Power Button

A History of Pleasure, Panic, and the Politics of Pushing

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1 Setting the Stage

In as far as what really matters in life, pain, pleasure, danger, death, it is generally constituted by or caused by events occurring in the medium of touch. ... It is in the tactile world that we "live" in as far as it is mainly events located in it that can please, hurt or kill us.[1]

The act of pushing a button provided a solution to a number of thorny problems. For one, a host of individuals and groups from inventors and electricians to factory owners and domestic engineering specialists were focused on the problem of reducing manual effort. The minor act of pushing buttons to actuate machines could, theoretically, make muscular work unnecessary. They sought to employ technologies that could reduce the intensity of hands' labor, thereby redistributing action from the whole hand or hands to but a single finger or even fingertip and from vigorous exertion to a "mere touch." Indeed, the phrase "by the mere touch of a finger on a button" circulated across nearly every industry, becoming cliché in its regularity.[2] Sweeping changes in ideas about using one's digits emphasized that "no mechanical force is therefore necessary to be exerted," and instead "the mere touch of a key, register, pedal, or finger-button" could provide easy manipulation of almost any device.[3] "Mere touch" seemed to work as if by magic, for "by the mere touch of the finger on a

button whole cities are aroused from their slumbers into a blaze of light and life before us like fairylands," one electricity enthusiast wrote.[4] Whether in factories, offices, or consumer spaces, designs for control with the smallest touch of a button promised that a newly defined hand could effortlessly command the object of its desires. To fulfill this promise required constructing a category of handwork that involved operation without effort.

Although push buttons attracted attention as an ideal mechanism for reducing hand labor, efforts to convert many hand movements to a single one extended beyond buttons specifically. Indeed, in the pursuit of nineteenth-century comfort through mechanization, many innovations involved "a single abrupt movement of the hand [that] triggers a process of many steps" in which "a touch of the finger sufficed to fix an event for an unlimited period of time."[5] Technologies like matches to start a fire or the switches used on a telephone switchboard also demonstrated a societal interest in rethinking how hands could carry out everyday tasks swiftly and efficiently, and engineers boasted about replacing difficult, hand-operated machinery with easy-to-use electrical machinery—cranes and hoists filled in for conveyors and chutes, while push buttons took the place of "laborious hand-actuated levers" and various kinds of "pulls."[6]

Yet this rhetoric of effortless machine interactions had long created uneasiness about what humans—and their hands—were supposed to do in a machine age. In treatises on laboring with machines, a perception of hand practices as atrophied had often figured importantly as evidence of human beings' alienation from production. Well before push buttons achieved mainstream usage, Marx (1848) worried in *The Communist Manifesto* that, "Owing to the extensive use of machinery and to division

of labour, the work of the proletarians has lost all individual character, and consequently all charm for the workman. He becomes an appendage of the machine, and it is only the most simple, most monotonous, and most easily acquired knack, that is required of him."[7] Marx's reference to "appendage" demonstrated a prominent fear that machines had made human beings only useless extremities, ready to provide unskilled input without authentic engagement in the production process. This opinion, routinely echoed at the turn of the twentieth century and beyond, imagined that users of automatic machines would be reduced to "spectators."[8] Concerns that machines would minimize hand gestures to rote, meaningless activities—or replace them altogether—characterized numerous discussions about mechanized labor. However, in actuality, the finger that pushed the button might be characterized by power, influence, and engagement, or by impotence, inactivity, and ridicule. These determinations only grew out of associations and links between people and machines and never independently from them.[9]

Despite the fact that hands pushed buttons, just as they pulled ropes or gripped hammers, the act of button pushing rhetorically and physically disassociated from manual labor as a less demanding—and thus somehow inauthentic—hand gesture to those accustomed to working with their hands. Workers had to negotiate what push buttons meant for their industries and for the kinds of work performed in spaces ranging from offices to factories. These worries over manual labor fit within changes occurring to the American labor force, which included a shift from agriculture to industry, greater separation between producers and means of production, and declining control over the way work was conducted.[10] Using technological mechanisms to amplify human bodies for work particularly accelerated at this

time period as human beings increasingly gave tasks over to and worked alongside machines.[11]

