Business as Usual:

Telephone Repair and Maintenance at the Bell Telephone Company of Canada

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This chapter examines histories of repair and maintenance in the early years of North American telephony, when the telephone industry was dominated by two monopolistic and closely associated telephone companies – the American Telephone & Telegraph Company in the United States (henceforth AT&T) and the Bell Telephone Company of Canada (henceforth Bell Canada or Bell).[1] It focuses in particular on the repair and maintenance practices of Bell Canada and its manufacturing arm, Northern Electric, between the 1880s and the 1930s.

Established in 1880 with capital and expertise supplied by AT&T, Bell Canada quickly acquired all but one of the telephone patents in Canada and a monopoly charter from the Canadian government. By 1887, the challenge of Canada's vast

1 AT&T was also commonly called "Bell" in the United States. For the purposes of clarity, I distinguish between the US telephone company and the Canadian telephone company by referring to them as AT&T and Bell or Bell Canada, respectively. In instances when I refer to these two companies together, I will use the term "Bell companies". The relationship between AT&T and Bell Canada was defined by a complex share-holding arrangement, in which AT&T's percentage declined from 48.8% in 1885 to 0% in 1975. Unlike other regional Bell operating companies, Bell Canada retained its ownership and had its own research and development labs and its own manufacturing branch, Northern Electric Company Limited. Bell Canada's relationship with Northern Electric paralleled AT&T's relationship with its equipment manufacturer, Western Electric in the United States, and the two manufacturing companies similarly shared information and technical components as well until the mid-1960s. See Rens, Jean-Guy: The Invisible Empire, Montréal: McGill-Queen's Press 2001, p. 65 and 217–218.

geography and the reluctance of Canadian investors prompted the company's directors to consolidate operations in Québec and Ontario, which were Canada's most populous provinces and home to its largest and most prosperous urban centres, Montréal and Toronto. Headquartered in Montréal, Bell Canada was never part of the (American) Bell System, but it did function as a Bell operating company, and the two companies were closely linked, freely sharing technical information and business strategies, until the mid-1960s.

Bell operating companies, including Bell Canada, were unique among their competitors in recognising the important role of repair and maintenance in the development and proper functioning of telephone networks (fig. 1). Unfortunately, the routines and rationales of repair operations were not carefully documented during the period prior to the introduction of Scientific Management techniques to Bell's operations in the late 1920s. Information on what was repaired and how, as well as who was responsible for repairing, is difficult to ascertain from company records.[2] Similarly, and perhaps not coincidentally, the practices and routines of repair have received less than their due of attention by historians of telephony. Like other scholars interested in histories of repair, I am attracted to the avenues of investigation that the study of repair and maintenance opens up.[3] For historians of technology, shifting the focus away from histories

2 Unlike North American independent telephone companies, Bell operating companies allocated a percentage of revenues for maintenance and repair and drew attention to this fact in their publicity and promotions. A Bell operating company spokesman noted that a "telephone plant deteriorates rapidly – more rapidly, perhaps than the mechanical equipment used by any other modern industry", that any telephone company that did not make such investments was failing both its subscribers and its shareholders. A pamphlet produced by another Bell operating company suggested that Bell companies allotted 8% of the cost value of their networks to maintenance and repair. See MacDougall, Robert: The People's Network: The Political Economy of the Telephone in the Golden Age, Philadelphia: University of Pennsylvania Press 2014, p. 144–145.

3 For example: Denis, Jérôme/Pontille, David: "Material Ordering and the Care of Things", in: Science, Technology, & Human Values 40, 3 (2015), p. 338–367; Jackson, Steven J.: "Rethinking Repair", in: Gillespie, Tarleton/Boczkowski, Pablo J./ Foot, Kirsten A. (eds.): Media Technologies. Essays on Communication, Materiality, and Society, Cambridge, MA/London: MIT Press 2014, p. 221–239; Krebs, Stefan: "Dial Gauge versus Senses 1–0: German Car Mechanics and the Introduction of New Diagnostic Equipment, 1950–1980", in: Technology and Culture 55, 2 (2014), p. 354–389; Lucsko, David N.: Junkyards, Gearheads, and Rust: Salvaging the Automotive Past, Baltimore: Johns Hopkins University Press 2016; Strasser, Susan: Waste and Want: A Social History of Trash, New York: MacMillan 2000.

of innovation and discovery allows closer attention to be paid to what David Edgerton has called "technology-in-use", to the materiality of technological artefacts under study, and to the economic and social aspects of the practices and relations of labour involved in the activities of maintenance and repair.[4] It also, certainly in the case of the telephone, makes the interconnection between technological systems and human networks of workers and users more explicit and visible.

Figure 1. In this advertisement Bell Canada boasts about the scale of its repair operations and offers instructions on how to care for telephones (Montreal Gazette, 3 May 1917, BCA, File: Newspaper Clippings 1910–1918).

