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 and more convenient to the users, 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, 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"..

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 6 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 later, in Section 5, I will synopsize the effect of "mechanization" on the various toll operating plans.

1.5 "Line" and "Station"

For simplicity, in this article I will speak of the calling and called *stations* as if each is served by an *individual line* (not as *stations* on a *multi-party line*). Thus we can consider *line* and *station* to be synonyms, and I will speak of the calling and called persons as associated with *lines*.

1.6 Symbology

1.6.1 *The switchboard icons*

The illustrations that follow are peppered with icons representing manual switchboards of various types. Once I get rolling, these will be 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.

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.

Nonetheless, in the first illustration I will illuminate those details to some degree.

1.6.2 *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 ultimate completed connection.

2 ABOUT "TOLL WORTHY" CONNECTIONS TO THE CALLING LINE

As we see the basic concepts of many of the toll operating systems, in the original contact of manual local switching, we will see that they begin with the calling subscriber asking the local operator who answers his "service request" to connect him to a "long distance" operator.

We might expect that the local operator would just plug the front cord of the cord circuit with which she answered this call into a trunk leading to the long distance switchboard.

But there would be several shortcomings to using this connection as a participant in a toll connection (the details of which need not concern us here). Some of these (such as the matter of the type of "talking battery" to be provided) have transmission implications. Another matter is the need for the toll operator to be able to ring the calling line, which could not be done from the toll switchboard through a regular "local" connection through the local switchboard.

To overcome those shortcomings, in most of the operating methods discussed here, in the final long distance connection, the connection from the calling line to the long distance switchboard is made in a different way, one in which various technical steps are taken to overcome those shortcomings. As we will, see, this often involved, as the connection is being completed, substituting a "toll worthy" connection from the calling line to the toll switchboard for the initial "local" connection to the toll switchboard.

In this article, I will speak of connections to the lines that were desirable as participants in an overall toll connection as "toll worthy connections" (my term, I think apt, but not used elsewhere in the literature).

As an aside, most of the considerations that disqualify the initial "local connection" as a participant in the ultimate toll connection are also at issue in the connection to the called line. But here, there is no "initial local connection" involved, and the arrangements for connecting to the called line are inherently made "toll worthy".

3 TOLL OPERATING METHODS

3.1 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 some detail 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”.

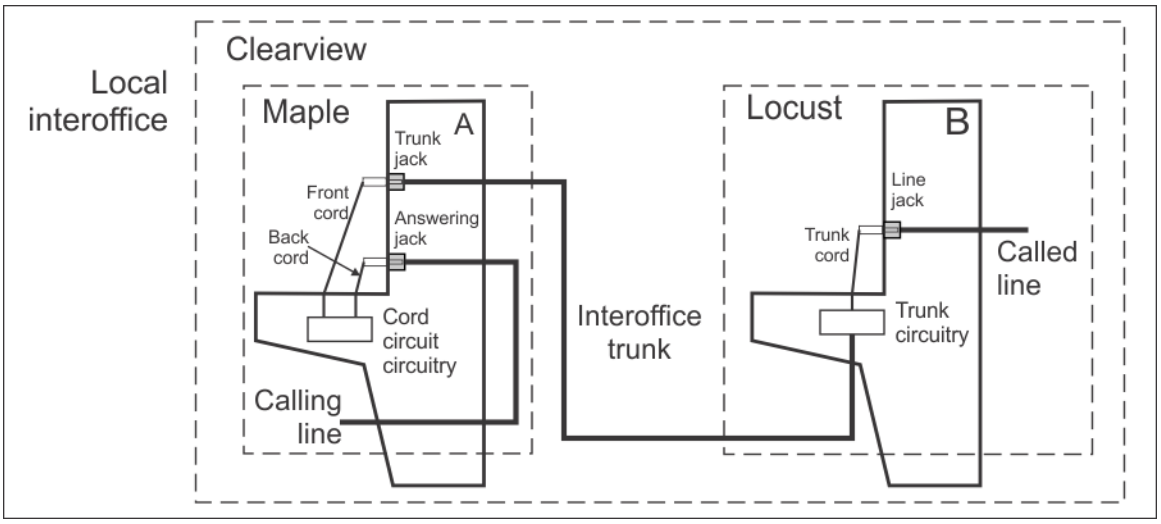

Figure 1. Local interoffice call

Here, I depart from my general practice in this article of showing switchboards as “black boxes”, but actually show (and speak in some detail about) the cords, plugs, and jacks that are involved, as these will be referred to (but not seen) later. This is for the benefit of the reader not already familiar with manual switchboard operation.