In line with these negotiations prompted by electrification and industrialization, proponents of electrical machines strove to redefine "work" both in and out of traditional workplaces. In the move toward streamlining workplace activities through minimal finger touches, disparities in terms of whose hands "worked" and whose hands "directed" stoked tensions among employees of various ranks. Laborers who spent their days doing physical activity expressed disdain for button pushers because they defined "work" as physical exertion, where those who sat idly by at their desks dispensing orders—exercising nothing but their fingers—did not qualify as legitimate workers in the eyes of others.[12] Rhetoric of this kind reflected the agenda of the scientific management movement, in which workers were taught to calibrate their hands with buttons that would enable them to perform "efficiently" with machines. To this end, scientists and efficiency experts rigorously documented the movements of bodies in factories and cataloged workers' efforts in experimental laboratories to achieve optimal button pushing. Managers, too, enthusiastically invested in scientific management principles and applied electrical solutions to minimize handwork and effort, pushing buttons to enforce discipline, control, and rationalized movement of bodies. Yet beyond these idealized views of pushing a button as an antidote to laboring hands, conflicts over how to define hands and what they could (or should) do reflected growing anxiety about mechanization. As workers pondered the definition of "work" in the industrial era, push-button control threatened previously stable understandings of labor.

As previously discussed, the act of pushing a button precipitated tensions between manual laborers and a growing class of "digital commanders," who managed others with their fingers rather than getting their hands dirty. Although we might commonly think of hands as tools of physical labor—the "hired hand," the "factory hand," the "field hand," and so on—a more nuanced exploration of hands at this time period reveals complexity and uncertainty about hands' roles.[13] Pressures to become "digital," to use one's hands to manipulate and control machines with an effortless finger touch, destabilized long-held beliefs about the hand as a modality for work, play, and everything in between. Buttons functioned as powerful scapegoats and symbols that emblematized a particular historical moment in which easy technological experiences were especially valorized and feared. To this end, push-button practices garnered so much attention because of broader shifts in meaning around "work," "manual labor," and "human touch" occurring across industries.

Although the notion of reducing bodily effort was part and parcel of the concept of pushing a button, other factors made this hand practice desirable, too. In a period of consternation about electrification, societal concerns turned toward the problem that electricity, an invisible force, evaded the senses. Writings on electricity often referred to it as "truly invisible" and "insensible in every shape or form."[14] Although close at hand, one could only verify its existence through effects. However, those effects often came at a price because touching an electrified surface could cause physical harm. So noted James W. Steele (1892) in his treatise on electricity: "Docile as [electricity] may seem ... it remains shadowy, mysterious, impalpable, intangible, dangerous. It is its own avenger of the daring ingenuity that has

controlled it. Touch it, and you die."[15] A society grappling with electrification widely debated electricity's "shocking" nature, both fearing and admiring the power of electric shocks. Medical applications of electricity promised to ameliorate all kinds of ills, while reports of electrical accidents filled up the pages of newspapers and magazines as evidence of the energy's unsafe nature.[16]

Concerns over touch as a destructive force certainly predated the advent of push buttons; in fact, touching throughout history has often connoted potency and danger, sometimes referring to an insipid form of communication or harmful transfer in the case of bodily transmission of illness. To be "touched" by illness or to communicate by "contact" implied that touch could constitute a dangerous act; the word "contagion" came from the Latin root for "touching."[17] Discussions of infection and hygiene practices focused on "direct personal contact."[18] Feeling the breath of an infected person, too, constituted a form of "communication."[19] The closeness of bodies—and their intermingling—represented a pernicious touch whereby disease could move from one person to another. According to a German physician on the subject of antiseptics in surgery (1881), "One touch of a wound with a finger which is not surgically pure may lead to a fatal result."[20] As discussions about germs reached new heights in the twentieth century, scientists and physicians began emphasizing that even bodies touching surfaces—and not each other directly—could communicate germs. Indeed, as a guide for embalmers and sanitarians warned (1913), "One single touch of the finger, moistened with saliva to aid in turning the pages of a book, might contain over 5,000 germs."[21] Touching not just anyone—but also anything—could bring about catastrophe, and this potency generated fear about fingertips' potentialities.

Much as with germs, the invisible and intangible quality of electricity created friction with a perception that, as a sense, touch was viewed as a primary way of experiencing and confirming one's reality. Many believed that "through touch we largely acquire our ultimate notions of the externality, extension, solidarity, and permanence of objects, which are so much more 'tangible' than the reports given by the other senses."[22] Indeed, psychologist George Wallace Neet (1906) wrote, "whatever seems real to the touch has met the supreme test of reality. 'Let me take hold of it,' is our demand when we distrust our other senses."[23] How, then, to manage the intangibility of electricity with a desire to touch? To "take hold" of electricity constituted a kind of faith, but it also meant interacting with it free from fear of harm, to wrangle it so it might perform according to the rhythms and regularities of everyday life.