The repair and maintenance of a "technology-in-use" as vast as a telephone system is necessarily ongoing and occurs at many sites. The local loops, trunks, and switching offices, and the millions of kilometres of wire that link these components, are all potential sites of breakdown and failure. Likewise, telephone users

4 Edgerton, David: "From Innovation to Use: Ten Eclectic Theses on the Historiography of Technology", in: History and Technology 16, 2 (1999), p. 111–136.

also constitute potential sites of technological breakdown, particularly during the period under study here. For this reason, I focus on the repair and maintenance of telephone subscriber equipment, in other words the technological instruments people used to make a telephone call: the telephone sets and private branch exchanges (PBXs) that were installed in residences and offices in Canada's urban centres. While Bell operating companies famously documented and quantified almost every aspect of their operations after the adoption of Scientific Management methods in the 1920s, information on Bell Canada's early repair and maintenance practices was more difficult to find and had to be gleaned from references in contracts, meeting minutes, and internal correspondence. The most fortuitous and useful source of information was a set of oral interviews conducted with retired repair workers who worked in Bell Canada's Telephone Contract Division at different times between 1907 and 1983. These interviews provide rare insight into the work of repairing telephones and the working lives of telephone repairmen that, like telephone use itself, are typically considered too mundane to warrant documentation. By looking at conditions on the ground through the accounts of those Bell employees most directly involved in the maintenance and repair of telephone equipment, this chapter contributes to the project proposed by Andrew Russell and Lee Vinsel to "knit together stories and anecdotes – microhistories, if you will – into an overarching narrative of maintenance".[5] This narrative is valuable, in and of itself, for what it tells us about technologies-in-use and the myriad ways that technologies were integrated into modern societies.

Furthermore, I suggest that understanding the historical role of maintenance and repair in the telephone industry is especially important today, for the insights it offers into the persistence of technology in the pre-liberalised telephone industry and beyond. Owning and leasing its telephones, and making significant investments in the maintenance, repair, and reuse of its equipment, allowed Bell to expand its networks and, most importantly, to safeguard its monopoly, during times when telephones were in short supply or when technological components malfunctioned. In turn, it can be argued that Bell Canada's monopoly status provided the conditions that made the integration of maintenance and repair in its operations both possible and logical. It is notable, though, that AT&T and Bell Canada chose to expand and rationalise their maintenance and repair operations in the mid-1920s, the same period that the majority of North American manufacturers embraced planned obsolescence. Key to making sense of this decision was

5 Russell, Andrew L./Vinsel, Lee: "After Innovation, Turn to Maintenance", in: Technology and Culture 59, 1 (2018), p. 1–25, here p. 7.

the associated companies' conception of the telephone as a technology and a utility rather than a commodity. This distinction made the maintenance and repair of telephone technology, or its persistence, a central concern of telephone operations. The telephone industry's valorisation of technology's persistence is instructive, especially when considered in the context of the present environmental crisis, to which the mass disposal of telecommunications devices contributes. Documenting the essential role played by repair and reuse in this modern technological industry helps to demonstrate that there was nothing natural or inevitable about 20th-century capitalism's embrace of obsolescence and disposability, and perhaps offers a means to imagine new ways of thinking about technological devices and their users.

MAINTAINING THE "TELEPHONE PLANT"

During the first 100 years of telephone service, Bell Canada, like AT&T, owned not only its systems' cables and wires, switchboards and central exchanges, and the public telephones found in city streets and inside stores, hotels, train and bus stations; it also owned the private telephones used by its residential and business subscribers. Altogether this technological apparatus – from the cables and wires to the telephones installed in homes and offices – made up what the Bell companies called their "telephone plant", a single operational entity that they owned, managed and maintained.

The affiliated Bell companies' conception of the "telephone plant" – with the telephone set imagined as just one component of the larger telephone system, and not a product, appliance or commodity – is significant for historians of technology because it distinguishes them from other utility companies and helps to explain why the repair and maintenance of subscriber sets was critical to the operations of the Bell telephone companies. Most utility companies – electric and gas companies, for example – provided services but did not manufacture or own the lamps, stoves and furnaces that their subscribers used. Since the consumers of these utilities purchased and owned their lamps, stoves and furnaces, it followed that it was their responsibility to maintain, repair or replace them as they saw fit. The condition of any one customer's technical devices was of little concern to a utility company because it did not affect the operation of its larger system. This was not the case with the telephone system, however, because subscribers using inferior telephone sets would experience inferior service and so would anyone they were calling.