When the caller takes the telephone “off hook”, this lights an lamp (not shown) at the line’s answering jack at a position of the “A” switchboard at the serving central office (here, the Maple office in the city of Clearview). The operator plugs the back cord of an idle cord pair into the answering jack, operates the talking key for that cord circuit (which connects the operator’s telephone set to it), 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 plugs the front cord of the cord circuit into the trunk jack for an idle interoffice trunk that leads to a position at the “B” switchboard at the Locust central office. There the trunk appears on its own trunk cord.

> At the “A”. switchboard, the cord circuit circuitry provides DC current (“talking battery”) to the front cord (and thus to the calling line), and provides for coupling the speech signals between the two cords

The B operator’s telephone set is automatically connected to that trunk circuitry. The trunk circuit sends an *order tone*, two quick short beeps, meaning, to the ”A” operator, “pass only the numerical part of the wanted number”. The “B” operator also hears the order tone, which alerts her that she should expect to hear the wanted number spoken by the “A” operator.

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 "B" operator plugs this trunk cord into the line lack for the wanted number. The trunk circuitry applies the ringing signal. When the calling line answers, the ringing signal is stopped, talking battery is supplied to the called line, and there is a transmission path for speech signals through the trunk circuitry.

The connection is complete.

For continuity's sake, Figure 2 is how that connection would be shown with a conventions used from here on.

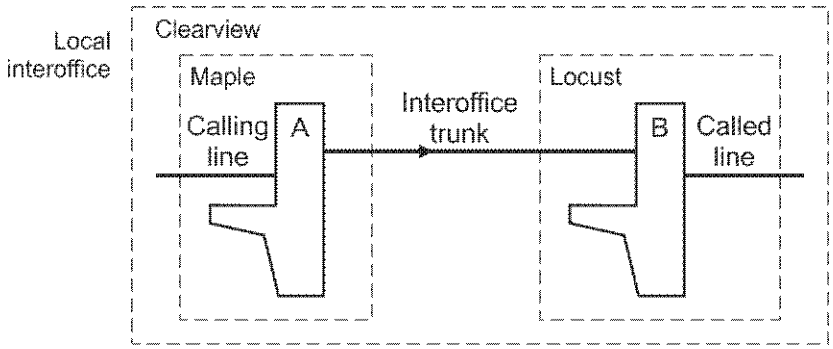

Figure 2. Local interoffice call—simplified presentation

3.2 The "two number" toll operating method

3.2.1 *Introduction*

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

3.2.2 *Operation*

Figure 3 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.