This dichotomy between tangibility (the desire to touch so as to make real) and intangibility (invisible and dangerous to the touch) is notable: humans could not palpate electricity; it existed in the shadows. As Steele surmised, one could die by virtue of a touch. Yet at the same time, a strong desire existed to harness and come into contact with electricity. To deal with this duality, electricians and early users relied on and experimented with ways to manage electricity by strategically concealing it. By "covering up" electricity—burying wires inside walls and hiding it behind push buttons—it could thrill, surprise, and delight without threatening. The act of button pushing emerged as a technique of protection, where one could conjure anyone or anything she desired at a safe remove from the imagined dangers of the Industrial Era. Buttons made electricity simultaneously real and yet magically and safely concealed. As a 2014 study on elevator push buttons has suggested, this

concealment made buttons potent because they "sever[ed] the visible connection between cause and effect" by virtue of the fact that "the entire mechanism—electrical connections, control apparatus, motor—vanished behind the scenes. Only the push button remained visible on the surface like some last vestige and seemed to be responsible for the whole spectacle of motion all by itself."[24] Efforts to make buttons visible and tangible while tucking everything else away thus could act as a coping mechanism to make the untouchable touchable. In fact, by the 1900s, buttons' role in acting as the harmonious "face" of electricity received specific mention: "The button idea is a beneficial one, it not only embodies the principle of efficiency, celerity, snap and perfection, but it acquaints the world with the thought, that the old system, with everything exposed in its raw and operative state, is unnecessary. Food is not served in kitchens. Show rooms are separated from factories. The office is distinct from the place of the producers."[25] In this regard, a preference for buttons stemmed in part from their ability to hide machines' "raw" and messy parts.

Just as buttons could cover up electricity so it would turn on and off at will, hidden away until needed, so too did push buttons serve the function of managing the presence and absence and comings and goings of people. As noted, architecture—informed by new social practices—began to change: homes featured separate servant quarters; managers worked in offices away from their employees; apartments grew larger and taller, farther from the happenings of the street; automobiles put drivers at a remove from other drivers and from pedestrians. These shifts meant that people, no longer within earshot of one another, needed a strategy for garnering attention and making people strategically present or out of sight. Designers of homes,

transportation, amusements, consumer products, and so on viewed push buttons as signaling tools that could facilitate these spatial rearrangements.

The more that people required greater isolation from each other, and from the machines they used, the more they required systems to overcome, manage, or enforce this distance. Efforts to extend the human hand's reach—to get "in touch"—fit into broader changes in transportation, communication, and control, which involved "the reordering of distance, the overcoming of spatial boundaries, the shortening of time-horizons, and the ability to link distant populations in a more immediate and intense matter."[26] This tension between proximity and distance raised important questions about the ways that hands should navigate newly electrified environments, and it also muddled long-held beliefs about touch as a proximate sense. Other senses seemed to travel across distance by virtue of electrical technologies. As Edward Bellamy (1897) suggested of this era, "You stay at home and send your eyes and ears abroad to see and hear for you."[27] The sense of touch, however, posed a greater challenge in terms of its portability. Physicians and scientists commonly confirmed that touch did not "extend beyond the reach of the arm" and relied on direct contact between two bodies.[28] Notably, it has been argued, "of all the senses, touch is the most resistant to being made into a medium of recording or transmission. It remains stubbornly wed to the proximate; indeed, with taste, it is the only sense that has no remote capacity."[29] Yet technologies like push buttons that could spur action over distance with a finger seemed to defy this logic. Indeed, author George T. Lemmon (1899) poetically wrote, "Our fingers have grown immensely longer. We touch each other from vast distances these days."[30] Although Lemmon might have referred to