Retaining ownership of and responsibility for the telephone set, and leasing it to Bell subscribers, was an early and strategic decision. It gave the Bell companies a degree of control over the technical and political problems associated with maintaining both the telephone system and their monopoly status. Bell Canada was granted a monopoly in 1882 by the federal government by arguing that its telephone service was "a work for the greater advantage of Canada".[6] Government support for Bell's monopoly rested on the company's argument that single ownership was the only way to guarantee quality of service across the entire telephone system, and so subscribers complaining of inferior service could threaten Bell's monopoly. By providing them with telephone sets that met its technical standards, Bell was able to ensure the quality of service and meet its government-imposed mandate. Ownership of "the entire plant" also allowed Bell to control the pace of technological change, and thereby to avoid the early obsolescence of equipment by introducing new technologies or components only when it was financially advantageous to do so. The leasing system also allowed Bell to monitor and maintain the quality of its telephone sets. Under Bell's leasing arrangements, when subscribers cancelled their service or moved, their telephone set would be disconnected and removed. All disconnected telephones were returned to Bell's storerooms, where they were inspected and repaired or reconditioned. Worn parts would be replaced, technical components that had become obsolete would be updated and the telephone's appearance would be refreshed if necessary, its casing polished and new telephone cords fitted.

As a consequence of the political and technological arrangements of both AT&T and Bell Canada, their telephones were manufactured to distinctive criteria. Unlike manufacturers of lamps, stoves and furnaces, for whom consumer preferences and popular style trends were key factors in company decision-making, the affiliated Bell companies' overriding concern was that the technological instruments and components that made up its telephone plant, including subscriber sets, should be long-lived, durable and repairable.

INTEGRATING MAINTENANCE AND REPAIR

At the turn of the century, the North American telephone network was still a work in progress and the telephone industry was far less organised than it would

6 Armstrong, Christopher/Nelles, H. V.: Monopoly's Moment: The Organization and Regulation of Canadian Utilities, 1830-1930. Philadelphia: Temple University Press 1986, p. 72.

become by the mid-1920s. Bell's 1885 attempt to stave off competition by buying up independent competitors and attempting to build a long-distance network left it chronically undercapitalised, just as demand for telephone service was beginning to grow. The rising demand for telephone service was a mixed blessing for Bell. More subscribers meant more revenue but also more expenditure on new central offices and new equipment. At this time, Bell purchased its telephones from a number of manufacturers (including Western Electric, the manufacturing arm of its American counterpart AT&T), but telephone manufacturers were unable to produce enough telephones and switchboards to satisfy demand.[7] Bell's repair operations provided it with the ability to (almost) keep up with demand, as well as giving it a degree of control over the costs and quality of equipment. The great demand for telephone service – and the difficulty meeting it – was a concern that reached the highest offices at Bell. In 1882, Bell's vice president wrote to the manager of the Ontario division enquiring about unused equipment that appeared in his inventory report: "Are these out of order? If so, you can ship them here [to Montréal], and we will repair them. We wish to put all this old material in order, that we may be able to utilize it as much as possible."[8] Any telephones that could be repaired were, so that they could be put into service.

The minutes of a meeting of Bell's senior officers and agents held in May 1887 demonstrated both the company's understanding of the importance of maintenance and repair and the nascent state of the telephone industry at that moment. Decisions about who would do the work of inspection, maintenance and repair and how it was to be done were still unresolved. The need to establish a system of inspection, whereby an inspector would be employed to visit central exchanges and inspect the equipment on a regular basis, was identified, but there was little agreement on whether this person should also be expected to do repair work. It was initially proposed that inspectors should only carry out inspections – that is, they should be separate from repair work, with Bell's vice president and managing director noting that inspectors should not be put in the position of inspecting repairs that they had made in the past. One district manager countered

7 The number of Bell subscribers in Québec and Ontario grew eight-fold between 1906 and 1929, from 95,145 to 761,456. See Mussio, Laurence B.: Becoming Bell, Montréal: Bell Canada Enterprises 2005, p. 40. The number of telephones in service in Canada grew rapidly between 1920 and 1930, from 856,000 in 1920 to 1,403,000 in 1930. Armstrong/Nelles: Monopoly's Moment, p. 295.

8 Memo from C. F. Sise, Vice President, to Hugh C. Baker, Manager, 12 Jan. 1882. Bell Canada Archives (henceforth BCA), Repair Service, Subject file: Correspondence 1882.

that Bell should purposely seek out agents capable of doing both their own inspections and repairs, while another proposed that the inspector "should be a sort of travelling repairer". Yet another agent suggested that, in smaller offices, telephone operators might also be trained in repair work.[9] The meeting yielded no conclusive agreement about how the company should organise inspection and repair work, thus leaving managers and agents to continue making their own judgements about how best to maintain their telephone equipment.