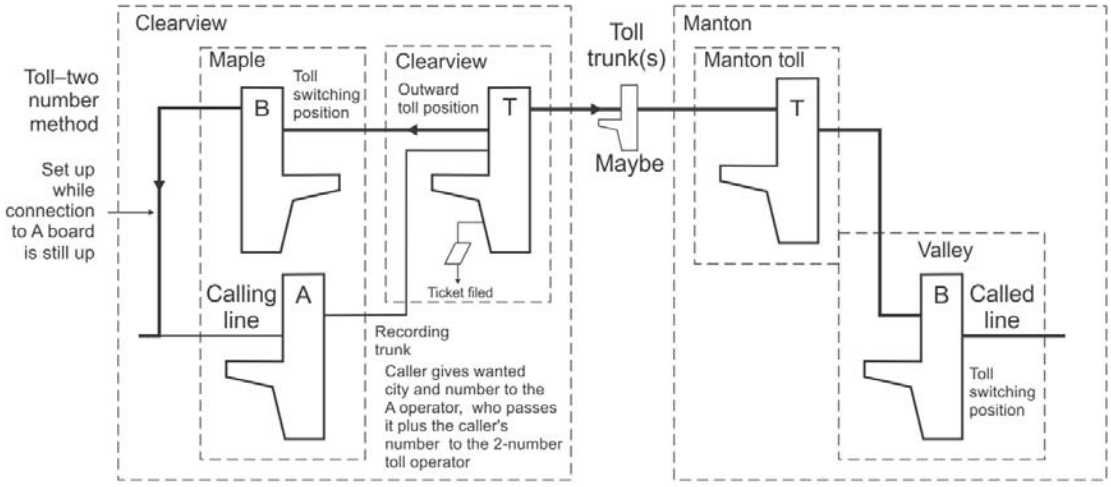

Figure 3. Toll call via the *two number* operating method

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 call, and gives her 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 "2-number" toll switchboard (perhaps some place in Clearview). When the operator there answers, th "A operator passes to 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, as discussed earlier, various aspects of the connection through the "A" switchboard (originally used only for local connections) were not ideal from a transmission and ringing control standpoint as part of a toll connection. We need not here be concerned with the details of that, but the concept will prove important.

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[1], 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.

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

There are two major reasons:

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

- "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

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

"calling back" when the connection could be made became the order of the day.

3.2.4 *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.

3.2.5 *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, as would be the case elsewhere).

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

3.2.6 *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.

3.3 The "two-ticket" toll operating method

3.3.1 *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.

3.3.2 *Operation*

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

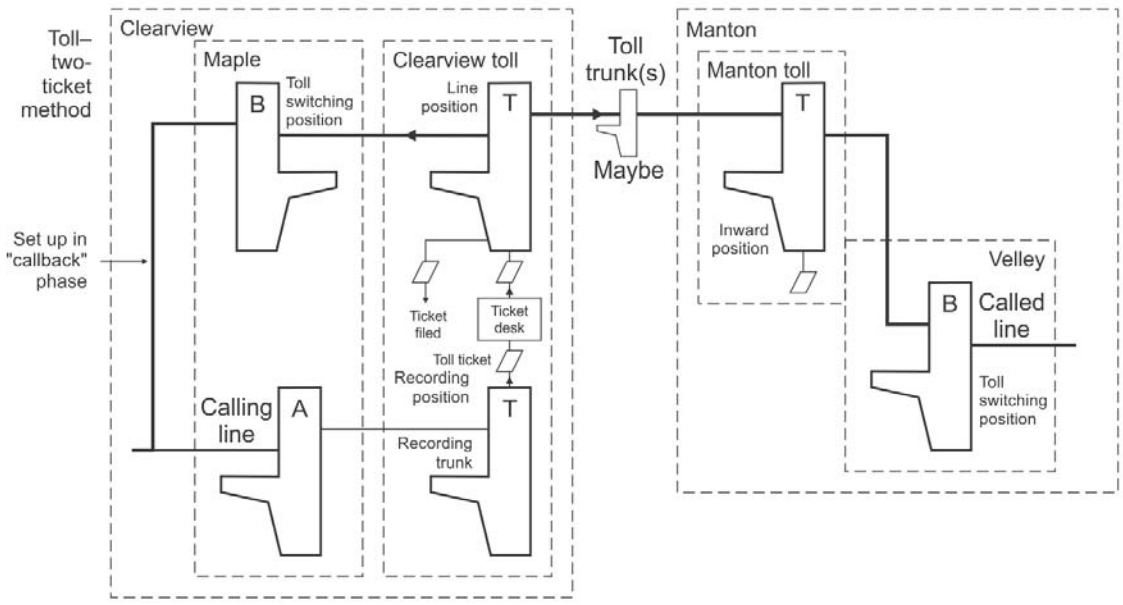

Figure 4. Toll call via the *two-ticket* operating method

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.

3.3.3 *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.

3.4 The "two-ticket" toll operating method

3.4.1 *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.