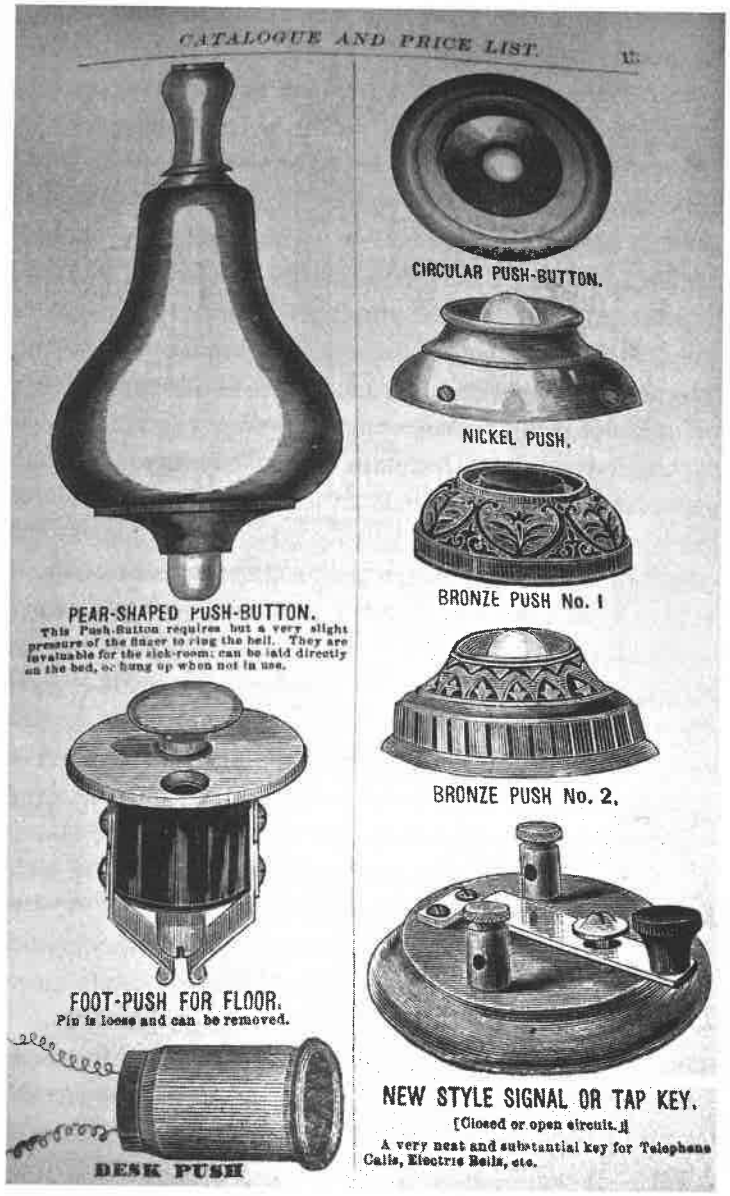
a kind of metaphorical "touch" based more on communication than physiology, his words spoke importantly to a burgeoning relationship among hands, touch, reach, and distant effects that once seemed impossible.

Within these contexts, "pushes" (another name for buttons) came to serve as the most familiar kind of control mechanism for domestic and commercial purposes in the United States.[31] The type of switch employed mattered on a number of levels, from its technical capabilities and cost to its aesthetics and correspondence to the surrounding environment. For example, Frank Eugene Kidder recommended to architects and builders that home designers should choose the button option when "a neat appearance is desirable."[32] He noted that electricians should implement snap switches (which looked similar to today's oven dial and were operated by the turn of a wrist) when looks did not matter because they were inexpensive but less pleasing to the eye. Thus, snap switches constituted an appropriate choice in vestibules or hallways, but highly trafficked areas such as sitting rooms, dining rooms, and parlors should feature push buttons.[33] Meanwhile, knife switches acted primarily as circuit breakers, meant more for industrial use and higher voltage.[34] As Kidder noted, buttons became popular for everyday use not because they worked better than other switches but because they could be disguised as not-switches; aesthetically, they blended best with their surroundings so as to appear unobtrusive. Buttons came in all shapes, sizes, and degrees of expense; the "common variety" wood ones used walnut, rosewood, oak, maple, or mahogany. Compared with those more ornate buttons made from metals like brass, wood buttons earned a reputation as "cheap and ugly."[35] Due to buttons' many variations, experts

and homeowners chose materials for these buttons depending on their purpose and degree of visibility in the home.