Nevertheless, evidence of Bell's desire to develop systems of quality control over its operations can be seen in these discussions.[10] An important step in this direction took place in 1895, when Bell established its own manufacturing subsidiary, Northern Electric, to build and repair telephones for its system as well as for independent telephone companies. In September 1912, Bell Canada and Northern Electric formalised their relationship by signing an agreement that established what would come to be known as the "Telephone Contract Division". It designated Northern Electric as Bell Canada's agent responsible for procuring "by manufacture, purchase or otherwise … any apparatus, supplies, or materials" that the telephone company might require. The term "otherwise" undoubtedly referred to repair work: "Operating a local repair and emergency shop" was notable on the list of the new division's responsibilities.[11] The growing demand for telephone service exceeded the production capacity of Northern Electric and that of independent manufacturers as well. By repairing and reusing telephones that it already owned, Bell was able to fill more subscribers' orders and continue to expand its network.

9 Minutes of a meeting of the officers and principal agents of the Bell Telephone Co. of Canada, Montréal, 16 May 1887, BCA, B-26606, p. 4–5.

10 Paul J. Miranti describes how the Bell System's efforts to "certify the reliability of its equipment and to provide economical service" between 1877 and 1929 provided the "learning" that resulted in the gradual development of an "organizational structure for coordinating and controlling quality assurance activities at both the staff and line levels and between the corporate elements of the Bell System". Miranti, Paul J.: "Corporate Learning and Quality Control at the Bell System, 1877–1929", in: Business History Review 79 (2005), p. 39–72, here p. 39. Although Miranti focuses on Bell's US operations, similar processes and systems were implemented by Bell Canada. Miranti does not address the roles played by repair and maintenance in the development of systemic quality assurance, but their importance can be easily drawn out from his account. See ibid.

11 Agreement between the Northern Electric and Manufacturing Company Limited and the Bell Telephone Company of Canada Limited, 10 Sep. 1912, BCA, B-21121-S contract 1912.

As the number of telephones in service grew over the first decades of the 20th century, the need for workers to repair and maintain the telephone plant grew, too. While the 1912 agreement had identified telephone repair as an integral part of Bell's operations, the actual work of repair remained an ad hoc practice for some years, as Bell struggled to meet demand and maintain service quality. Northern Electric's manufacturing activities were consolidated in a single building in Montréal in 1912, but Bell continued to operate local storerooms and repair workshops (including in Toronto and Montréal) until 1925 and 1929, when Distribution Houses were built in both cities.

EARLY MAINTENANCE AND REPAIR PRACTICES AT BELL CANADA

While there are few records of Bell's repair operations prior to 1925, a series of interviews conducted in 1968 with retired Bell repairmen have proven to be invaluable sources of information about that under-documented period (and beyond). Employed over the period between 1907 and 1966 in Bell's Toronto Plant Department, they offer insights into the day-to-day routines of repairmen and how the role and practices of repair changed as the company grew.

The interviewees were all hired between the years 1907 and 1925, a period when high demand for telephone service coincided with wartime labour shortages. They describe Bell's hiring practices as being relatively informal – each of them recalled being recruited by neighbours and relatives who were Bell employees, and it seems that Bell's workshop supervisors had the authority to hire workers directly. Each of the men was hired without previous experience doing telephone work, which was not unusual given the relative newness of the industry. A job at Bell was seen as offering good, steady, dependable work. George Dumbleton, who appears to have been in his very early teens when he was hired in 1907, spent the first 18 months on the job "cleaning sets", "repairing receivers" and "doing odd jobs around the Storeroom" before he was transferred to work in installations, and then moved on to work in repairs.[12] His long sojourn in the storeroom was likely due to his young age. Harald Judson, who was in his early

12 George L. Dumbleton. Interviewed by A. Barwell. Life Story. Toronto, 8 Dec. 1967. BCA, Bio-file: G. L. Dumbleton. Dumbleton talks about preparing for the Owen Sound cut-over, which took place in 1959, and then goes on to describe working for a number of years after that, so he likely retired in c. 1960. If he was 14 years old in 1907, and he worked until 1960, he would have retired at 68 years of age.

20s when he joined Bell in 1922, also started as a storekeeper (at $0.35 an hour) but only stayed there for six months before being moved into installation work.[13] "Ted" Eames was hired in his mid-20s and was assigned to installations from the start, but only worked there for six months before being transferred to repair work.[14] According to Judson, installation work was "a young man's game, lots of speed, and go, go, go" and moving to repair work was seen as a step up, but the boundaries between installation and repair during these years were fairly permeable. While Dumbleton and Eames remained working in repairs once they were transferred, Judson described being reassigned to installation work at various times in his career when the need arose.

The repair shops operated on an apprenticeship model: new employees received their training in telephone repair and maintenance on the job from more experienced workers. If installation work was a "young man's game", repair work was the purview of a more diverse group of workers. Judson recalled that one of the three senior men who worked exclusively repairing and testing subscriber equipment was a war amputee, one of a number of veterans who found work at Bell after the First World War ended. Another, a part-time employee, was "an odd type" but "a magnificent pianist", who Judson believed was hired so that he could play in the Bell Telephone Orchestra.