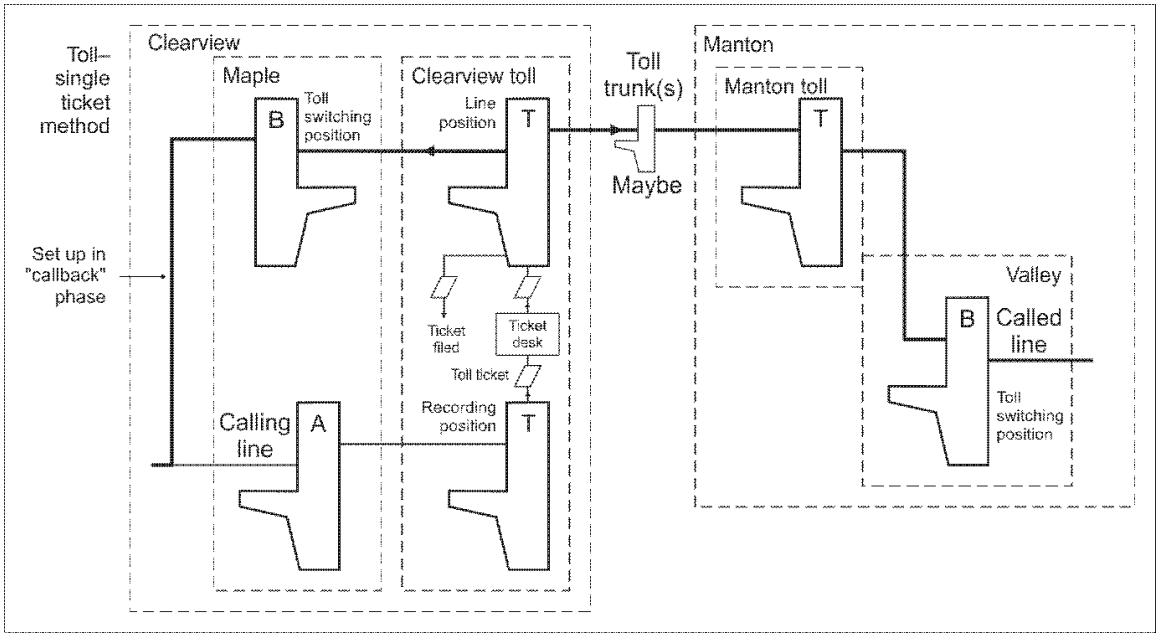

Figure 5. Toll call via the *single ticket* operating method

3.4.2 *Operation*

Figure 5 shows the setup for that operating method.

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[2], 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

[2] 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" .

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[3] 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.

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

3.5.1 *Introduction*

Clearly, the single-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

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[3] 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"

number) and the *line* function (in which the outgoing connection was actually established), were done by the same operator.

3.5.2 *Operation*

We see the setup for the initial form of this operating method, in Figure 6.

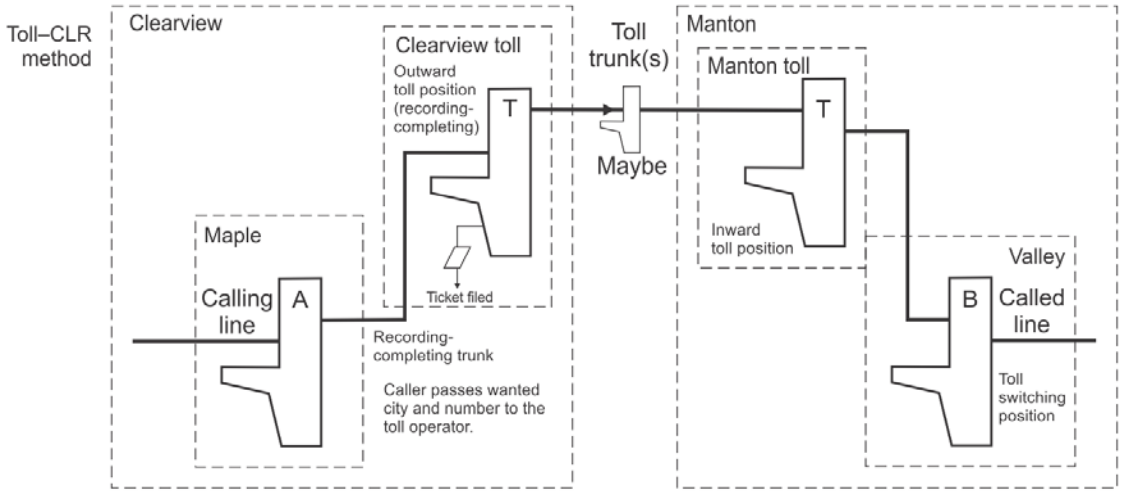

Figure 6. Toll call via the *combined line and recording (CLR)* operating method

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, spoken of as a "recording-completing" operator (who is the outward toll operator here). But the moniker "combined line and recording" (CLR) is used to describe this method of operation, and to identify various ingredients associated with it.