In the early 1880s, few electric buttons existed because few electric devices were available to the general population. An 1882 catalog, for example, offered consumers three push button options: a pear-shaped push button ("To be attached to Electric Bell"), a compound push button (a panel with three buttons designed for office use so that managers could buzz a cashier or assistant), and a circular push button (in bronze, nickel, or wood) for "insert[ing] in desks or other furniture."[36] These buttons ranged from 75 cents to $2.50 a piece in cost and occupied but half a page in a catalog of more than 100 pages. Two years later, the same catalog had expanded its offerings to one full page of buttons for purchase, most with the same technical features, but providing larger, more detailed illustrations.[37] By the early twentieth century, more than 50 different designs of push buttons existed at a fraction of their previous cost.[38] Consumers could purchase buttons that clamped to dining room tables and embedded in floorboards for easy pressing by hand or foot; they could obtain buttons with lettering, numbering, and intricate decorations; and they could choose buttons that hung from cords, illuminated, and that made a variety of sounds. Ranging from plain to incredibly ornate, push buttons in the early twentieth century had evolved into inexpensive, desirable, and multifaceted electrical accessories (see figure 1.1).[39]

As more consumers began to consider electrification, a host of electrical supply companies started producing push buttons. Some of the most prominent manufacturers included Cutler-Hammer Manufacturing Company of Milwaukee, Hart-Hegeman Manufacturing Company of Connecticut, the Perkins Electric Switch Manufacturing Company of Connecticut, and General



Electric of New York. Alongside these notable producers, dozens of others also entered the market with an eye toward capitalizing on the growing demand for electrical control mechanisms.[40]

Buttons worked in a variety of ways, and how fingers pushed them often aligned with how people perceived their purpose and effect. Most buttons functioned via "momentary" action. This momentary push came out of key culture; as with the telegraph key, the piano key, and the typewriter key, one could only get sound, signal, or effect when one's finger touched the button. The camera button or electric bell button worked in the same way: a snap of the shutter or ring of the bell tied to the action of the finger. Stringing together a set of sounds, patterns, lights, and so on became important because meaning was derived from how many pushes a finger made and how the pusher arranged her pushes according to certain patterns and rhythms. In this case, buttons defaulted to a state of "off" would spring to "on" upon pushing and then return to "off" again. Alternatively, "continuous" buttons could retain their state after an initial finger pressing. This functionality meant that buttons "automatically" took over the work of state maintenance—holding a button in an on position for an extended period of time—and the only time a pusher interacted with a button again was to turn it off; therefore, the finger only intervened to begin and end something. Yet a third form of button pushing utilized buttons in a discrete

Figure 1.1
Catalog advertising a variety of push buttons available for purchase. Source: Patrick, Carter & Wilkins, *Catalogue of Annunciators, Alarms and Electrical House Goods*, 1909. Image courtesy of the Warshaw Collection of Business Americana—Electricity, Archives Center, National Museum of American History, Smithsonian Institution.

manner, much like a trigger.[41] To use a button as a kind of trigger meant that the finger could start a process or action; once the process began, it would no longer remain under the control of the operator's hand. Trigger buttons existed more in the cultural imagination than in everyday life, as in fears about push-button warfare, and they presented a weighty proposition: as the process of state maintenance became increasingly autonomous from the finger, one could not undo what was done. There was no "off" switch and only one push: an irrevocable one.

In the spaces where digital hand practices were implemented, workers coped with increasing physical distance, new production processes, and bureaucratic measures that destabilized traditional working environments. Efficiency experts touted the benefits of improved reaction time and enthused about hands that could do more by virtue of their machine counterparts. Similarly, advertisers boasted to homeowners about the merits of button pushing that reduced the need for hand strength or special skills. A glorified vision of a single push meant to imagine a world in which "huge machinery is started and stopped through it by one-finger power."[42] Yet the mythical button that eased the hand's burden, required only a finger, and functioned without problems did not really exist. Just as no universal hand pushed buttons, buttons did not operate seamlessly and neutrally.

2 Ringing for Service

> Some persons object to pushes and pressels; they like to have something to pull as in the ordinary bell-pull of the old system. There are others who have become habituated to the bell-pull, and cannot take comfortably to the order of new things.[1]

The practice of ringing bells served an important function in the late nineteenth and early twentieth centuries, and in fact the bell acted as "a proxy for all sorts of relations" between people.[2] To understand how buttons began to achieve prominence as communication and control mechanisms requires understanding bells and bell ringing as a popular method of signaling, warning, garnering attention, and making demands. One might find push-button bells in a variety of places, but they first achieved prominence as fire-alarm mechanisms. In 1870, inventor Edwin Rogers designed a fire-alarm repeater and included a push button in his designs. Deemed the "inventor of the electric push button" years later in his obituary (the only fleeting mention of buttons having any one "inventor" at all), Rogers identified a need for instant action and reaction—and signals that could replicate over distance—to engage the appropriate parties in fire response.[3] Rogers' repeater made it possible for an alarm triggered at the location of one box on the street to

Chapter 1: Setting the Stage

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2. See other examples of "mere touch," such as John Milton Gregory, *A New Political Economy* (Cincinnati, OH: Bragg & Co., 1882); "The Wonders of Electricity," *Journal of the Brotherhood of Locomotive Engineers* 24 (1890): 913–914; Alexander Findlay, *Chemistry in the Service of Man* (London, New York: Longmans, Green and Co., 1920).

