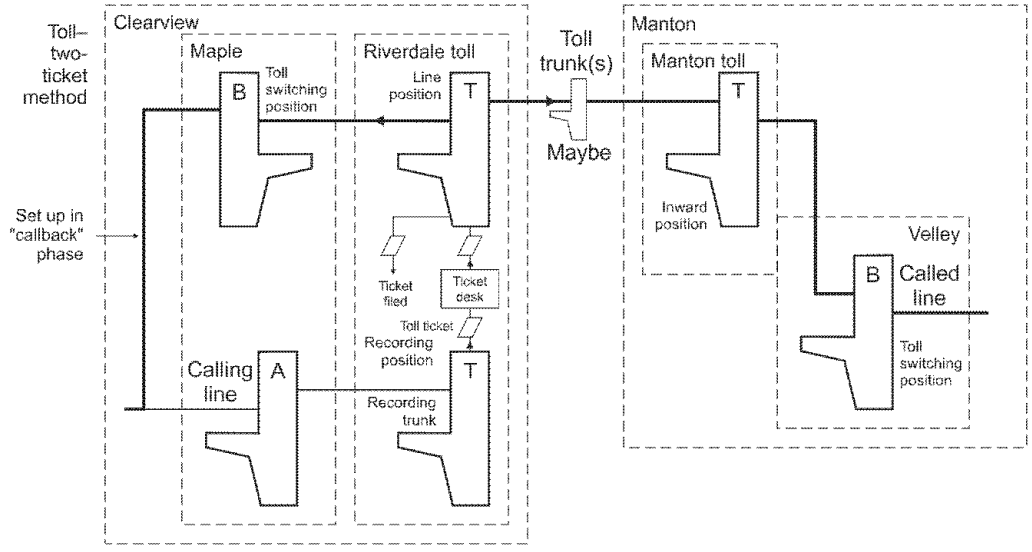

Figure 4. Toll call via the *single ticket* operating method

2.4.2 *Operation*

Figure 4 shows the setup for that operating method. The fictitious cities and offices are again the same as before.

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[3] In fact, the original formal name for that switchboard was the "dial system A" switchboard (DSA). Later, that name was changed to the "dial service assistant" switchboard (still "DSA").

The initial drill is just as described for the two-ticket method, and I will not repeat it here.

In this case, when the inward toll operator at Manton answers[4], the outward toll operator at Manton just gives the desired central office (in this case, "Valley"). The inward toll operator makes a connection to a trunk leading to a position in the toll completing section of the B switchboard at the Valley office.

Note that she does this right away, unless it is not possible, in which case she so advises the outward toll operator, who advises the caller to hang up and try again later. She does not need to make a ticket to which she can later refer (and in fact she hasn't even heard the numerical part of the called number, nor does she ever need it).

So we see how this operating method gets its name.

When the Valley ""B" operator answers[5] the outward toll operator gives the numerical part of the wanted number. (The "Valley" part is not needed, given that the connection has already arrived at a Valley "B" switchboard.)

Probably while this is happening, the outward toll operator, much as we saw in the prior example, sets up a connection to the caller, via the "B" switchboard in the caller's office (again, probably one of only a few positions equipped for toll connection completion). This time, the caller's line is rung.

That call is answered (hopefully by the original caller). She tells the caller that the connection is about to be completed. She cuts the connection through, and the conversation can begin.

She notes the time the connection is consummated on the toll ticket. When the conversation ends, she notes that time on the ticket, and then sends the ticket (in one of several ways) to where it will be processed for billing.

If this is a "person-to person" call, so there will have to be a conversation with the person answering about what person the call is for, that is done by the Clearview outward toll operator. If the call is on a "collect" basis, and the called party, in "accepting the charges", has asked to be advised, when the call is completed, of the amount that will be charged, the Clearview outward toll operator does that.

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[4] Actually, the system might just send an *order tone*, in this case likely a quick series of three short beeps, meaning "pass the office name only" .