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 a recording-completing outward position of the Clearview toll switchboard. (This is a "toll-worthy" connection; see Section 3.5.3.)

The caller gives the toll operator the city and number wanted. While the caller remains on the line, the toll operator proceeds to advance the connection over a toll trunk toward the destination city (essentially as described earlier for the *single-ticket* method of operation. She also asks the caller for his number.

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 "toll-worthy" connection to the calling line is done later, on a "call-back" basis.

Similarly, in the infrequent situation where the toll operator must "ring back" the calling line, the connection through the "A" switchboard is released and the toll operator establishes a new connection (on a "toll-worthy basis, in fact) with the calling line.

3.5.3 *Modifications needed to institute CLR operation*

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. This involved adding to each "A" switchboard position a few new cord circuits, these being quite different from the existing cord circuits. These are used only for making connections from the calling line to the (CLR) toll operator, and were spoken of as "toll cord circuits". Rather than providing a "non toll worthy" connection between two cords, including a "talking circuit", these cord circuits make a straight through connection (just like a "patch cord").

If the caller asked for "Long Distance", the serving "A" operator would remove the back cord of the (regular) cord circuit she had used to answer the call from the line's answering jack. She would then take the back cord of one of these special toll cord circuits and plug it into the calling line's answering jack (yes, she had to remember what answering jack that was.). She would then plug the front cord of that cord circuit into a jack for a recording-completing trunk to the (CLR) toll switchboard.

The combination of the "straight through" cord circuit and the circuitry of the recording completing trunk made this a "toll worthy" connection from the calling line to the toll switchboard. That connection remained in place as a participant in the eventual overall toll connection.

It also required that now all switchboard positions (of the 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 toll switchboards ("tandem" switchboards) would have to be established, each position there having access only to trunks to certain destinations. The CLR operator would the set up the outward connection to a position of the tandem switchboard having access to a trunk required to continue the connection (getting this information from her "position bulletin").

3.6 The "A-B toll" method

3.6.1 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 unique nature), it is believed to have been introduced very early.

3.6.2 *Operation*

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

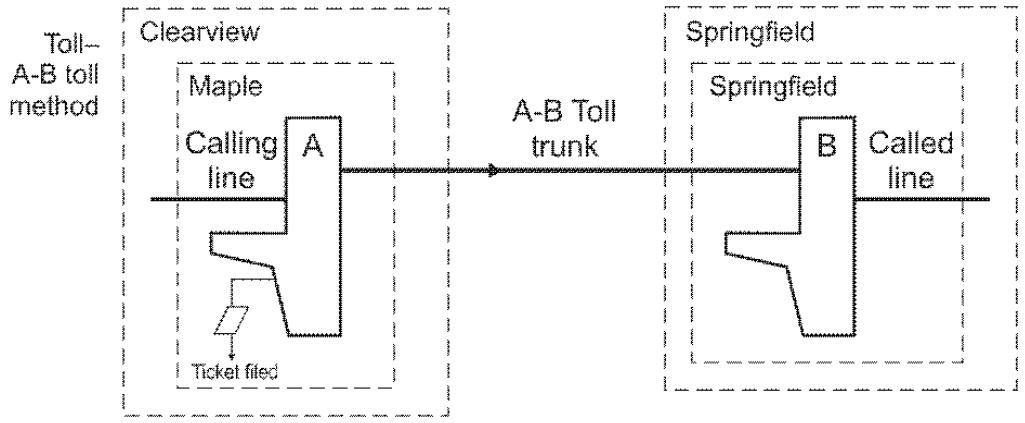

Figure 7. Toll call via the *A-B toll* operating method

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 a "station to station" toll call to Springfield should be placed through the local operator (rather than through "Long Distance").