3. "A Modern Organ," *Journal of the Franklin Institute* 72, no. 1 (1876): 186–191.

4. Francis Trevelyan Miller, *Wonder Stories* (New York: The Christian Herald, 1913).

5. Walter Benjamin, "On Some Motifs in Baudelaire," in *Walter Benjamin: Selected Writings*, ed. Howard Eiland and Michael W. Jennings, vol. 4, *1938–1940* (Cambridge, MA: Harvard University Press), 328.

6. *The Factory Management Series: Machinery and Equipment* (Chicago: A. W. Shaw Company, 1915).

7. Karl Marx and Friedrich Engels, *Manifesto of the Communist Party* (London: Reeves, 1888).

8. Jean Baudrillard, *The System of Objects* (London: Verso, 2005); Michel de Certeau, Luce Giard, and Pierre Mayol, *The Practice of Everyday Life: Living and Cooking*, vol. 2 (Minneapolis: University of Minnesota Press, 1998); Vilém Flusser, *Shape of Things: A Philosophy of Design* (London: Reaktion Books, 1999).

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11. Shoshana Zuboff, *In the Age of the Smart Machine: The Future of Work and Power* (New York: Basic Books, 1988).

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13. See Janet Zandy, *Hands: Physical Labor, Class, and Cultural Work* (New Brunswick, NJ: Rutgers University Press, 2004).

14. W. H. Preece, "Recent Wonders of Electricity," *Popular Science* 20, no. 46 (1882): 786; George Walter Stewart, "A Contribution of Modern Physics to Religious Thought," *Homiletic Review* 68 (1914): 278.

15. James W. Steele, *Steam, Steel and Electricity* (Chicago: The Werner Company, 1895).

16. Linda Simon, *Dark Light: Electricity and Anxiety from the Telegraph to the X-Ray* (Orlando, FL: Harcourt, 2004). See also Graeme Gooday, *Domesticating Electricity: Technology, Uncertainty and Gender, 1880–1914* (London: Pickering & Chatto, 2008).

17. "Contagion (n)," in *A Dictionary of the Derivations of the English Language* (London: William Collins, Sons, & Co., 1872), 76.

18. Solomon Solis-Cohen, *A System of Physiologic Therapeutics: Prophylaxis, Personal Hygiene, Civic Hygiene, and Care of the Sick*, vol. 5 (Philadelphia: P. Blakiston's Son & Co., 1903), 289.

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Contagion with Reference to the Quarantine Laws (London: Burgess and Hill, 1819), 26.

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23. Albert Salisbury, *The Theory of Teaching and Elementary Psychology* (Whitewater, WI: The Century Book Company, 1905). See also Grace D. Coleman, "The Efficiency of Touch and Smell," *American Annals of the Deaf* 67 (1922): 301.

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27. Bellamy, *Equality* (New York: D. Appleton and Company, 1897), 348.

28. H. P. Bowditch and Wm. F. Southard, "A Comparison of Sight and Touch," *Journal of Physiology* 3 (1882): 233.

29. John Durham Peters, *Speaking into the Air: A History of the Idea of Communication* (Chicago: University of Chicago Press, 1999), 269.

30. George T. Lemmon, *The Eternal Building or the Making of Manhood* (New York: Eaton & Mains, 1899), 158.

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32. Kidder, *Architect's and Builder's Pocket-Book*, 1333. Buttons were frequently lauded for their "neat appearance." See O. S. Platt Manufacturing Company, "The 'New England' Push-Button Switch," *Electrical World* 29 (1897): 695.

33. See Schuylkill Electric Const. & Supply Co., "Specifications for Electrical Work for Mr. Simon Krick," 1909 (Warshaw Collection of Business Americana, Archives Center, National Museum of American History, Smithsonian Institution, Washington, DC).