Like the telephone industry itself, Bell's on-the-ground operations of installation and repair appear to have been somewhat informally organised during the first decades of the 20th century. Bell's Toronto repair workshop was housed in its Elm Street Storehouse, a former garage located in the downtown district. It is possible but unlikely that Bell owned the property; it appears that during this period Bell leased both the buildings and the services it used on an as-needed basis. Dumbleton, who worked at this site, reported that materials used by the repair shop were delivered to the Elm Street site by a "horse and waggon" leased from "Mr. Walsh on Queen St.". Installation crews and their equipment were also transported this way. Bell repairmen, on the other hand, were left to arrange their own means of getting to and from their job sites. The Church Street Storeroom where Judson worked was located in an old church that had been converted into a boxing gym. Bell rented part of the church for its storehouse and it seems that

13 Harald Dowson Judson. Interviewed by F. F. Pendock. Life Story. Toronto, 17 Sep. 1968. BCA, Bio-file: Harald Dowson Judson.

14 Edward (Ted) J. Eames. Interviewed by A. Barwell. Life Story. Toronto, 7 Feb. 1968. BCA, Bio-file: Edward (Ted) J. Eames.

much of the district's subscriber equipment – telephone sets and some PBXs – was repaired here.[15]

During these years, repair work took place at the repair workshops, at the homes of residential subscribers, and on site at the locations of Bell's commercial subscribers. Repair work that took place in the workshops typically involved repairing and reconditioning telephone sets and smaller PBXs that Bell retrieved when subscribers cancelled their service or moved. Judson explained that repairs to "the simple sets of that era" – 1293 wall sets, D020 desk stands, 295A bell boxes and 1294 wall sets – were straightforward: "[w]e changed hook switches, receivers, transmitters, cords, etc." Once repaired or reconditioned, these telephones could then be picked up by the installation men to be connected at a new location. Even with repaired telephones augmenting Bell's stock, Judson recalled that during this period the storehouses "were [often] very short of sets and installers would come in waiting for them". Judson also recalls that the shortage of telephones was often matched by a shortage of installers. He remembered that sometimes "sets" delivered to homes and offices "might be there for a couple of months before an installer came around to connect them up. Sometimes, by the time the installer got there the people who ordered the phone, had gone".[16] The shortage of workers – and the growing demand for telephone service – was likely the reason that some plant employees worked in both repairs and installations over their careers.

Bell repairmen were also sent to the homes and offices of subscribers to fix telephones that had malfunctioned. While Bell leased trucks when it needed to move materials or deliver equipment, repair workers were responsible for getting themselves and their tools to and from their work sites. Eames recalled that repairmen working in Toronto "either walked to the job or rode a bicycle. The Company paid us $5.00 a month for the use of our own bicycle. You would put your tools on the back, your wire etc. on the handlebars and either rode or pushed it to the job."[17] This was manageable if they were assigned to work in their home district; otherwise repair workers used public transit to get to the job site. Toronto was informally divided into West, Central and East districts – but

15 There is some discrepancy between the accounts of Dumbleton and Judson as to whether the Elm Street Storehouse or the Church Street Storehouse was Bell's first repair shop in Toronto, and whether one replaced the other or both operated simultaneously. The two sites are located no more than 1.5 km apart, approximately a 15–20 minute walk.

16 All quotes Judson, p. 2.

17 Eames, p. 4.

Bell's installation and repair operations were not organised by district at this time. Job orders were sent out from a centralised dispatch office in the downtown district and the repairmen could be sent anywhere in the Toronto territory. Judson, who worked primarily on residential installations and repairs, recalled that this sometimes resulted in workers spending much of their time commuting, not always productively, from job site to job site.

"If you were out in the West and called in, you might be dispatched to the East End and have to pedal all the way across Toronto.... When you got down there the people might be out [and you might then be] sent up [to the north end of town]."[18]

Repair workers tried to make any necessary repairs they could at the subscriber's location, both in order to save a return trip and because of the scarce supply of replacement sets. "If there was anything wrong with the telephone and it had to be changed, it was quite a job to get a new one. What we used to do was come into the garage at night, look over the telephones recovered by the installation that day and if they looked to be good, those [were] the ones that went into the subscriber's premises the next day."[19] Telephones returned from one subscriber's home or office were quickly pressed into service for the next, as demand outpaced production capacity.

According to Eames, the technologically simple telephone instruments of the period were relatively easy to repair.

"[Most] had an old 323 transmitter that used to get packed every once in a while. So we would undo the screws, loosen the button, give it a twirl with a thumb and put it back together again, perhaps blow into it a couple of times, and most of the time it would make it work all right."[20]

His account suggests that repair work often relied as much on creative improvisation as on technical skill.