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

Recall that this "B" switchboard is a switchboard that primarily is used to complete local calls to numbers in the Springfield office (as seen for the Springfield Locust office 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 perhaps only 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 (which she sees by a the front cord supervisory lamp on the cord circuit used for this call going dark), she notes the time. When the parties disconnect (the front cord supervisory lamp lighting), 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[4]. The connection is between an "A" switchboard and a "B" switchboard (both being "local" switchboards), no "toll" switchboards being involved.

3.6.3 *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.

Performing some of these would involve technical complications in the system equipment and switchboards, which would defeat the purpose

[4] 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

of the A-B toll 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 have been 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 a "regular" outward toll operator).

3.7 What happened to "toll worthiness"?

3.7.1 *Introduction*

In the operation of the A-B toll operating method with manual local service, the connection through a cord circuit at the "A" switchboard was not of the "toll worthy" type.

But, especially with the limitation of the distance to the destination office in force for calls to be handled by this method, the need for the connection to the calling line to have "optimal" transmission performance (which we look to a "toll worthy" connection to give) was not seen as vital.

The other main attribute of the "toll worthy" connection, that it supported ringing back to the calling line, through the local switchboard, by the toll operator, was not an issue here. The local operator (who was the "toll operator" in this method of operation) could do that, if necessary, with the regular cord circuit involved in the connection (just as for a local call..

And in any case, with the usual limitations as to the type of calls that were handled with this method, it would rarely be necessary for the operator to ring back th calling line.

At the called end, at a "B" switchboard position, the transmission circuit is associated with that end of the trunk. Accordingly, for an A-B toll connection, the transmission circuit at the end of the A-B toll trunk can be inherently "toll worthy". Thus there is no transmission compromise at that end of the connection from the use of the A-B toll method.

3.7.2 *But, to be scrupulous*

In some cases, the system planners wanted to remain scrupulous in this matter. So a slightly more complex approach was taken.

Now, at each position of the "A" switchboard in a office equipped for this form of the A-B toll method, a few new cord circuits are added, these being quite different from the existing cord circuits. These are used only for making connections from the calling line to the (A-B) toll operator, and were spoken of as "toll cord circuits". Rather than providing a "non toll worthy" connection between two cords, including a "talking circuit", these cord circuits make a straight through connection (just like a "patch cord")..

If the caller asks for "Long Distance", the serving "A" operator removes the back cord of the (regular) cord circuit she had used to answer the call from the line's answering jack. She would then take the back cord of one of these special toll cord circuits and plug it into the calling line's answering jack (yes, she had to remember what answering jack that was.). She would then plug the front cord of that cord circuit into a jack for a toll trunk to the wanted city.

The pass-through nature of the cord circuit, combined with the circuitry of that trunk, made the connection through the "A switchboard "toll worthy".

3.8 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" calls. Person-to-person calls were variously described as "particular person" or "person" calls [5]

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 of that as their "Two Number" service.

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[5] Do not expect all of these (even "station to station" or "person to person") to make sense semantically.

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: that the calls would be handled by what we know as the A-B toll method.

Although this distinct service only provided “two number” calls, it was not necessarily the only service that provided for such calls; they might also have been 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, as mentioned previously, 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.

3.9 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 got this.

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 1915 to 1934.