34. See, for example, the Stout-Meadowcroft Company, *Illustrated Catalogue and Price List of the Stout-Meadowcroft Co.* (New York: Stout-Meadowcroft, 1885; collections of the Bakken Museum, Minneapolis, MN), 106; J. Elliott Shaw Company, "Household and Experimental Electrical Supplies and Novelties, Catalog No. 15," 1903 (Warshaw Collection of Business Americana, Archives Center, National Museum of American History, Smithsonian Institution, Washington, DC).

35. John Wright, *The Home Mechanic: A Manual for Industrial Schools and Amateurs* (New York: E. P. Dutton and Company, 1905), 204.

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37. Patrick and Carter Co., *Patrick & Carter's Illustrated Catalogue and Price List* (Philadelphia: Patrick and Carter Co., 1884; Warshaw Collection of Business Americana, Archives Center, National Museum of American History, Smithsonian Institution, Washington, DC).

38. Patrick, Carter & Wilkins Co., *Patrick, Carter & Wilkins Co. Catalogue* (Warshaw Collection of Business Americana, Archives Center, National Museum of American History, Smithsonian Institution, Washington, DC).

39. See other catalogs, including Belden Manufacturing Company, *Belden Manufacturing Company Catalogue*, 1909; Novelty Electric Company, *Novelty Electric Company Illustrated Catalogue*; Ohio Electric Works, *Illustrated Catalogue*, all from Warshaw Collection of Business Americana, Archives Center, National Museum of American History, Smithsonian Institution, Washington, DC.

40. Hart-Hegeman push-button switches, known as "Diamond H Switches," had an international reach, with installations that included the Ritz Hotel, Bank of England, Hotel Maurice and Hotel Regins in Paris, and so on. See "Untitled," *Electrical Review* 38, no. 2 (1901), Warshaw Collection of Business Americana, Archives Center, National Museum of American History, Smithsonian Institution, Washington, DC; Sears, Roebuck and Co., *Electrical Goods and Supplies* (Chicago: Sears, Roebuck and Co., ca. 1902; Collections of the Bakken Museum, Minneapolis, MN).

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42. "Untitled," *Electrical Record and Buyer's Reference* 2, no. 1 (1907): 3.

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2. Edwinson, "Electric Bells," 323.

3. "Push-Button Inventor Dead," *Sun*, August 17, 1907: 5.

4. T. Commerford Martin and Stephen Leidy Coles, eds., *The Story of Electricity*, vol. 1 (New York: The Story of Electricity Company, 1919).

5. "Electric Fire Alarm; Fifty Years Since the Inauguration of the System," *Sun*, May 1, 1902: 5.

6. Andrew Carnegie, *Triumphant Democracy: Or, Fifty Years' March of the Republic* (New York: Charles Scribner's Sons, 1886), 83.

7. "To Prevent Panic in Theatres," *Harper's Weekly*, April 22, 1882: 243. Although these signals could provide real protection from danger, satirists also mocked them by suggesting that soon enough everyone would have an electric button at hand, with a trapdoor beneath each seat, to carry patrons to safety. The observer humorously noted that a gentleman sitting behind a lady with a tall hat might too make use of this technology, surreptitiously using his button to remove the visual impediment. See "Untitled," *Electrical Journal*, 186. Additionally, push buttons were commonly kept behind glass; the user would break the glass to get to the button. See, for example, "Telephone Fire Alarm," *Municipal Journal & Public Works* 33, no. 21 (1912): 782–783.

8. William Paul Gerhard, "The Essential Conditions of Safety in Theatres.—IV," *American Architect and Building News* 45, no. 969 (1894): 25–26; Gerhard, *Theater Fires and Panics* (New York: John Wiley & Sons, 1897).

9. Hugo Diemer, *Factory Organization and Administration* (New York: McGraw-Hill, 1910). Floor buttons were common in places like offices and hospitals, and shops sometimes placed buttons under doormats to call employees' attention to entering customers. See Rankin Kennedy, *The Book of Electrical Installations*, vol. 2 (London: Caxton Publishing, 1902).

10. William L. Allison, *Allison's Webster's Counting-house Dictionary of the English Language and Dictionary of Electricity, Electrical Terms and Apparatus* (New York: William L. Allison, 1886); Kennedy, *Book of Electrical Installations*; Charles Robert Gibson, *Electricity of To-Day: Its Work & Mysteries Described in Non-Technical Language* (London: Seely, Service & Co. Ltd., 1912).