[5] Actually, the system might just send an *order tone*, in this case likely a quick series of two short beeps, meaning "pass the numerical part of the number only"

2.4.3 *In a dial local switching setting*

In a dial local switching setting, the situation here is essentially the same as described above in Section 2.3.4.

2.5 The "combined line and recording" (CLR) toll operating method

2.5.1 *Introduction*

Clearly, the two-ticket operating method was clumsy, inconvenient to the user, and very labor-intensive.

Several improvements in the telephone network (I will delay discussion of them so I can get on with the story) made it possible to think of a more direct way of handling calls. This was called the "combined line and recording" (CLR) method.

As you might guess from the name, in this method the *recording* function (learning and recording where the call was to, and from what number) and the *line* function (in which the connection was actually established), were done by the same operator.

2.5.2 *Operation*

We see the setup in Figure 5, for the most desirable call scenario. The fictitious cities and offices are again the same as before.

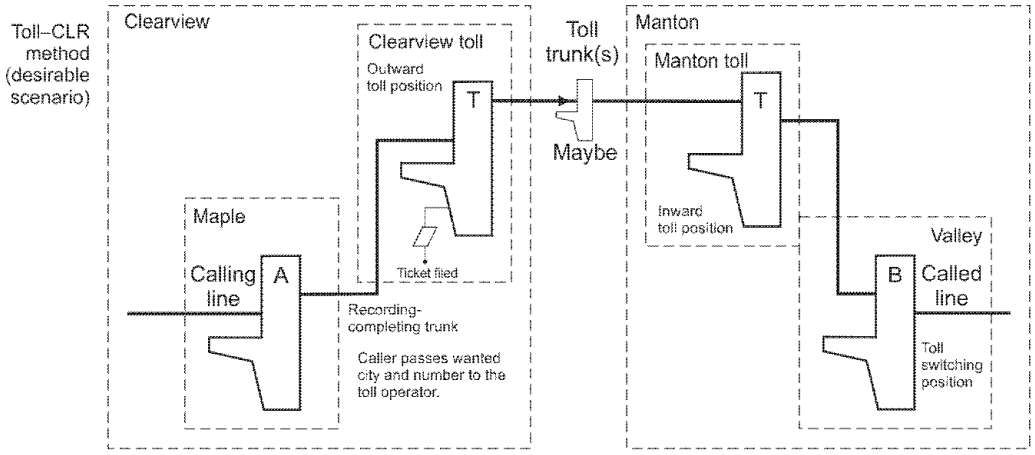

Figure 5. Toll call via the *combined line and recording (CLR)* operating method

Here, there are no longer both a *recording* and a *line* switchboard operator involved at the originating end. The two functions are done by a single operator, hence the moniker "combined line and recording" (CLR).

As before, our intrepid caller takes his phone off the hook, and an "A" operator at his serving office (Clearview Maple) answers. He tells her that he wants to make a long distance call.

The "A" operator extends the connection over a *recording-completing* trunk to an outward position of the Clearview toll switchboard. But, different from the earlier examples, this connection is "toll-worthy" from a transmission and ringing control standpoint. (Yes, this required significant changes to all the "A switchboards. And operation might have involved some complicated maneuvers with the cord circuits.)

The caller gives the outward toll operator the city and number wanted. While the caller remains on the line, the toll operator establishes the connection to the wanted city and then to the wanted line, in the way described before under the *single-ticket* method of operation..

The outward roll operator makes the paper toll ticket, eventually recording on it both the time of answer and (when the call has ended) the time of disconnect, and sends it on its way.

The fact that the caller remains on the initial connection the whole time is generally attractive from the standpoint of the caller. When it gets less attractive is when, owing to network congestion, the connection cannot be completed in a fairly short time. In such cases, the outward toll operator may ask the caller if he would like to be called back when the connection is established. If he agrees, then the overall situation becomes as seen in Figure 6.