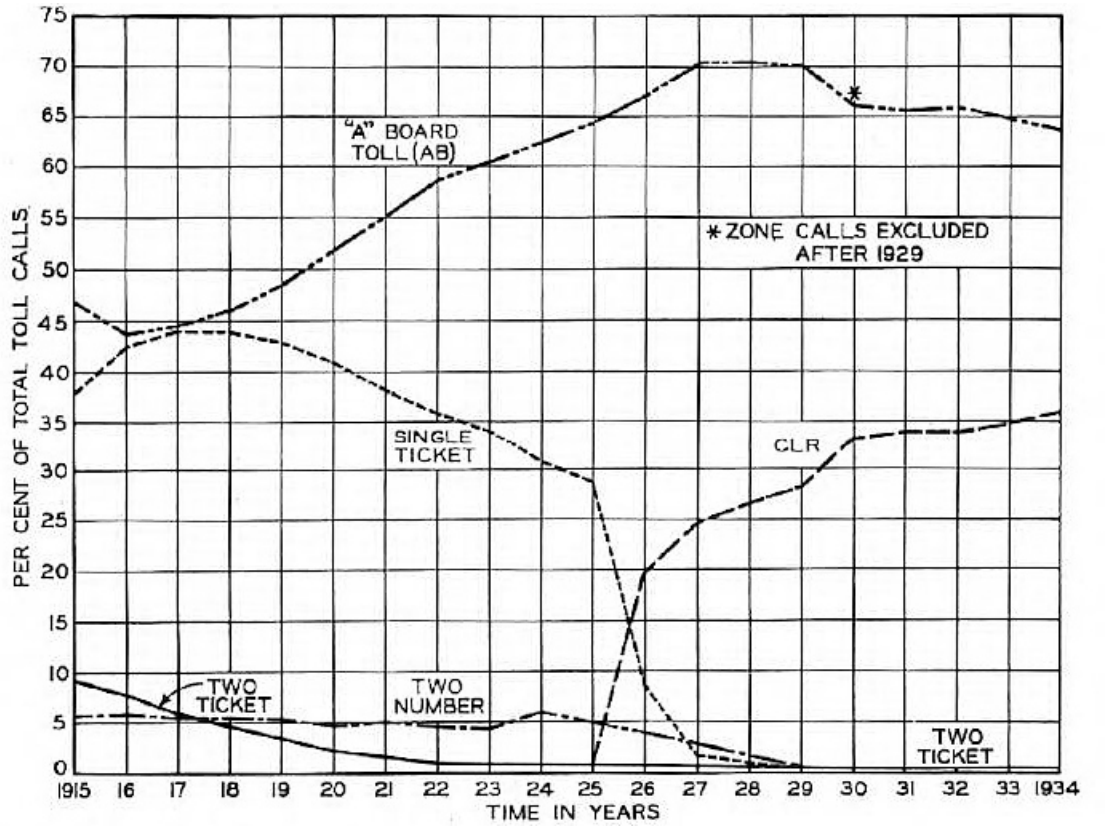

Figure 8. Distribution of use of toll operating methods

We see that by 1915 most of the toll calls were handled by either the single ticket method or the A-B toll method (labeled here as "A" board toll). The A-B toll method was by then 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 LOCAL MECHANIZATION

The discussion of the four toll operating methods given above is predicated on a manual switching of local calls.

As mechanized ("dial") operation for local calls came progressively into use, all of these toll operation methods were adapted to that context. I

will not discuss the details of that here. But, in synopsis, first for all operating methods other than "A-B toll":

- When a subscriber wished to make toll call, he would dial 110 (if served by a step-by-step switching system) or 211 (if served by a common-control switching system, such as panel dial or crossbar) to reach the toll operator.

- These switching systems were arranged so that this connection was made on a "trunk", rather than "line", basis, and thus it was straightforward to make these connections inherently "toll worthy". Thus for a toll call that was not delayed in completion, for any of the these operating methods, the outward toll operator would not have to subsequently set up the "toll worthy" connection from the calling line.

For calls to be handled by the A-B toll method, the caller would dial "0" to reach the "local operator". That was actually what was formally called the "DSA switchboard"[6]. She would then handle the call essentially as described earlier for the local switchboard operator. The connection to the DSA switchboard was "toll worthy", so it could without any compromise remain as a part of the ultimate toll connection.

6 OPERATOR DIALING

The discussion of the four toll operating methods given above is predicated on manual switching of toll calls, which might in fact involve switchboards at one or more intermediate points in the route.

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 even (by concluding the sequence with the wanted party's local 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

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[6] The original formal name of this switchboard was the "dial system A" switchboard, from which that abbreviation 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 assistance" switchboard (still, conveniently enough, abbreviated "DSA").

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"[7]. 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.

7 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), or if the calling number could not be automatically discerned by the originating local office, 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 actual "connections" were made by the switching machine, responding to numbers entered into the machines from "keypads" on the consoles (if the call was not caller-dialed.

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