"The diaphragm [of 122 or 144 type receivers] used to get rusty and you could fix that by taking it out, dusting it on the seat of your pants and then putting it back into the receiver. You would tell the subscriber that it was all right now, she would call a friend and then

18 Judson, p. 3.
19 Eames, p. 4–5.
20 Ibid., p. 6.

usually tell you that it was now just 'wonderful'. That would be the extent of many repairs on telephones."[21]

While all three repairmen downplayed the degree of technical skill required to repair residential subscriber equipment, each of their accounts reflects an awareness of the importance of maintaining good relations with subscribers.

Eames described residential repairs as typically routine, but recalled having a bad experience when a subscriber falsely accused him of taking her purse and "[didn't do] much apologizing" when she later found it.[22] Eames found residential repairs neither interesting nor challenging. He was happy when he was sent to work with Bell's business subscribers in Toronto's downtown district, where he was able to maintain and repair a wider range of telephone equipment, including switchboards. Judson, on the other hand, enjoyed the variety and sociability of residential repair work, noting that "there [was] something different all the [time] as no two jobs [were] alike". He observed that it was the nature of repair work that repairmen had to deal with subscribers who were not at their best. "Our reception [by the subscriber] was not always good with the phone out of order. However on installation, if they [had] been waiting a long time for a phone, your reception [was] no better. There is a great sameness about installation and a great variety on repair."[23] Apparently, the varied jobs Bell's residential installation and repair workers were called on to do included rescuing cats that climbed up telephone poles and couldn't find a way down. Eames described the established protocol for accomplishing this job without sustaining injuries as wearing a heavy coat, making sure to turn up the collar, climbing up the pole and waiting for the cat to jump on one's shoulder, and then climbing back down, at which point the cat would typically make its happy escape. He claimed to have successfully rescued many cats this way without receiving a scratch.[24]

Senior and more skilled workers were typically assigned to the repair and maintenance work done on site for Bell's larger commercial subscribers, such as

21 Ibid. In his ethnographic study of the field service work performed by Xerox technicians, Julian Orr notes that technicians considered the maintenance of good relations with their customers as being just as important as the maintenance of the machines. He describes how maintaining this "triangular relationship of service" between technicians, customers and machines allowed technicians to establish an image of authority and professionalism. Orr, Julian: Talking about Machines: An Ethnography of a Modern Job, Ithaca: ILR/Cornell University Press 1996, p. 78–79.

22 Eames, p. 5.

23 Both quotes Judson, p. 5.

24 Eames, p. 6–7.

hotels, department stores, and railway stations. This work could include repairing any malfunctioning telephone sets, but primarily involved keeping the switchboards of commercial subscribers in good working order. Maintaining PBXs required a greater degree of technical expertise and these assignments were viewed as a sign of an employee's greater reliability and superior skills, and therefore higher status. Dumbleton explained that when he "graduated" from repairing sets, he spent several years assigned to the maintenance of switchboards for both Canadian Pacific Railway and Canadian National Railways at Toronto's Union Station, and then did similar work at the King Edward Hotel.[25] Two of the three interviewees described having worked at Eaton's, Canada largest department store, installing and maintaining the switchboards and "order tables" that were required for its business and telephone sales operations (fig. 2).[26] Eames' description of the repair work he did in the downtown district in the 1920s demonstrates both the rudimentary nature of the era's telephone technology and the degree to which ongoing maintenance and repair were critically important to its proper functioning. Many downtown businesses and offices were fitted with 550- and 551-type switchboards, "most of which were battery [fed] from central offices on cable pairs with varying loads. The voltages used to go up and down like a yo-yo. Subscribers had much trouble with this and to overcome this the first thing [Bell] did was to send out a reconditioning crew to current flow all the relays." Apparently, the problems with these switchboards were not easily resolved: Eames noted that "[s]ome of the men did that [work] for months and months".[27] Eames estimated that, in order to ensure a reliable telephone service for its business subscribers, Bell had approximately 60 men working in repair and maintenance at this time in the Toronto downtown area alone.

By virtue of the fact that Bell's commercial subscribers required regular service and maintenance, repairmen sometimes found themselves playing a policing role for Bell. Dumbleton described discovering "buckshee" (or "free") connections on his service calls.

> "One day ... I was repairing one phone and from my position could see another three or four phones around me. I heard someone talking but could not see what phone was being used or who was using it. So I took a good look around and found that one of our ex-employees had installed a Stromberg-Carlson switchboard for them and placed phones on every floor, having run a concealed wire to one of our trunks. When I disconnected their

25 Dumbleton, p. 1.

26 Eames, p. 9; Judson, p. 1.

27 Both quotes Eames, p. 8.

concealed wiring, they put up quite a fuss. Later when I checked it again I found it had been reconnected so this time I reported it ... and after some fussing around with various people we got straightened away."[28]

Figure 2. Operators working at the "order tables" at the Eaton's department store. Bell repair and maintenance workers kept switchboards such as these in good working order (Montréal, 1931, BCA, A-30147).