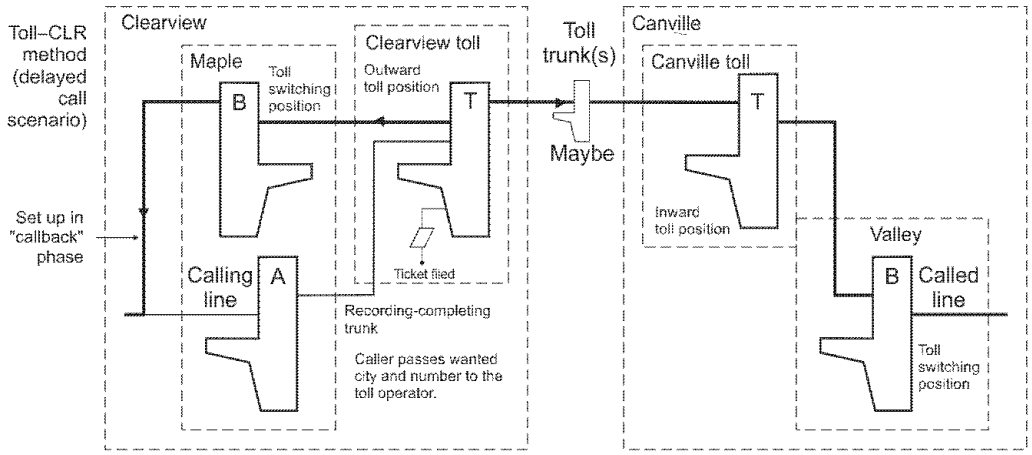

Figure 6. Toll call via the *combined line and recording (CLR)* operating method–delayed call

I think, based on the prior discussions, this should be self-explanatory.

Now. what are the conditions that changed and made the introduction of this clearly-superior operating method practical? Mainly these:

- Various factors now made it technically practical for the connection from the caller's line through the "A" switchboard to the toll switchboard to be "toll-worthy from a transmission and ringing control standpoint. (This took a lot of work. I didn't say this was going to be cheap!)

- The toll network itself had been "thickened" so that it was now very unlikely that completing a toll connection would be delayed, and in most cases, when it was that was only by a minute of so.

Introducing the CLR method over the entire telephone network was a massive undertaking. For one thing, as mentioned earlier, it required that all A" switchboards be modified so they could establish "toll-worthy" connections to the CLR switchboard.

It also required that now all switchboard positions (of the now CLR outward toll switchboard) would have to be equipped to connect to any trunk needed to advance the call over whatever route applied. (Earlier, each position might only be able to access trunks to certain points, and that position would only be given tickets for calls for which the route involved trunks accessible at that position.)

Now, any position on the now-CLR switchboard might receive a call for any city imaginable. For large toll offices, with thousands of outward toll trunks altogether, to hundreds of destinations, there was not room on the jackface of a single switchboard position for groups of trunks to each possible destination.

So in many cases a second stage of switchboards ("tandem" switchboards) would have to be established, each position there having access only to trunks to certain destinations. The "A" operator would them set up the outward connection to a position of the tandem switchboard having access to a trunk required to continue the connection.

2.5.3 *In a dial local switching setting*

In a dial local switching setting, If the caller want to make a long distance call, he dials a code (perhaps 110 or 211, depending on the kind of switching system involved), which makes the connection to the CLR toll switchboard.

In this situation it is relatively simple to make that connection from the caller's line to the toll switchboard "toll-worthy".

2.6 The "A-B toll" method

2.6.1 Introduction

It was early realized that, especially for toll calls to relatively close cities, and if we limit ourselves to "station to station" calls, a method of operation that was much more like that used for local interoffice calls would be less costly (and in some case, speedier to the caller).

The result was the adoption of an operating method called "A-B toll" (the premise for which name will shortly become apparent). Althoiugh

I have placed it last (because of its application), it is believed to have been introduced very early.

2.6.2 *Operation*

We see the basic setup for the A-B toll method in Figure 7.

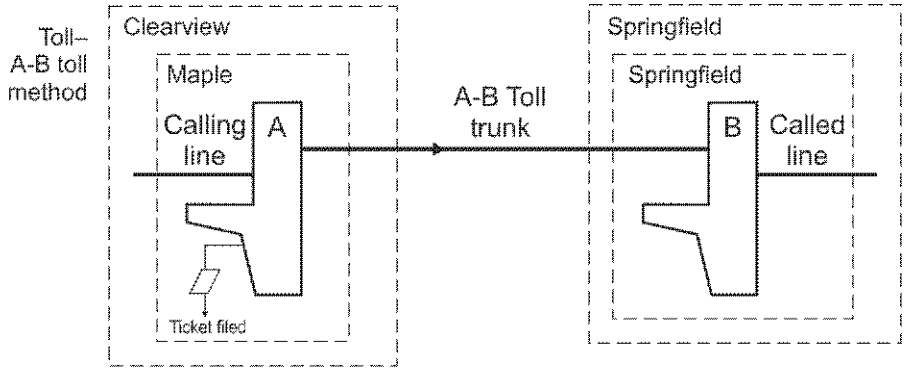

Figure 7. Toll call via the *A-B toll* operating method

Well, it certainly looks simple!

Here our caller, again in the Clearview Maple office, now wants to make a toll call to the fairly-nearby town of Springfield. We assume that, as is often the case for this situation, Springfield is a small city and has only a single central office (which would therefore itself be called "Springfield").

Here, as before, the caller takes the telephone off hook, and an "A" operator answers. He has learned (perhaps from calling instructions in the directory) that this toll call should be placed through the local ("A") operator (rather than through "Long Distance").

He gives the wanted city and number to the "A" operator. She extends the connection over an "A-B toll trunk" to the "B" switchboard at the Springfield office.

The "A" switchboard is equipped and operated so that this is a "toll-worthy connection" from the caller's line. This has required some modification of the "A" switchboards, and may in operation require some complicated maneuvers with cord circuits there for such calls.

Recall that this "B" switchboard is a switchboard that primarily is used to complete local calls to numbers in the Springfield office (as seen in Figure 1), but also is used to complete toll calls to that office, and here it does the latter (perhaps only certain positions are set up for, and used for, that).

The Springfield "B" operator completes the connection to the wanted line, and ringing is applied.

At the outset, the "A" operator starts a toll ticket for this call. When the connection is answered, she notes the time. When the parties disconnect, she notes that time on the ticket, and sends it on to be used for billing the call.

Except for the matter of the toll ticket, the duties of he "A" operator here are essentially the same as on a local call. And the experience seems just like that to the caller.

We can of course now easily see the rationale for calling this the "A-B toll" operating method[6].

2.6.3 *No delayed calls*

Suppose that there are no trunks available to Springfield at the moment. There is no prospect of handling the call on a "delayed" basis. Rather, the "A" operator says, "I'm sorry, but that call cannot be completed at this time. Please hang up and try again later."

2.6.4 *Why the limitation to "station to station" calls?*

Why that limitation to only station-to-station calls via this operating method? In the case of person-to-person calls, there are often a lot of "gymnastics" involved, possibly calling the caller back later, or setting up a connection to a line but not yet ringing on it.

Suppose the caller nevertheless asks the "A" operator for the call to be "person-to-person" (so he will not be billed for it unless and until a certain person at the called number comes on the line). There is no provision for handling such calls via this method–for dealing with such "gymnastics".

These all involve considerable technical complications in the system equipment and switchboards, which much defeats the purpose of the method. And in any case, it was not seen as desirable to have to train all the "A" operator in the myriad intricacies of handling such calls.

In some cases, the "person-to-person" option is just not offered (in any way) for calls to such fairly-nearby cities. There may be little justification for it, given that the rates for such calls were quite low. And the "A" operator would advise the caller of that situation.

But where those calls are offered, but via the regular "Long Distance" service, the "A" operator might say, "You will have to place that call through Long Distance. I will connect you" (that is, to an outward toll operator).

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[6] It is sometime referred to as the "AB toll" (no hyphen) operating method. It is also sometimes referred to as the "A-board" operating method

2.6.5 *In a dial local switching setting*

As discussed earlier, in a dial local switching setting, there were no "A" switchboards to play the role described above. But, there was something close: the "local operator" switchboard (DSA) that was typically reached by dialing "0"[7].