It is noteworthy that Dumbleton chose not to report the unauthorised connections in the first instance. Whether this was due to a reluctance to inform on a former colleague or a gesture of good faith in the business subscriber's integrity, Dumbleton clearly believed he possessed a significant degree of autonomy in his role as a repairman.

While most of Bell's commercial subscribers were businesses located in urban centres, some were located well beyond the limits of the city's public transit network and further than one could reasonably expect a repair worker to travel by bicycle. Dumbleton remembered that when he and his co-workers were sent

28 Dumbleton, p. 4.

out to make repairs at Harris' Slaughterhouse, which was located about three-and-a-half kilometres east of the city, "we had to take the streetcar [most of the way there], and then Harris would send someone with a pony and gig to take us the rest of the way".[29] When they were dispatched to do repair work at Taylor's Farm, located to the northeast of Toronto, "we had to take a train so far and then hike it the rest of the way".[30] Judson described the lengthy journey he had to make when he was sent up to do repairs at the Langstaff Jail Farm, approximately 25 km north of the city: he had to pedal up to the north edge of the city, "leave my bicycle there, and take the Radial Car [suburban railway] from there. One of the boys at the prison farm would come out to the Radial to pick [me] up and take [me] back".[31] Bell's apparent lack of concern about the inefficient use of its workers' time underscores the importance it placed on keeping its service in good working order and its subscribers happy. It speaks, too, of Bell's expanding network and the growing ubiquity of telephone service among Canada's urban and suburban populations.

RATIONALISING TELEPHONE MAINTENANCE AND REPAIR

As Bell reorganised its operations according to the principles of Scientific Management, new cadres of professional managers, often engineers, began to oversee and then replace the foremen who had been responsible for running the storerooms and workshops.[32] Repair work moved from Bell and Northern Electric's workshops to new modern purpose-built facilities. The new Toronto Telephone Distribution House was erected in October 1925, and its Repair Department opened in the autumn of 1926.[33] Montréal's Telephone Distribution House was completed in early 1929, with its Repair Department installed in February of that same year.[34] While the apprentice model of on-the-job training for novice telephone repair workers continued, it was shaped and supplemented by courses

29 Dumbleton, p. 5.

30 Ibid., p. 5.

31 Judson, p. 4.

32 Miranti, "Corporate Learning", p.46 and 48.

33 Telephone Distributing House Premises–Toronto (1925), BCA, Northern Electric Historical Collection, Vol. 4, #10791.

34 Telephone Distributing House Premises–Montréal (1929), BCA, Northern Electric Historical Collection, Vol. 4, #10508.

that were mandatory for both new and experienced workers.[35] Dumbleton recalled taking and enjoying "several of the courses", as did Judson.[36] Eames described the implementation of weekly meetings at this time. Led by the Repair Department manager and foreman, the meetings were designed to keep employees informed of technical advances and changes and to convey job safety guidelines and procedures.[37]

Another effect of Bell's adoption of Scientific Management methods was a sharp increase in the production and circulation of information about Bell's and Northern Electric's operations. In addition to thorough documentation on operational activities and finances in their internal communications, both companies also introduced publications aimed at keeping employees – and, in the case of Bell, its subscribers as well – informed about new developments.[38] Whereas it was difficult to find information about Bell's repair and maintenance practices prior to the mid-1920s, by the 1930s, feature articles in these new publications offered detailed accounts and photo documentation on repair operations in the Toronto and Montréal Distribution Houses (fig. 3).

According to a 1938 article in Bell Canada's *Blue Bell* magazine, each Distribution House contained a warehouse, a repair shop, and a company garage that housed a fleet of 100-plus trucks used to pick up returned materials.[39] It portrays repair operations at the Distribution Houses as fully routinised, with repair shop workrooms that were modelled on laboratories: orderly, clean and well lit, with fully-equipped work benches. It details the journey that "returned" telephones took from their arrival at the Distribution House through the assessment process that determine whether they would be "junked" or sent to the Repair Shop. Returned telephones deemed worthy of repair were sorted again in the Repair Shop

35 Dumbleton was one of the repairmen who were often assigned to train new employees. In his interview, he recalled that during this period there were "two years steady [when] I don't think there was a week without having someone with me to train. I finally got fed up with the whole thing". Dumbleton, p. 4.

36 Ibid.; Judson, p. 5.

37 Eames, p. 8–9.

38 For example, Bell began publishing Blue Bell magazine in 1921 to keep its employees informed about new developments and company social events. Northern Electric began publishing its employee magazine, Northern Electric News, in 1927. Bell also began publication of a circular called Telephone News in 1934 to inform subscribers of new developments and proper telephone etiquette.