So a caller wanting to make a station-to-station call to a city served for such calls by the A-B toll operating method would dial "0". When the DSA operator answered (with "Operator"), he would tell her that he wanted to make a call to that city and that number. The DSA operator would then essentially proceed as described just above for the "A" operator in Clearview.

Making that connection through the DSA board "toll-worthy" from a transmission and ringing control basis might have involved some slightly inconvenient manipulation of cord circuits once it was discovered that the caller had a toll call in mind.

2.7 For more information

The A-B toll operating method is described in greater detail in the article "The 'A B toll' method of handling manual long distance calls", by this same author. It is probably available where you gote this

3 A SOURCE OF CONFUSION

In certain cities, at certain times, the telephone company for various reasons characterized what we now call "station-to-station" toll calls to fairly-nearby cities as a separate service, distinct from the "Long Distance" service.

We assume that these would certainly be handled by the A-B toll operating method. The lower cost of using that method (compared to one of what I call the "regular" toll operating methods) allowed calls handled this way to have lower rates than the "regular" long distance rates for station-to-station calls to such cities.

At the time, the terms "station-to-station" and "person-to-person" had not been generally adopted for those two "options" for a toll call. Rather, "station-to-station" calls were variously described as "particular number", "number", "number-to-number", or "two-number"

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[7] The original formal name of this switchboard was the "dial system A" switchboard, from which that abbreviation DSA came. It was so-called because it was the closest thing to a "A" switchboard that a dial office had, and its operator provided many of the supporting services which were done, in a manual office, by the A operator. Later, when that historical connection to a real "A" switchboard had faded, the formal name was changed to the "dial service assistant" switchboard (still, conveniently enough, abbreviated "DSA".

calls. Person-to-person calls were variously described as “particular person” or “person” calls [8]

In some cases where the telephone company chose to characterize the handing of station-to-station calls to relatively-nearby cities as a distinct service, they chose to speak If that as their “Two Number” service.

Of course one problem was that “two-number” indicated what we today would call “station-to-station”, yet in this case it had a significance well beyond that. Although this distinct service only provided “two number” calls, it was not the only service that provided for calls; they were also provided under the “Long Distance” service (but there maybe under a different synonym).

To the student of telephone operation (perhaps a reader of this article), the name “two-number” of course sounds like the name of a toll method of operation (one described above). But in fact the two uses of the term are not at all related. In fact, the method apparently used for the “Two Number” service is the “A-B toll” method, which is about as distinct as can be from the “two-number” method.

It is interesting that at least one telephone company, wishing to characterize their program of handling such calls as a separate service, met the technical nitty-gritty head on and called it the “A-B Toll Service”. While that is nicely clear to, for example, readers of this article, it was probably completely mystifying to the telephone customers of the time.

4 HISTORICAL TRENDS

Figure 8 is a chart from a special supplement to the Bell System Technical journal for May-June, 1936, “Technical Developments Underlying the Toll Services of the Bell System”. It shows the relative usage of these four toll operating methods over the period from 1916 to 1934.

[8] Do not expect all of these (even “station to station” or “person to perso\n”) to make sense semantically.

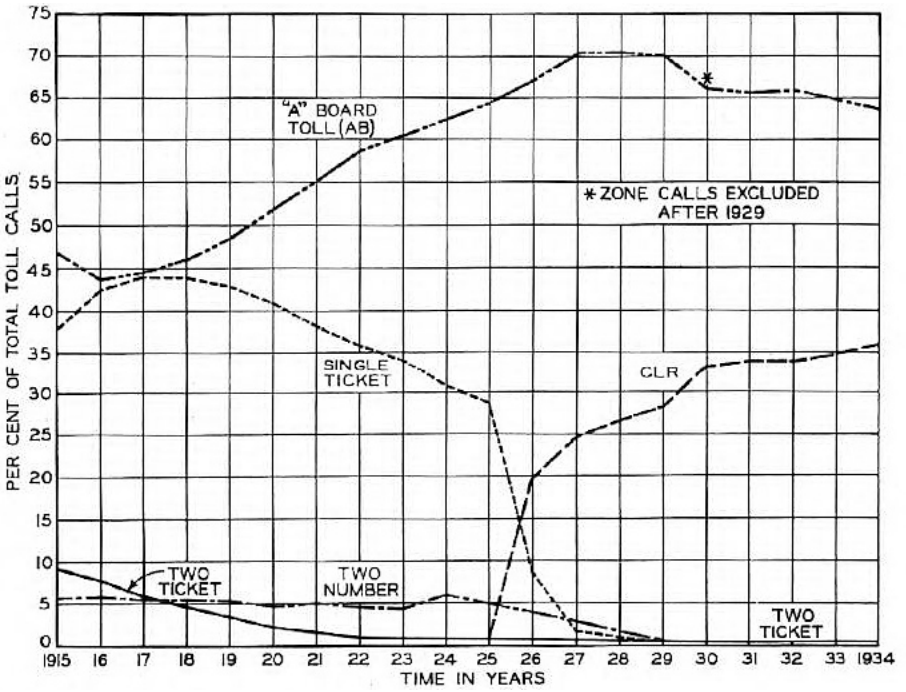

Figure 8. Distribution of use of toll operating methods

We see that by 1915 most of the toll calls were handled by either the single ticket method or the A-B toll method. The A-B toll method was already the "go to" method for station-to-station toll calls to relatively-nearby cities (and there were a lot of those calls). The single-ticket method was the "go to" method for the rest of the toll traffic. The two-number and two-ticket methods were also-rans by that time.

During the 1920s, the amount of toll traffic to fairly-nearby cities increased, with much of it being handled by the *A-B toll* method, thus the progressive increase in its proportional standing..

The highly efficient CLR method came into general use for toll calls not best suited to the A-B toll method, starting in 1925, and as it was implemented widely it essentially took over from the single ticket method. Two-number operation essentially disappeared, but, for some reason, two-ticket operation lingered on for a small fraction of the calls.

5 MECHANIZATION

5.1 Operator dialing

The discussion of the four toll operating methods given above is predicated on a wholly manual mode of switching toll calls. The routes often included switching by toll switchboards intermediate to the outward and inward toll switchboards ("toll tandem" switchboards).

But starting in the late 1930s, the Bell Telephone system began to introduce dial switching into the toll network, this all implemented

using the "step-by-step" type of switching equipment. The scheme revolved around arbitrary codes that would be dialed by the outward toll operator, in sequence, to direct the switching from office to office over the entire route, and perhaps (by concluding the sequence with the wanted number) directly to the called line. This was often spoken of as the "intertoll dialing" system.

Nonetheless, from the standpoint of the caller, this all worked like the CLR operating method with wholly-manual switching, and the outward toll switchboards were indeed considered (quite properly) "CLR switchboards".

Staring in about 1947, the Bell Telephone System began an ambitious program described as "operator toll dialing"[9]. Its premise was that the outward toll operator, having received the destination city and number from the caller (or having determined it from some sort of directory assistance desk) would key into a new kind of "intelligent" switching machine the called number, prefixed in most case by a *numbering plan area* (NPA) code (what came to be known later to civilians as an "area code").

The detailed route to be followed would be determined "on the fly" from "tables" in the switching machines, pursuant to a clever overall plan. The plan involved an "alternate routing" concept that was followed by the switching machines. That aspect provided for an economic optimization of calls routing as traffic varied, and in addition overcame the possible failure of, say, all toll trunks between two points in the network.

Again, from the standpoint of the caller, this all worked like the CLR operating method with wholly-manual switching.

5.2 Direct Distance Dialing

Under the Direct Distance Dialing system, users could directly dial toll calls. In this paradigm, the toll operating methods discussed in this article were not at all applicable.

When operators were involved (as for "person-to-person" or "collect" calls), they were brought into the picture by an early switching machine in the chain, and they generally operated at what we would today call "consoles", not having any cords nor jackfields; all the actually connections" wee made by the switching machine.

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[9] Yes of course this was "intertoll dialing", but it got a new name.