39 Telephone Repair Shops, Blue Bell, (Jun. 1938), p. 16–18.

according to the types of repair needed, before being repaired, tested, then packaged and sent to the warehouse to await future installation.[40]

Figure 3. "Alvin Keith checks a consignment of miscellaneous material and equipment sent from the Bell Telephone distributing room to the returned material department or the Northern Electric Company on Shaw Street." (Image and caption appeared in Blue Bell, Bell Canada's employee magazine, Oct. 1942, BCA, A-38716-01)

The 1938 article is significant in that it provides a careful account of the volume and value of Bell's repair operations – information that could be inferred from earlier documents but not confirmed. The article reported that the telephone apparatus returned to the Toronto and Montréal repair shops in 1937 had included: 173,000 telephones, 74,000 bell boxes, 460 PBX switchboards and 670 telephone booths, with an estimated total value of C$4,676,000. Of the total number of returned apparatus, 152,000 telephones, 62,000 bell boxes, 304 PBX switch boards, and 548 booths (or 65 to 85% of the devices) were repaired and/or reconditioned, and moved into storage at the Telephone Contract Division's warehouses, ready to be put back into service. According to the article, the recuperat-

40 Telephone Repair Shops, p. 16.

ed value of the repaired apparatus was C$3,834,320 at a cost of C$748,160 for parts and labour.[41] To put this into perspective, Bell's repair operations yielded more than C$3,000,000 of recuperated value in a year when Bell's reported operating balance was C$12,519,975.55.[42]

Figure 4. "These [wall sets] have been repaired and reconditioned and are being cleaned before being refinished. The Cleaners are left to right, John Wilkinson, Gordon Hann and James Dunn." (Image and caption appeared in Blue Bell, Bell Canada's employee magazine, Oct.1942, BCA, A-38716-04)

The representation of the value of repair and maintenance in this article – and in similar articles and reports that followed in the 1940s and 1950s – is both a demonstration and an effect of Scientific Management's influence on the operations of Bell and Northern Electric's Telephone Contract Division beginning in the 1920s. While these later records offer detailed descriptions of the *fiscal* value of repair and maintenance to Bell's operations, evidence of Bell's recognition of the *instrumental* value can be inferred from its integration of repair and mainte-

41 Telephone Repair Shops, p. 18.

42 Bell Telephone Company of Canada Annual Report, 1937.

nance in its earliest conception of its telephone business. By recuperating, repairing and reconditioning, rather than replacing, its telephone sets and equipment, Bell's repair operations proved to be an important factor in the company's ability to manage costs, meet demand for service, and monitor and maintain acceptable levels of technological quality (fig. 4).

CONCLUSION

The accounts of the Bell Canada employees offer insights into the day-to-day routines and experiences of telephone repair work in Canada's largest cities during a period for which little documentation exists. Repair work was perceived by these employees as being of higher status than installing telephones, requiring technical knowledge and resourcefulness as well as social skills. They recognised and seemed to enjoy the fact that they possessed a degree of independence that was greater than other workers in the Plant Department. Taken together, the recollections of the repairmen show repair work to have been a necessary and integral component of the telephone as a technology-in-use, which literally ensured that telephones and the telephone network could be "used". They describe how Bell's early telephone repair and maintenance operations not only ensured that the telephone system functioned properly; they also acted as a stopgap that allowed the company to both meet subscriber demand and bridge intermittent shortages of equipment and workers. Just as importantly, they also describe how the practices and role of repair changed over the course of their careers, with the introduction in the 1920s of more systemic organisation and management across all Bell System operations, including those of its Canadian branches, Bell Canada and Northern Electric.[43]

While there is little evidence that environmental concerns motivated Bell's early decision to lease and repair its telephone equipment, it is interesting to consider what the ecological effects of that decision might be if it was still in effect today, a little more than one hundred years later. What if today's (mobile) telephones – purchased, used and disposed of, like any other commodity – were designed to be returned, repaired and reconditioned for reuse? The reflection of a Northern Electric employee, interviewed in 1983, offers an example of the persistence of technology in the *post-liberalised* telephone industry, and another reason for historians of technology to shift their focus from innovation to repair. He observed that if

43 Miranti, "Corporate Learning", p. 47.

"Northern ceased to offer support for its old equipment it would mean that every time an old piece of equipment would [break] down, we would have to throw it out rather than repair it. [They used to] say the product life is 40 years [but] it's a lot more than that, because we're still maintaining switchboards that were installed long before 1925 and they're still working and they're still giving good service".[44]

This employee's observations suggest that maintenance and repair may in fact be more durable ideas – perhaps even more modern, and more profitable – than planned obsolescence. This chapter suggests that looking back at the telephone industry's practices of recuperating, repairing and reconditioning, rather than replacing its telephone sets and equipment, may offer a way to imagine the role of maintenance and repair in the lives of our present-day technological devices.

44 Jack Brighton. Interviewed by Gordon Bennett. Life Story. Jan. 1983. BCA, Bio-file: Jack Brighton, p. 6.